Course Outline

FACULTY:	**Faculty of Science and Technology**	
PROGRAM(S):	**243.A0 Computer Engineering Technology**	
DEPARTMENT:	**247 Computer Engineering Technology**	
COURSE TITLE:	**MICROCONTROLLER AND MICROPROCESSOR SYSTEMS**	
COURSE NUMBER:	**247-307-VA**	
COURSE SECTION(S):	0001, 0002	
PONDERATION:	2-3-2	lecture - labwork - homework
NUMBER OF CREDITS:	2.33	credits
PREREQUISITE(S):	247-207-VA	Computational Logic Circuits
SEMESTER:	Semester 3	
SEMESTER/YEAR:	Fall 2020	
TEACHER:	Day Yann Fong	
	Office	K-311
	Tel.	514-744-7500 x8335
	E-mail	Use MIO or Teams
	Availability	Mon 10am – noon, Fri 1pm-3pm, or by appointment

Description

In this course students will be introduced to Microcontroller and Microprocessor Systems. They will identify the main processing units of a computer system and integrate them with other peripheral devices. They will learn to diagnose a problem affecting a circuit containing a microcontroller or a microprocessor.

Students will analyze microprocessors architecture. They will learn how to program in assembly language using specific architecture. They will learn how to use C language in microcontroller environment. They will be introduced to memory, timers, input/output, oscillator configuration and interrupts.

The student gains familiarity with data sheets, circuit schematic diagrams, professional IDE specific to microcontroller (including simulator and debugger). These concepts will be illustrated based on Microchip 8-bit PIC microcontroller. Students will also learn peripheral I/O interfacing and various hands-on applications.

Statement of Competencies

Course Material Required

- Hand-outs will be provided as required and reading maybe be assigned

Student Personal Resources Required

- Lab:
  - PIC16F887 Microchip microcontroller, data sheets and user guide
  - Purchase of system components for project (max CAD$20-30)
  - USB flash key

Bibliography

- *Designing Embedded Systems with PIC Microcontrollers. Principles and applications. Tim Wilmshurst*

037G To diagnose a problem affecting a circuit containing a microprocessor

1. Become familiar with the specifications.
2. Install a microprocessor.
3. Conduct tests.
4. Determine the cause or causes of the problem.
5. Write a report.

037S To program computerized systems

1. Become familiar with the specifications.
2. Define algorithms.
3. Customize the environment.
4. Code the program.
5. Perform compilation exercises.
6. Conduct tests.
7. Optimize the code.
8. Document the program.

Tentative course and corresponding lab content (Sequence subject to change)

All classes are scheduled to be conducted online, unless otherwise stated.

++ These labs are to be conducted in the laboratory/classroom in campus

Week duration	Theory Topics (Fri : 10am – 12pm)	Tentative Lab Activities (Wed : 2-5pm, Thu : 2:30-5:30pm)
1	Course Outline. Introduction to embedded system and processor architecture.	Review on digital logic and memory capacities. In-class assignment.
2	Introduction to microcontroller.	Processor architecture (theory) and assignment
3	PIC startup and assembly language programming	Introduction to PIC16F887 (theory) and assignment.
4	PIC instruction and Core SFR	++ Introduction to PIC microcontroller assembly, IDE and debugger
5	PIC IO ports	Basic digital input and output
6	Branching	
7	*** Midterm Test ***	++ Internal clock and software delay loop
8	*Study and Assessment Week*	
9	Timers	++ Subroutine call
10		Timer0 as counter
11	Interrupts	Timer0 interrupt
12		++ Project
13	MPU and memory map	
14		
15	Review	*** ++ Lab Test ***
16	*** Final Exam ***	MPU and memory map (assignment)

Important Assessment Dates

The following dates are tentative and will be confirmed at least 1 week in advance

- Midterm Test : Week 7 (9th Oct 2020)
- Final Exam : Week 16 (11th Dec 2020)
- Project demo and presentation : Week 14 (25th & 26th Nov 2020)
- Lab Test : Week 15 (2nd & 3rd Dec 2020)

THEORY:	2 hour / week	Lectures and demonstrations, discussions and problem solving with student participation.
LABORATORY:	3 hours / week	Demonstrations, lab activities and work performed by students, and results presented. Detailed report written by the students demonstrating an understanding of the competencies addressed. Mini project completed in small group and documented in report.
HOMEWORK:	2 hour / week	The student will be expected to devote approximately 2 hour per week to homework.

ATTENDANCE

THEORY: Consistent attendance is strongly recommended. **Students are responsible for obtaining all material covered during any absence.**

LABORATORY: Laboratory sessions are part of assessment activities. Failure to complete lab activities assigned in the designated lab class without just cause may result in a failure of the lab session and any results and/or lab report derived from the session.

In order to meet and be evaluated on the course competencies lab attendance is required. Note that there is both a separate and an integrated **professionalism** mark associated with the course (see below).

During the lab periods, you are expected to work on your assignments. It is not permitted to use the internet during lab periods outside the scope of the lab.

TESTS: Absence will result in failure of the missed test (mark of 0). Students with a just cause for absence are encouraged to seek alternative arrangements with the instructor – beforehand if possible. College policies on just cause will apply.

