

Course Outline

1. COURSE INFORMATION

Session Offered	Fall 2023
Course Name	Human Monitoring and Smart Health Systems
Course Code	SMRTTECH 4HM3
Date(s) and Time(s) of lectures	C01 Monday 9:30 AM 11:20 AM T01 Monday 11:30 AM 12:20 PM L01 Wednesday 9:30 AM 12:20 PM L02 Wednesday 9:30 AM 12:20 PM
Program Name	Automation Engineering Technology/Automotive and Vehicle Engineering Technology
Calendar Description	This project-based course covers human monitoring and health data acquisition, monitoring of respiratory activities and other vital signs, wearable and contactless sensors, multi-sensor platform for circadian rhythm analysis, Signal processing, and networked and mobile systems for vital signs monitoring through wired and wireless Local Area Networks, cloud, and the Internet of Things (IoT).
Instructor(s)	E-Mail: toosizas@mcmaster.ca esteve.hassan@mohawkcollege.ca Monday 9:30 AM – 12:20 PM, In-Person: MDCL 1009 & BSB B156

2. COURSE SPECIFICS

Course Description	<p>This course examines the definitions and types of the latest human monitoring and mobile health (mHealth) devices. The course evaluates the use of smart health technologies for self-care and remote care and explains design considerations in medical for wearable sensors, mobile communication devices (including smart phones), Internet of things (IoT), and machine-to-machine (M2M) systems.</p> <p>The course starts with presenting an overview of the mHealth monitoring concept, new sensing technologies, and smart mobile applications to provide significantly improved care to anyone, at any time, and anywhere, while increasing the coverage, quality, and efficiency of healthcare. While this course covers a wide spectrum of human physiological monitoring technologies, it focuses on: (1) the evaluation of the suitability of various wearable, implantable, and ingestible sensor devices used in healthcare monitoring; (2) Investigating the potential of employing mobile devices and Internet of things (IoT) in medical applications; (3) Assessing the performance of wireless medical devices with addressing data privacy challenges.</p>		
Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	26
	L	Laboratory, workshop or fieldwork	18
	T	Tutorial	13
	DE	Distance education	
	Total Hours		57
Resources	ISBN	Textbook Title & Edition	Author & Publisher

	ISBN:	ISBN: 978-1-118-49698-5	m-Health: Fundamentals and Applications
	Other Supplies	Source	
	Lecture notes, slides, and videos	Avenue to Learn	
Prerequisite(s)	ENGTECH 4EE0 and registration in level IV of Automation Engineering Technology program or the Automotive and Vehicle Engineering Technology program		
Corequisite(s)			
Antirequisite(s)			
Course Specific Policies	Late assignments and reports will result in 10% reduction in the assigned marks for each day the work is late, including weekend and public holidays, for the first five days. Assignments and reports that are late for more than five days, including weekend and public holidays, will get a score of zero marks.		
Departmental Policies	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p>		
3. SUB TOPIC(S)			
Week 1	Course Introduction. Course Guide and Instructions. Assessments. Rubrics. Lab Requirements. Digital Tools.		
Week 2	Introduction to eHealth and mHealth systems		
Week 3	Wi-Fi Enabled healthcare	Assignment 1: Wireless Body Area Networks: Challenges, Trends, and Emerging Technologies. - Due end of week 4 Lab Session- Lab 1A Quiz1	
Week 4	Role of mHealth for Self-Care and Remote Care (Lecture)		Lab 1A & 1B

Week 5	mHealth sensing and monitoring (Lecture)	Assignment 2: Smartphone applications for patients - Due end of week 6 Lab 1C
Week 6	mHealth Computing (Lecture)	Lab 1D
Week 7	Human activity monitoring with smartphones	Lab 2A_Shimmers Digital Device
Week 8	mHealth and Mobile Communication Systems (Lecture)	Midterm Exam
Week 9	mHealth Care Models and Applications (Lecture)	Lab 2B_Shimmers Digital Device
Week 10	Clinical examples using mobile devices (Lecture)	Lab_Project_Shimmer's Kit evaluation and analyses (Project in- Lab)
Week 11	Assessing wireless medical devices performance(Lecture), Shimmer's Kit evaluation and analyses	(Project in-Lab- continued)
Week 12	Data security and Future Trends(Lecture), Project Presentation	
Week 13	Course Review	
Week 14	Final Exam	

Classes end: Wednesday, December 6, 2023
Final Examination Period: Friday, December 8, 2023 to Thursday, December 21, 2023

List of experiments

Lab 1	Lab 1A_HumanActivityMonitoring
Lab 2	Lab 1B_HumanActivityMonitoring
Lab 3	Lab 1C_HumanActivityMonitoring
Lab 4	Lab 1D_HumanActivityMonitoring
Lab 5	Lab 2A_BioSignal Measurement
Lab 6	Lab 2B_BioSignal Measurement

Note that this structure represents a plan and is subject to adjustment term by term.
The instructor and the 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.

4. ASSESSMENT OF LEARNING *including dates*	Weight
Assignments	5%
Quizzes	10%
Mid-term test	25%
Project	20%
Labs	10%
Final examination (tests cumulative knowledge)	30%
TOTAL	100%

Percentage grades will be converted to letter grades and grade points per the University calendar.

5. LEARNING OUTCOMES

1. Examine mHealth enabling technologies and examine potential gains and challenges related to system implementation
2. Evaluate the suitability of various patient care and treatment devices used in healthcare monitoring.
3. Investigate the potential of employing mobile devices and the Internet of things (IoT) in medical applications.
4. Evaluate the use of signal processing (filtering, denoising, and detection) and machine learning techniques in early diagnoses and health problem prediction.
5. Assess the performance of wireless medical devices
6. Address the challenge of medical data privacy when using mHealth devices.
7. Examine mHealth enabling technologies and examine potential gains and challenges related to system implementation

6. COURSE OUTLINE – APPROVED ADVISORY STATEMENTS

ANTI-DISCRIMINATION

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf

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. It is your responsibility to understand what constitutes academic dishonesty.

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. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at <https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/>

The following illustrates only three forms of academic dishonesty: The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic

integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com, please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, 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 a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

COMMUNICATIONS

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests. <http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf>

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.