Technical Elective: Engineering for Sustainability
Spring 2024
Syllabus

Instructor: Sophia Zuoqiu, D. Sc.
Email: yqiu@scupi.cn
Office hours: Monday 11:00am-12:00pm, Tuesday 2:00pm-3:30pm, Wednesday 11:00am-12:00pm, or by appointment

TA: Anna Deng 邓晴月

Note: This syllabus is subject to change.

Course Description

This is a case-study based course designed for junior and senior students in any major to learn about engineering in the context of sustainable development. The course will cover key concepts such as sustainability, innovation, planetary energy flow, global carbon cycle, and human-nature interaction. The course will cover major sustainability-related quantitative assessment tools such as carbon footprint evaluator, life cycle analysis, and sustainable development index. Students will be evaluated on in-class participation, individual work and group work.

Course Objectives

The main objective of this course is to advance students' previous learning by connecting engineering concepts to real world applications. Students should be able to 1)develop comprehensive understanding of engineering in the rapidly changing global environment, 2) form evidence-based thinking about key concepts such as innovation and climate change, and 3)use evaluation tools to quantitatively assess the sustainability of a given engineering project.

ABET outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics;
2. An ability to communicate effectively with a range of audiences;
3. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts;
4. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
5. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Course type

Elective

Course prerequisite

None

Grading (NO MAKE UP ACCEPTED for any of the following grading components)

Attendance	20%
Class participation	20%
Weekly report	10%
In-class work	20%
Group project	30%

Video and Audio Recording Policy

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion, and activities without the advance written permission of the instructor, and any such recording properly approved in advance should be used solely for the student's private use.

Academic Integrity

We are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). Unacknowledged direct copying from the work of another person/group/source, or the close paraphrasing of such, is called plagiarism and is a serious offense, equated with cheating in examinations. This applies to copying both from other students' work and from published sources. Paraphrasing, when the original statement is still identifiable and has also no acknowledgement, is plagiarism. The use of artificial intelligence also requires explicit citation and specification of contribution. The Code of Student Conduct allows Sichuan University to take disciplinary action if students don't follow this community expectation.

Tentative Topics & Schedule

The schedule is tentative and subject to change.

Lecture 1:

Course introduction
Student introduction and information about background in engineering
Brief history of engineering education systems around the globe

Lecture 2:

Sustainability: the concept
Brief history of sustainable development (MDGs, SDGs)
Sustainable development index

Lecture 3:
- All about Carbon
- Carbon footprint
- Feedback loop

Lecture 4:
- Global development and urbanization
- Climate change and global environment
- Consequences of global development and urbanization

Lecture 5:
- Food production and consumption
- Carbon footprint

Lecture 6:
- Human-environment interaction
- Ecological footprint

Lecture 7:
- Quantification of sustainability
- Life Cycle
- In-class work

Lecture 8:
- Climate change and engineering
- Sustainable designs
- Mini case study: sustainable campuses

Lecture 9:
- The economics of sustainability
- Cost-benefit analysis and co-benefit analysis

Lecture 10:
- Group project presentation: sustainable design and evaluation

Lecture 11:
- Group project presentation: sustainable design and evaluation