EVALUATION

The final mark will be weighted:	50% theory	*15%*	*Assignment/Quizzes*
		15%	*Midterm Test*
		17%	*Final Exam*
		3%	*Professionalism, participation, English proficiency*
	50% lab	*25%*	*Laboratory*
		10%	*Project*
		12%	*Lab test*
		3%	*Professionalism, participation, English proficiency*
	Total	**100%**	

The following general rules apply:

- A minimum mark of 60% is required to pass the course **AND** at least 50% in the Theory portion **AND** at least 50% in the Lab portion. If the mark is less than 50% for either the Theory o**r** Lab portion, the total mark will not exceed 55%.
- At least one week's notice will be given for test dates or changes in test dates.
- Tests questions will not be re-graded after 24 hours of returning and any altered material will not be re--graded
- Quizzes may be given without prior notice – there are no make-ups for quizzes (mark of 0 for missed quizzes).
- **Students are expected to conduct themselves in a professional manner at all times.** This includes but is not limited to:
  - Arriving to laboratory on time and prepared to do the required work;
  - Conducting themselves in an appropriate manner at all times (including being respectful to the teacher, classmates, and any guests);
  - Using professional language (no cursing and/or swearing and using appropriate vocabulary);
  - Arriving to class/lab with all necessary supplies (logbook, notebook, textbook, manual, paper, writing implements, calculator, etc.);
  - Turning off all personal communication/music/video electronics (removing headphones, earphones, ear buds etc.); and
  - Having all assigned work completed.

  Remember that developing professional behaviours and habits now is an important aspect of preparation for entering a professional work environment in the future.
- Students are expected to take their own notes during classes.
- Reports must be typed and computer generated according to the guidelines.
- When requested, Lab preparations and Lab Results/logbooks are to be handed in during the lab session. Late Lab Preparations/Lab Results may not be accepted, and a zero mark will be recorded.
- Reports are due one week after they are assigned unless the instructor provides a specific due date.
- **ALL** assigned work (assignment, lab report etc) must be submitted **ON TIME**. **NO LATE SUBMISSION WILL BE ACCEPTED**, and a zero mark will be recorded, unless for valid reasons that was communicated to the instructor at least 2 days prior to the deadline.
- In-class assignments will only be accepted in the class in which they are assigned.
- Students who are consistently late for class may be refused entry.
- All grades are reported on a numeric scale from 0% to 100%. The following categories briefly describe the relative value of these grades.

range	mean	Description
90 - 100	**95**	Excellent, mastery of the objectives
80 - 89	**85**	Very Good mastery of the objectives
65 - 79	**72**	Good, mastery of objectives
60 - 64	**62**	Fair mastery of objectives
0 - 59	n/a	Poor mastery of objectives

Academic and other Resources

If at any point in the semester, you are concerned about the course or you realise that you are having academic difficulties; your first resource should be to talk to me, your teacher. Academic difficulties include problems with the understanding of the theory, to the development of the practical skills required by the course. The earlier you look for help, the greater your chances of succeeding in the course. If I don't feel I can provide you with the help you need then I may recommend one of the College resources below.

For other problems or difficulties, you may encounter while at Vanier there are a number of Services available to help you within the college. They are there for you to use. These include:

Student Services (C203): Some areas where they provide services and/or information are:

Services for students with disabilities	Counselling (personal and other problems)
Student Advocate	Financial Aid (including aid and scholarships)
Health Services (Nurse on staff)	Student Employment
Academic and Behaviour Policies	Lockers
Housing	Volunteering

Student Services is a great resource for questions about college life and any problems you encounter while at Vanier. If they do not have the answer, they can direct you to the right place to find it.

Tutoring and Academic Success Center - TASC (F-300): Student-orientated centre dedicated to promoting and aiding students' development and success in academics and in society.

Admissions and placement tests	S.T.A.R. Program
English Exit Exam	English conversation and pronunciation clubs
English Peer Tutoring	Scholarship information
Vanier Native Program	Diversity support

TASC is the main college resource for students with learning difficulties and for students with weak English language skills.

Science, Technology, Engineering and Mathematics - STEM (D-301): This Centre aims to promote student success in mathematics and science. The large interactive study space includes a hackerspace for hands-on applied projects such as robotics, and a study hub for collaborative group work. Teacher help, computers, and a large collection of math and science textbooks are equally available. We offer a number of activities, services and resources including:

Free drop-in peer tutoring	Drop-in help from teachers
Free private tutoring	Teacher-led review sessions
Computer access	Laptop borrowing

Mediation and Grades Review

There are two committees available to the student for resolution of academic complaints.

1. The *Grades Review Committee* to review complaints concerning the grading of students' work.
2. The *Faculty Mediation Committee* to review academic complaints other than those dealing with student grades – see *Student Academic Complaints* below.

General College Academic Policies

It is the student's responsibility to be familiar with and adhere to all Vanier College Policies. A summary of the course-level policies that apply in this and all other Vanier courses can be found under "Course-Level Policies" in Important Vanier Links on Omnivox, or by following this link: http://www.vaniercollege.qc.ca/psi/course-level-policies/. Complete policies can be found on the Vanier College website, under Policies.