

Engineering Design **Cornerstone** Project Course

Course Outline & Syllabus

[Tentative Version]

Center for Engineering Education Innovation (E²I),
The Hong Kong University of Science and Technology

The Hong Kong University of Science and Technology

UG Course Syllabus – Tentative Version for SENG Website

First Year Cornerstone Engineering Design Project Course

ENGG 1100

3 Credits

Exclusion: ENGG 1200 – Engineering Team Design Experience [For first year engineering students only.]

Course Instructors

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Office Hours	By email appointment	By email appointment	By email appointment	By email appointment

Course Description

This project course is designed specifically for first year engineering students. This course aims at providing engineering students with experiential learning experience through exposing students to knowledge and skills from different SENG disciplines before making decisions on their majors. Students on this course will be divided into design teams. Each team will use the acquired knowledge and skills to design and build an engineering artifact. Students would be engaged in experiential learning through working on team projects.

Course Delivery

The course will take the format of 12 face-to-face 3-hours lectures with technical sessions for engineering fundamental knowledge and build sessions where students will follow the engineering design process of professional engineering through each stage of the design cycle and build on knowledge introduced in other courses.

Students will be presented with a partly defined problem statement inspired by authentic real-life scenarios and constraints. Through in-class technical sessions and with the aid of Student Technical Advisors (STAs) from senior year engineering students, students will ideate and construct prototypes, develop potential alternatives, plan a chosen solution, assess the results and refine their solution.

Students will use qualitative methods to evaluate their design decisions such as building logs and consultation sessions with the instructors. Throughout the course, checkpoint activities will be scheduled to check on the progress of the students in the form of launch level demos and first build demos. In the end of the course, students will be given an opportunity to participate in a final competition with other teams using their constructed engineering artefact as well as giving a presentation on the design considerations they have taken and reflect on their design journey

Attendance & Class Participation

Although there is no score assigned for class attendance, students are expected to attend every class and actively participate in the class activities. In the case that students are unavailable to attend the class or complete any assessments, they need to contact either Paul (egpaul@ust.hk), Ian (egian@ust.hk) or Paco (egpaco@ust.hk) in advance to make alternative arrangements. Students should also notify his/her groupmates of the absence in advance.

Intended Learning Outcomes (ILOs)

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

1. **Understand** some foundation concepts and applications covered by different disciplines of engineering.
2. **Apply** the knowledge, theories and hands-on skills introduced in the course to complete the assigned design project task.
3. **Design and implement** the project by working collaboratively in a team setting.
4. **Explore** possible innovative engineering solutions and **solve** problems via experiential learning and self-initiated, blended learning processes.
5. **Present and demonstrate** their projects orally and in writing.

Course Schedule (Tentative)

Venue: Undergraduate Student-initiated Experiential Learning Laboratory (USEL Lab), CYT 1002, Lift 35-36

Time: 1:30pm – 4:20pm (Fridays)

	Session & Topics*	Date**
1	Course Introduction	6-9-2024
2	Technical Session/ Engineering Fundamentals 1 ***	13-9-2024
3	Technical Session/ Engineering Fundamentals 2 ***	20-9-2024
4	Technical Session/ Engineering Fundamentals 3 ***	27-9-2024
5	Launch Level Demo	4-10-2024
6	Hands-on Build Session 1 ****	18-10-2024
7	Hands-on Build Session 2 ****	25-10-2024
8	First Build Demo	1-11-2024
9	Technical Consultation & Feedback Session	8-11-2024
10	Hands-on Build Session 3 ****	15-11-2024
11	Hands-on Build Session 4 ****	22-11-2024
12	Final Competition & Presentation	29-11-2024

*The course contents and schedule may be revised to better address students' needs

**Add-Drop Period: 2nd – 14th September

No lesson on 11-10-2024 due to **Chung Yeung Festival

*** Contents may include electronics, mechanical systems, structure, materials, 3D modeling, CAD, manufacturing, creativity, idea incubation etc. depending on the project topic of the semester

**** Students will be given free time in the lab to work as a team to make use of the equipment to develop their engineering design artefact with the aid of Student Technical Advisors (STAs)

Assessment and Grading

A combination of formative and summative assessments will be employed to monitor the learning process of the students. Every assignment will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment will be provided in the course Canvas page, outlining the criteria used for evaluation.

Assignment Submission

Students are required to individually submit all course assignments onto Canvas to the designated assignment pages. Assignments that are meant to be completed independently will be graded individually while team assignments will receive a team grade. However, students will not receive a grade for any assignment they do not submit.

Late Submissions Policy

20% of the total marks will be deducted from an assignment for each day that it is late (weekends are also counted). Assignments submitted more than 5 days after the due date will receive a zero grade.

Team Assessments

Individuals who have not received permission to be excused and are not present will receive a zero grade (except in cases of emergencies and documented illnesses). The whole team will lose out on any grades associated with a missing student's participation or contributions.

Assessment Summary Table

Assessment Task	Contribution to Overall Course grade (%)	Deadline *
Engineering Fundamentals (20%)		
Engineering Fundamentals Assignment 1	5%	To be announced during class **
Engineering Fundamentals Assignment 2	5%	To be announced during class **
Engineering Fundamentals Assignment 3	10%	To be announced during class **
Project Conceptualizations (15%)		
Complete Artefact Design Sketch	10%	To be announced during class **
Mechanism Design Sketch	5%	To be announced during class **
Project Demonstrations (55%)		
Launch Level Demo	10%	4-10-2024 (Class 5) **
First Build Demo	20%	To be announced during class **
Final Competition & Presentation	25%	29-11-2024 (Class 12) **
Self-reflection (10%)		
5 x Weekly Build Logs	10% (5x2%)	Multiple deadlines **

* Assignment deadlines may be adjusted to better address students' needs.

