

Engineering Physics 4US2
Modern and Applied Physics Laboratory – Smart Systems
Fall 2020
Course Outline

CALENDAR/COURSE DESCRIPTION

This course is one of five advanced laboratory courses in the areas of applied physics: Photonics, Nano- and Micro-devices (Photovoltaics), Biomedical, Smart Systems, and Nuclear Labs. Students must take two of the five topics, in order to fulfill degree requirements (for a total of four units). The same topic cannot be repeated.

In 4US2 Modern and Applied Physics Laboratory – Smart Systems, students will gain hands-on experiences in design, building, and performance evaluation of integrated systems with sensors, sensor networks and active feedback controls. In this advanced lab course, the focus is on experiential learning through mostly prescribed labs. Each of the lab will have an optional open-ended component allow students to explore different design and functionalities.

In this coming 2020 Fall semester, to ensure social distancing and safe work conditions, this hands-on lab will be conducted completely remotely at home with take-home kits and detailed instructions. The lab tutorials will be provided as synchronous and/or asynchronous videos while the TAs will be available in designated times for additional instructions and assistance. The evaluations will also be conducted remotely through video conferences.

The course consists two modules. In the first module, an ambient environment sensor system will be built and used with a cloud computing platform for continued ambient environmental parameters such as temperature, humidity, light, and movements near the sensor system.

In the second module, each student will choose from one of the following smart system projects: 1) a medical ventilator; 2) a smart home sensor network with indoor positioning systems and environmental sensing; and 3) a LIDAR system. The students will build and demonstrate the functionality of the system and analyse the control from the sensors in the project.

PRE-REQUISITES AND ANTI-REQUISITES

Prerequisite(s): ENGPYS 3W04 A/B and PHYSICS 3B06, or both ENGPYS 3BA3 and ENGPYS 3BB3

Antirequisite(s): ENGPYS 4U02 A/B

INSTRUCTOR OFFICE HOURS AND CONTACT INFORMATION

Dr. Qiyin Fang
ETB 405
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ext. 24227

Office Hours:
by appointment

TEACHING ASSISTANT OFFICE HOURS AND CONTACT INFORMATION

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TBD

Office Hours:
by appointment

COURSE MEETING TIME

All labs will be conducted remotely at home. There is no on campus activities. Each student will be assigned to one of the following lab times for synchronous tutorial and Q&A.

Monday, Wednesday, Thursday, Friday

14:30 to 17:30

COURSE WEBSITE/ALTERNATE METHODS OF COMMUNICATION

The course website, including all course information will be hosted on Avenue to Learn:

<http://avenue.mcmaster.ca/> All course-related submissions must be done through Avenue to Learn Dropboxes. It is the students' responsibility to check regularly the course web page (Avenue to Learn) for updates and announcements. Students are required to obtain and maintain McMaster and Avenue to Learn e-mail accounts for timely communications between the instructors and the students.

The synchronous tutorials, Q&A, and evaluations will be conducted through Microsoft Teams, while Cisco WebEx and Zoom will be used as backup solutions.

COURSE OBJECTIVES

The objective of this course is to apply previously learned electronics and control knowledge to develop basic smart systems. Through these experiential learning activities, the students will learn about the controls and interactions between the components involved in these two projects.

By the end of the course, students should be able to:

- Understand the mechanisms and role of sensors in the design of the smart systems

- Understand the control mechanisms and learn how to use microcontrollers to build compact data acquisition systems.
- Learn how to use cloud computing platforms for continuous data acquisition, processing, and analysis.
- Be familiar with all the circuit components used to create their projects
- Understand the impact of smart sensors in the real world

MATERIALS AND FEES

Required Texts: N/A

Calculator: Any

Other Materials:

A experiment kit for project assembly will be available at the McMaster Book Store.

COURSE OVERVIEW

Date/Week	Topic	Readings
Week 1-5	Project A: smart environment sensor systems	
Week 7-12	Project B: smart systems lab	
Week 13	Project demonstration and final evaluation	

ASSESSMENT

Component	Weight
Project A Report	15%
Project A Demonstration	15%
Project B Report	30%
Project B Demonstration	30%
Final Lab Report	10%
Total	100%

ACCREDITATION LEARNING OUTCOMES

The Learning Outcomes defined in this section are measured for Accreditation purposes only, and will not be directly taken into consideration in determining a student's actual grade in the course.

5.1, 5.2, 7.1, 7.2, 7.3, 12.1

For more information on Accreditation, please visit: <https://www.engineerscanada.ca>

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at <http://www.mcmaster.ca/academicintegrity>

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

ACADEMIC ACCOMMODATIONS

Students who require academic accommodation must contact Student accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contact by phone at 905.525.9140 ext. 28652 or e-mail at sas@mcmaster.ca. For further information, consult McMaster University's Policy for [Academic Accommodation of Students with Disabilities](#).

NOTIFICATION OF STUDENT ABSENCE AND SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK

1. The [McMaster Student Absence Form](#) is a self-reporting tool for Undergraduate Students to report absences DUE TO MINOR MEDICAL SITUATIONS that last up to 3 days and provides the ability to request accommodation for any missed academic work. Please note this tool cannot be used during any final examination period.
2. You may submit a maximum of 1 Academic Work Missed request per term. It is YOUR responsibility to follow up with your Instructor immediately (NORMALLY WITHIN TWO WORKING DAYS) regarding the nature of the accommodation. Relief for missed academic work is not guaranteed.
3. If you are absent for reasons other than medical reasons, for more than 3 days, or exceed 1 request per term you MUST contact the Associate Dean's Office. You may be required to provide supporting documentation.
4. This form must be submitted during the period of absence or the following day, and is only valid for academic work missed during this period of absence.
5. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in his/her course.
6. You should expect to have academic commitments Monday through Saturday but not on Sunday or statutory holidays. If you require an accommodation to meet a religious obligation or to celebrate an important religious

holiday, you may submit the Academic Accommodation for Religious, Indigenous and Spiritual Observances (RISO) Form to the Associate Dean's Office. You can find all paperwork needed here:

<https://www.eng.mcmaster.ca/programs/academic-advising>

NOTICE REGARDING POSSIBLE COURSE MODIFICATION

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

TURNITIN.COM STATEMENT

In this course we will be using a web-based service (Turnitin.com) to reveal plagiarism. Students will be expected to submit their work electronically to Turnitin.com and in hard copy so that it can be checked for academic dishonesty. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to <http://www.mcmaster.ca/academicintegrity/>.

ON-LINE STATEMENT FOR COURSES REQUIRING ONLINE ACCESS OR WORK

In this course, we will be using Avenue to Learn. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

REFERENCE TO RESEARCH ETHICS

The two principles underlying integrity in research in a university setting are these: a researcher must be honest in proposing, seeking support for, conducting, and reporting research; a researcher must respect the rights of others in these activities. Any departure from these principles will diminish the integrity of the research enterprise. This policy applies to all those conducting research at or under the aegis of McMaster University. It is incumbent upon all members of the university community to practice and to promote ethical behaviour. To see the Policy on Research Ethics at McMaster University, please go to <http://www.mcmaster.ca/policy/faculty/Conduct/ResearchEthicsPolicy.pdf>.