同济大学 TONGJI UNIVERSITY
CEIE Academic Mobility Program

050270 The Environment and Sustainable Engineering Systems

Course Code	050270		**Course Name**	The Environment and Sustainable Engineering Systems	
Instructor	Dr Zhibo Lu		**Other Teachers**	TBA	
Course delivery	Lectures	Seminars	Guest Speakers	Group Activities	Field Trip(s)
	√	√	√	√	√
	Tutorials	Projects	Pitch(es)	Presentations	Outreach Workshop
	√	√		√	Optional
Total Hours	54 in-class contact hours + Self Study Hours This course is worth 6 ECTS points.				

Course Description

This course aims at helping students learn to implement elements of sustainable engineering designs which do not compromise the natural environment. Sustainable engineering takes environmental engineering concepts to the next level by looking at the interactions between technical, ecological, social and economic systems. Students will examine the processes and materials used in the life cycle of typical engineering designs. Societal influences and their impact on designs will also be explored. Other areas of assessment will include the impacts on the environment, the economy and society as a whole.

Case studies are drawn from the fields of electrical, chemical, mechanical, electronic and civil engineering. Throughout completing coursework and team projects students will develop critical skills needed for professional practice in designing sustainable engineering processes.

Brief Schedule and Topics

1. Introduction to sustainable engineering
2. Design approach and philosophy
3. Applying sustainability to the engineering design
4. Tools of the design process and management of design
5. IEA framework
6. Model for an impact strategy
7. Developing data: Information systems, Indicators and indices and Data analysis
8. Energy resources, conversion, use and consequences
9. Water resources, use, consequences and control
10. Waste management
11. Economics of Sustainable Systems
12. Design for total control
13. Communication for engineerings
14. Drivers of sustainability in design
15. Strategic sustainable design
16. Future development

Learning Objective

By the end of this course you should be able to:

- Demonstrate an understanding of sustainable engineering designs which do not compromise the natural environment.
- Understand principles of sustainable engineering and how it is applied to the design and manufacturing processes.
- Analyse environmental emissions and develop basic methods to reduce these emissions
- Develop a basic level of ecological literacy and capacity for life-cycle and systems thinking in the design;
- Use these modes of thinking to develop a relational systems view of people and nature mediated by the built environment;
- Engage with our industrial and natural life-support systems seeking symbiosis and resilience.
- Develop critical skills needed for professional practice in designing sustainable engineering processes by reviewing case studies and completing group projects
- Develop a basic level of ecological literacy and capacity for life-cycle and systems thinking in the design;
- Develop an understanding of the environmental, social and economic context in which engineering is practised;

Requirements

This course is open to engineering students from all different fields of engineering. It provides the essential concept upon which students should plan and practice sustainable engineering designs.

Reference Books

Johnson, A. and Gibson, A. (2014). *Sustainability in engineering design*. Waltham, MA: Academic Press.

Chang, N. (2011). *Systems analysis for sustainable engineering*. New York: McGraw-Hill Professional.

Supplementary readings and handouts will be distributed during class.

Assessments

Assessments in this course include:

Class participation (20%):

To further enhance the learning experience, it is also important for you to engage in regular discussions with other students, in exchanging knowledge and ideas with regards to this course and its key topics.

In-class exercises (40%)

Eight In-class exercises (5% each) are to be completed during lectures at the set time. Multiple choices and short answers will be required for students to show that they have fully understood what has been taught during lectures.

Group project (20%) and group presentation (20%)

Students will be allocated into groups to complete a group project relating to course topics. They are required to work collaboratively with each other to complete this task and present it to the class through a group presentation.

Late submission will attract a penalty of 10% of the total weighting of the assessment task. A 10% deduction applies for EACH late day and the assessment will not be accepted after 5 working days. Extensions will only be granted upon the basis that there is reasonable medical evidence of illness or any other extreme circumstances that the university may place under consideration. Under no circumstances will extensions be granted for work or any other commitments. A request for an extension must formally be submitted to the lecturer in writing prior to the due date, in accordance with the university's assessment policies. Medical certificates or other evidence of extreme misfortune must be submitted through a special consideration form and must contain information that justifies the extension sought.

