Course number	Course Title	Term
ENGR 490	Multi-Disciplinary Capstone Design Project	FALL/Winter 2020

Course Instructor	Office	E-Mail	Office Hours
Dr. Ali Akgunduz	ONLINE	ali.akgunduz@concordia.ca	Mondays 11:00 AM Tuesdays 11:00 AM

Conditions Specific to Remote Teaching and Assessment

1. All students are expected to have access to a computer with following capabilities:
   a. reliable internet connection
   b. camera and microphone
   c. document scanning application such as Adobe Scan

2. All students should install VPN for remote desktop access to Concordia University computer labs
   https://www.concordia.ca/it/support/connect-from-home.html
   Once you have VPN connection to Concordia University, you can access to all available software in Gina Cody School labs by following the process described in:
   https://www.concordia.ca/ginacody/aits/support/faq/connect-from-home.html

3. All students are expected to do online presentations for assessment
   a. All students MUST turn on their webcams during presentations

4. Academic Integrity
   Violation of the Academic Code of Conduct in any form will be severely dealt with. This includes copying (even with modifications) of program segments. You must demonstrate independent thought through your submitted work. The Academic Code of Conduct of Concordia University is available at:
   https://www.concordia.ca/conduct/academic-integrity.html

   It is expected that during class discussions and in your written assignments you will communicate constructively and respectfully. Sexist, racist, homophobic, ageist, and ablest expressions will not be tolerated.

   All students must read and sign the Expectations of Originality form and submit the signed copy to course instructor by September 14, 2020

COURSE CALENDAR DESCRIPTION

Students work on a supervised team project to solve a complex interdisciplinary design problem. The project is completed by a team of students from at least two different departments in GCS. The project must provide clear goals for each discipline-specific task and each student must have sufficient exposure to subjects in their program of study. Student eligibility and project topics for this course are subject to approval by the ENGR 490 Design Committee, which includes a member from each department in GCS that offers undergraduate programs. This committee vets each project

to ensure the clarity and scope of the goals and its relevance to the learning outcomes of students from each discipline.
The project is carried out over both Fall and Winter semesters. Students are expected to: provide a preliminary project proposal, a progress and final report (as a group); take part in group discussions in audit sessions during the design phase; and participate in a poster session involving individual oral presentations at the end of the winter term. In addition to the technical aspects, students are expected to learn how to evaluate their designs for compliance to regulations, environmental and societal expectations and economic issues. Students learn how to work in a multidisciplinary environment and receive exposure to entrepreneurial skills. Lectures: one hour per week, two terms. Equivalent laboratory time: three hours per week, two terms.

PREREQUISITE

Eligibility to register in one of these courses: AERO 490, BLDG 490, CIVI 490, COEN 490, ELEC 490, INDU 490, MECH 490, SOEN 490 or COMP 490.

NOTE: Students work in groups under direct supervision of a faculty member.

POSSIBLE PROJECTS

1. **Road/Highway Condition Monitoring and Maintenance Planning**
   Using the capabilities of smart phones and/or communication devices imbedded in automobiles:
   - Scan the current condition of roads (such as the existence of potholes and their locations)
   - Collect road condition information in a database
   - Based on the severity of the conditions and the availability of resources, design maintenance plans

Student Composition: Computer Engineer and/or software engineers (or electrical engineers with strong programming experience), Civil Engineer, Mechanical Engineers and Industrial Engineer

2. **Artificial Intelligence to Manage Free Time During a Business Trip**

Develop an Artificial Intelligence based decision support system to help business travelers to get most out of their limited free times in place they are not familiar with. Based on the data available on persons' social media platforms and the other data available through smart phone usage, the proposed AI based solution is expected to define a user personality (likes, dislikes etc) and based on the available free time, AI suggests a set of activities with an expectation to maximize person's satisfaction (utility!)

Student Composition: Industrial Engineers, Software Engineers and/or Computer Engineers (possible collaboration with Department of Phycology)

3. **Subway safety:**
   A device to detect people stepping on the yellow safety band and announce the person at fault, e.g. by a vocal message. Could be a camera with AI, a motion sensor, etc., announcing on PA, on tv screens, anything as long as can be integrated in the current Metro Montreal design

Student Composition: Software Engineers and/or Computer Engineers and students from other disciplines

4. **Manufacturing Capability Identification for Medical Equipment Production under Severe Supply chain Disruptions**

Students are expected to study various critical medical equipment designs, identify bill-of-materials and manufacturing needs to produce these parts.
Next, student are expected to study various manufacturing industries in Canada and study their production capabilities using products manufactured by these organizations (reverse engineering).
Next, develop databases to match capabilities of these organization and the processing needs to manufacture medical equipment.
Finally, design supply-chain network to be waken-up only under emergency conditions to locally manufacture and supply critical equipment in order to satisfy the needs of Canadian healthcare system.

Student Composition: Mechanical Engineers, Industrial Engineers students from other disciplines. A student with strong programming background would help.

5. **A Cooperative Based Taxi Services**

Student are expected to build an online taxi service app. Once it is up and running, the owner of the system will be the drivers. Developer can charge service fees to each cooperative. There will be one cooperative per city. When customers use the app in different cities around the world, they will use the same app, but they will access to different cooperative databases.

Student Composition: Software Engineering, Industrial Engineering and other disciplines

6. **Hockey Goalie Training Simulator**

The objective of this project is to design a simulator to train hockey goalie. While this is an open-ended project and final configuration is up to students, what I expect is the goalie with his/her full equipment go in front of a screen and watch players to shoot at him/her. A camera system is utilized to verify if goalie successfully save the goal. While programming and graphics will be significant part of the project, we expect physical rules to be well incorporated in the simulator.

Student Composition: Software Engineering, Computer Engineering and/or Mechanical Engineering

7.

Students may also suggest their own multidisciplinary projects that require expertise of an interdisciplinary team.

GRADING POLICY

Tasks	**Due dates**	**Grading**
Group formation and preliminary project proposal • Groups • Faculty supervisors • Justification for the interdisciplinary nature	By Week 2 in Fall	10%

• Industry partners and the support letter (if any)		
Formal project proposal which includes: • Objective • Potential application areas • Potential customers • Current or potential competitors • Product main features/functionalities, desired dimensions • Partners (potential vendors, research centers)	First week of October	10%
Detailed project proposal • Alternative solutions • Evaluation of alternatives • Candidate solution that best serves the objectives	First week of December	20%
Preliminary solutions • Prototype • Computer Simulations • Physical mockups Evaluation of design with respect to its impact on: • Society • Environment Evaluation of design with respect to: • Ethics and equity	First week of February	20%

Final project report and presentations
• Working prototype of the best alternative
• Evaluation of the project with respect to its compliance to design objectives
• Manufacturing process and cost of manufacturing or: Dissemination cost (for software projects)
• Entrepreneurship opportunities
  • Potential customers
  • Potential investors
  • Funding sources
  • IP and patent issues
  • Competition
  • Life-cycle analysis
	First week of April	40%