Co-Op CENG/BIEN 4940 (6 credits) *Syllabus*

Coordinator

Prof. Marshal LIU (Rm 4551, keysliu@ust.hk)

Teaching Assistants

TBA

Course Description

This course offers an alternative capstone experience for chemical engineering and bioengineering students. Students will spend the whole Fall or Spring term on a meaningful industry internship. This enables them to directly apply their academic knowledge to solve real-world engineering challenges faced by companies in related sectors.

Through the Co-Op, students will tackle open-ended, practical problems, participating in activities like data analysis, prototyping, testing, and providing recommendations. The Co-Op experience aims to give students invaluable exposure to professional engineering practice, while allowing them to make meaningful contributions to their host organization. Therefore, students can complete their capstone requirement and prepare for the workforce transition.

Expected Learning Outcomes

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

1. Integrate and synthesize the knowledge gained across the curriculum to tackle real-world engineering challenges.
2. Design and conduct appropriate experiments, whether in the lab or through simulations, to optimize and evaluate proposed solutions.
3. Develop creative engineering designs, products, or processes that address relevant societal needs in the chemical, environmental, and biomolecular domains.
4. Collaborate effectively in multi-cultural and cross-disciplinary teams to achieve project objectives.
5. Communicate the problem statement, proposed solutions, and key findings clearly and persuasively, both in written reports and oral presentations.
6. Assess the broader impact of engineering designs on society, considering various relevant perspectives.
7. Demonstrate effective project management skills, including task allocation, personal time management, goal-setting, and meeting deadlines.

Course Requirements and Grading

Project nature:

The Co-Op project scope and key deliverables will be jointly defined by the host company and the departmental Co-Op coordinator. This ensures the project involves open-ended problem-solving, engineering design, experimentation or prototyping, teamwork, and evaluation of societal and economic impact.

To satisfy the Co-Op requirement, students must spend the majority of their work time (more than 50%) focused on a specific project, in addition to their other duties assigned by the company. This project-based work may include identifying an engineering problem, evaluating feasible solutions, conducting experiments or data analysis, and/or designing and optimizing a product or process.

The assessment of the Co-Op experience will be aligned with FYP or FYT requirements, with some adaptations to accommodate the industry-based nature of the work and different schedule. Students will be primarily supervised by a practicing engineer at the host company, but they are also encouraged to seek technical guidance from faculty members in the department.

Student's performance will be assessed mainly by the department (70%), and the company (30%), based on their attitude, teamwork, efforts, milestone achieved, interim presentation, poster presentation and final thesis. The details are listed below (percent weighting and assessors in parentheses).

1. **Completion of the 2 milestones on time (20%, by industrial adviser)**

The **milestones** are mutually agreed by the students and industrial adviser, according to the project scope and deliverables jointly defined by the company and departmental Co-Op coordinator. Students need to prepare a **written summary** with illustrative images (e.g., experimental setup), tables, graphs, review, etc. to demonstrate progress. The complete report should be submitted to the industrial adviser on/before the submission deadline. The grading rubrics is as follows (out of 5):

- 0 mark: no progress, project effectively did not start yet.
- 1 mark: unsatisfactory progress: no evidence of tangible progress.
- 2 marks: marginal progress: some activities, but clearly below expectations.
- 3 marks: adequate progress, but some key expected activities / progress lacking.
- 4 marks: good progress, at most only minor activities / progress are lacking. All key activities conducted according to expectations and agreements.
- 5 marks: excellent progress, exceeding expectations. The quantity and quality of the activities exceed what was expected in the period.

2. **Teamwork (5%, by industrial adviser)**

Teamwork concerns how well the student works with advisers and colleagues in the company. This will be assessed by the industrial adviser based on his/her observation. The grading rubrics is as follows.

