UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 2014
REVISED COURSE IMPLEMENTATION DATE: September 2023
COURSE TO BE REVIEWED (six years after UEC approval)**:** September 2028
Course outline form version: 09/08/2021

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: ENPH 340	**Number of Credits:** 4 Course credit policy (105)
Course Full Title: Microcontrollers and Embedded Systems **Course Short Title:** Microcontrollers & Embed Syst	
Faculty: Faculty of Applied and Technical Studies	**Department (or program if no department):** Physics

Calendar Description:

Introduction of the design and construction of microprocessor-controlled devices. Basic concepts of sensors and actuators. Introduction to embedded systems using microcontrollers. C and assembly language programming.

Note: Students with credit for ENGR 340 cannot take this course for further credit.

Prerequisites (or NONE):	ENPH 320.
Corequisites (if applicable, or NONE):	
Pre/corequisites (if applicable, or NONE):	

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number: **ENGR 340**

Cross-listed with:

Equivalent course(s):

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar	21
Supervised laboratory hours (science lab)	54
Total hours	**75**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: ☒ No ☐ Yes

Course Details

Special Topics course: **No**
(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **No**
(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **May be offered in multiple delivery modes**

Expected frequency: **Annually**

Maximum enrolment (for information only)**: 18**

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

Transfer Credit *(See **bctransferguide.ca**.)*

Transfer credit already exists: **No**

Submit outline for (re)articulation: **Yes**
(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:**	February 14, 2022
Faculty Council approval	**Date of meeting:**	April 14, 2022
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	September 23, 2022

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

Upon successful completion of this course, students will be able to:

1. Analyze the architecture of a microcontroller.
2. Describe arithmetic logic instructions and programs.
3. Describe advanced addressing modes, macros and modules.
4. Write programs using C and assembly language.
5. Explain basic concepts of sensors and actuators.
6. Describe interface with analog and digital I/O, timer/counter programming.
7. Design simple embedded systems.
8. Design and construct projects using a microcontroller, sensor(s), motor(s), and electronic components.
9. Communicate effectively with project collaborators about the concepts above.

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Assignments:	5%	Quizzes/tests:	10%	Final exam:	25%
Lab work:	30%	Project:	30%		%

Details:

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	Textbook	Edward H. Currie, David Van Ess	PSoC3/5 Reference Book	2010
2.	Textbook	Robert Ashby	Designer's Guide to the Cypress PSoC	2005
3.				
4.				
5.				

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

The necessary laboratory equipment will be provided to the students.

Course Content and Topics

1. Introduction to microprocessor systems
2. Microcontroller architectures
3. Assembly language programming
4. C programming for microcontrollers
5. Input/output ports and I/O interfacing
6. Arithmetic logic instructions and programs
7. Advanced addressing modes, macros, and modules
8. Interfacing with analog and digital I/O, timer/counter programming, and interrupts

Laboratory sessions include experiments on microprocessor-based hardware design; assembly and C language program development; programming and interfacing with I/O device; and sessions dedicated to the design and completion of a major laboratory project.