** Assessment marks for individual assessed tasks will be released within two weeks of the due date.

3 x Engineering Fundamentals Assignments (20%) [Individual Submission]

These simple assignments will be used for students to practice and apply the knowledge, skills and theories introduced in the Engineering Fundamentals session. The contents of the assignments will be based on the teaching content during class time which may include elements of mechanics, electronics, structural stability, 3D modeling, Computer Aided Design etc.

Complete Artefact Design Sketch (10%) [Group Submission]

Students are required to submit a sketch of what they want their final engineering design artefact to look like along with labels of significant parts and sections. The sketch can be made using any medium as they see fit. The final sketch should allow the reader to have a rough understanding of what the final product should look like.

Mechanism Design Sketch (5%) [Individual Submission]

The final engineering design artefact should include some form of mechanism that can perform a certain function. Students are required to submit a sketch of what they want that mechanism to look like along with labels of significant parts and sections. The sketch can be made using any medium as they see fit. The final sketch should allow the reader to have a rough understanding of what the mechanism should look like and how it will operate and function.

Launch Level Demo (10%) [Individual Submission]

Students should apply the technical skills and knowledge learnt from the 3 Engineering Fundamentals session to build a simple system to demonstrate they have a grasp of the basic knowledge required for the final project. The required system will vary each semester and be set based on the topic of that semester. One example of the required system will be an electronic circuit that can control the rotational direction and speed of 2 motors using an APP.

First Build Demo (20%) [Group Submission]

A simplified version of the final competition task will be used to test the functionality, area of improvement of the first working prototype built by the students. The goal of this assignment is to help students evaluate the quality of their prototype. They can then make use of the experience to make further improvement to the next iteration of the prototype or discuss the issues they observed with the course instructor in the technical consultation and feedback session held in the next class.

Final Competition & Presentation (25%) [Group Submission]

Students will make use of the latest iteration of their engineering design artefact to compete with other teams in a series of competitions. The details of the competition will be announced early on during class time. Depending on the topic of the semester, students may also be asked to give a brief presentation and product demonstration of their finished engineering design artefact to the rest of the class to explain their design considerations, design journey and collect feedback from their peers and the instructors.

5 x Weekly Build Logs (10%) [Individual Submission]=

For 5 selected sessions, students are required to submit a brief build log talking about the progress they have made during class time. Guiding questions based on the course content on that day will be provided to facilitate the self-evaluation process of the students.

Mapping of Course ILOs to Assessment Tasks

Assessment Task	Mapped ILOs
Engineering Fundamentals Assignment	1, 2
Complete Artefact Design Sketch	2, 3, 4
Mechanism Design Sketch	2, 3, 4
Launch Level Demo	2, 3, 4
First Build Demo	2, 3, 4
Final Competition & Presentation	3, 4, 5
Weekly Build Logs	4, 5

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Students with excellent performance in the course demonstrate a strong grasp of lecture materials, effectively utilize tools and equipment available, excel in various project stages. They exhibit exceptional hardware and software skills, meticulous project planning, efficient teamwork, and effective leadership abilities.
B	Good Performance	Students with good performance in the course exhibit a solid understanding of lecture materials, proficient use of tools, competent completion of in project stages. They showcase commendable hardware and software skills, effective project planning, teamwork, and leadership potential.
C	Satisfactory Performance	Students with satisfactory performance demonstrate an adequate understanding of lecture materials, and satisfactory use of tools. They make acceptable progress in project stages, displaying satisfactory hardware and software skills, project planning, teamwork, and leadership.
D	Marginal Pass	Students with a marginal pass show limited understanding of lecture materials, inconsistent or inappropriate use of tools and equipment. Their progress in project stages is minimal, and they exhibit limited hardware and software skills, project planning, teamwork, and leadership abilities.
F	Fail	Students who fail the course display a lack of understanding of lecture materials, inadequate use of tools. They show little to no progress in project stages, lacking essential hardware and software skills, project planning, teamwork, and leadership capabilities.

Policy on the Use of Generative Artificial Intelligence (Gen AI)

There are no restrictions on the use of generative AI for all the assessments of the course.

Students are allowed to make use of any Generative AI tools to facilitate and assist them anytime in the course for tasks such as code writing and debugging etc. The intension of this policy is to train the AI-literacy of the student and to better prepare them for future AI integration in the evolving industrial landscape, so **students are responsible to apply their own problem solving and critical thinking skills to encounter potential issues they may face when using the AI tools instead of blindly relying on the output of the AI tools.**

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include [specific details, e.g., strengths, areas for improvement]. Students who have further questions about the feedback, including marks, should consult the instructors within five working days after the feedback is received.

Required Text and Materials

Since this course is focused on providing students with exposure to the different disciplines of Engineering and the integration of multidisciplinary knowledge to an engineering design project, there is no specific textbook or reference that adequately covers the topics in this course. Students will be provided with references and technical materials in each session and will be expected to read found on Canvas for each session. The slides and lab menus, along with online resources, will give you the necessary information to successfully complete the course and the design project.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to [Academic Integrity | HKUST – Academic Registry](#) for the University's definition of plagiarism and ways to avoid cheating and plagiarism.