- 0 mark: unsatisfactory level. No participation, consistently disruptive to team dynamics and fails to contribute meaningfully.
- 1 mark: poor level. Minimal input; infrequently participates and often conflicts with team members.
- 2 marks: fair level. Limited involvement; participates occasionally but lacks effective collaboration.
- 3 marks: good level. Generally cooperative; contributes positively to discussions and team activities.

- 4 marks: very good level. Actively supports team members; enhances collaboration and contributes significantly to team goals.
- 5 marks: excellent level. Inspires teamwork; fosters a strong group dynamic, mentoring others and driving the team toward success.

3. **Project logbook (5%, by industrial adviser)**

Each student is required to keep an **online project logbook** using Google Doc (or other similar platform). This "living" document takes the place of periodic progress reports. The logbook should document the major action items and tasks completed, the team meetings (date and time, attendance, matters discussed, action items, key decisions, etc.), hurdles encountered, and decisions made, etc. The student should use the logbook to manage the project, and to keep the supervisor abreast of his/her progress on a day-to-day basis. The advisor needs to be provided access to the logbook, and assess how well the logbook is kept throughout the project with the following grading rubrics for two milestones respectively.

- **0 marks** if not used (or not shared with adviser) or no real substance.
- **1 mark** if used but not effectively (or ad-hoc only), typical characteristics of ineffective use include:
    - Incorrect information, like the actions taken, responsible person, date.
    - Taks without follow up on completion or status
    - Some ad-hoc figures/tables, but no complete archiving of data
    - Broken links to data / working documents, no access to background information for supervisor.
    - Few minutes of meetings only, or general information with no substance
- **2 marks** if used effectively throughout the entire period. Effective use includes all the following characteristics:
    - Complete all tasks distributed
    - Follow up on agreed tasks (data, issues)
    - Concise and up-to-date minu1tes of meetings (including with supervisor) with good substance (what decisions made?)

4. **Interim presentation (10%, by a panel of faculty)**

A short presentation on project progress will be delivered to a panel of faculty on campus, in **December for Fall term Co-Op** students, while **May for Spring term Co-Op** students. It will be graded on aspects such as the comprehensiveness of literature review, the amount and level of achievements, the quality of the design (including the reasoning behind decision choices), and presentation skills. The grading rubrics is provided on Canvas.

5. **Final poster presentation (20%, by a panel of faculty)**

Co-Op students need to prepare a poster presentation about the whole project and stand by at the poster to present it to assessors. **Fall term Co-Op** students will present in May, while **Spring term Co-Op** students in late July. Each poster will be assessed by 3 groups of professors and outside experts. It will be graded on aspects such as the amount and level of

achievements, the quality of the design (including the reasoning behind decisions and choices), how well the work has been or could be translated into the real world, and presentation skills. The grading rubrics is provided on Canvas.

6. **Final project report (40%, by a panel of faculty)**

The final project report covering every aspect of the project will be due in early May, for **Fall term Co-Op** students, while late July for **Spring term Co-Op** students. The report will be read and collectively assessed by a faculty panel. Students need to answer any question in person that the panel might have. More details about the expected length, content, format, and grading rubric will be provided later on Canvas.

Tentative Schedule

Fall term Co-Op

Oct 31: Deadline for Milestone 1

December: Interim Presentations on campus

Late Jan: Deadline for Milestone 2, Teamwork, and Logbook (one week before project end)

May 7: Poster presentations

Mid-May: Report Grading Meetings

Spring Term Co-Op

Mar 31: Deadline for Milestone 1

Early May: Interim Presentations on campus

Late July: Deadline for Milestone 2 (one week before project end date)

Late July: Poster presentations & Report Grading Meetings

Other arrangements of the course

Co-Op students may conduct some experiments in the labs of department. All laboratory work in the CBE laboratories must be carried out according to a pre-approved work plan. It is the responsibility of the students to prepare the work plan, review all safety precautions, and obtain approval from Co-Op coordinator. Note that violations of laboratory safety rules may lead to suspension of laboratory access; the students will bear any consequence of such lost time.