Detailed Daily Schedule (TBC)

Topic (tentative)		Activities
Introduction to sustainable engineering design	What is design? What is sustainability? Environment and society; How to achieve sustainability in engineering design? Measuring design.	Introduction; Lecture/seminar; Development and Communication
Design approach and philosophy	Historical approach to design; The classic design approach; The new approach to design.	Lecture/seminar; Case Studies ; In Class Activities; **In-class exercise 1 (5%)**
Tools of the design process and management of design	Product development process; Managing the whole process; Design and planning methods; Sustainability frameworks, including industrial metabolism and ecology, dematerialisation and the precautionary principle; The Whole System Approach to Sustainable Design.	Lecture/seminar; Case Studies ; In Class Activities; **In-class exercise 2 (5%)**
Understanding Impact; **Model for an impact strategy**	What is an impact strategy? When do you prepare an impact strategy and who is responsible for it? Why do you need an impact strategy? Understanding issue attention cycles; Model for an impact strategy ; Attributes of impact strategies and traditional communications activities; Steps in building an impact strategy; Case studies.	Lecture/seminar; Case Studies ; In Class Activities; **In-class exercise 3 (5%)**
Developing data; **Information systems;** **Indicators and indices;** **Data analysis**	Importance of process; Types of data; Qualitative data; Quantitative data; Monitoring and data collection of environmental trends and conditions;	Lecture/seminar; Case Studies ; In-Class Activities; **In-class exercise 4 (5%)**

	Data compilation; GEO Data Portal; Indicators and indices; Indicators; Indices; Non-spatial analysis; Spatial analysis.	
Energy, Water and Waste management; **Economics of sustainable Systems**	Energy resources, conversion, use and consequences; Water resources, use, consequences and control; Waste management; Economics of Sustainable Systems.	Lecture/seminar; Case Studies ; In Class Activities; **In-class exercise 5 (5%)**
Communication for engineerings	Communication overview; Reports: project and technical; Graphical communications.	Lecture/seminar; Case Studies ; In-Class Activities; **In-class exercise 6 (5%)**
Performance prediction	Testing; Safety considerations; Predicting performance.	Lecture/seminar; Case Studies ; In Class Activities; **In-class exercise 7 (5%)**
Design for total control	Traditional approaches; The sustainability umbrella model; Maintenance.	Lecture/seminar; Case Studies ; In-Class Activities; **In-class exercise 8 (5%)**
Drivers of sustainability in design	The effectiveness of legislation and regulations; Non-legislative tools; Forces behind sustainable design.	Field trips
Strategic sustainable design	The triple bottom line; Implications for producers; Consumer Perspective.	Lecture/seminar; Case Studies ; In-Class Activities; **Group Presentation (15%)**
Ethics & Justice	Health, Risk and Safety; Ethics; Justice.	**Group project Submission(20%)**

Content is subject to change.

Academic Integrity and Policies

Tongji University Academic Policy for international students makes reference to the Academic Policy for Undergraduates (Issuing on 20th, June 2005) and Academic Policy for Postgraduates.

Academic Integrity

Students are expected to uphold the university's academic honesty principles, which are an integral part of the university's core values and principles. If a student fails to observe the acceptable standards of academic honesty, they could attract penalties and even disqualification from the course in more serious circumstances. Students are responsible for knowing and observing accepted principles of research, writing and any other task which they are required to complete.

Academic dishonesty or cheating includes acts of plagiarism, misrepresentation, fabrication, failure to reference materials used properly and forgery. These may include, but are not limited to: claiming the work of others as your own, deliberately applying false and inaccurate information, copying the work of others in part or whole, allowing others in the course to copy your work in part or whole, failing to appropriately acknowledge the work of other scholars/authors through acceptable referencing standards, purchasing papers or writing papers for other students and submitting the same paper twice for the same subject.

This Academic Integrity policy applies to all students of the Tongji University in all programmes of study, including non-graduating students. It is to reinforce the University's commitment to maintaining integrity and honesty in all academic activities of the University community.

Policy

- The foundation of good academic work is honesty. Maintaining academic integrity upholds the standards of the University.
- The responsibility for maintaining integrity in all the activities of the academic community lies with the students as well as the faculty and the University. Everyone in this community must work together to ensure that the values of truth, trust and justice are upheld.
- Academic dishonesty affects the University's reputation and devalues the degrees offered.
- The University will impose serious penalties on students who are found to have violated this Policy. The following penalties may be imposed:

  - Expulsion;
  - Suspension;
  - Zero marks/ fail grade;
  - Marking down;
  - Re-doing/re-submitting of assignments or reports; and
  - Verbal or written warning.