CIEE Global Institute – Paris

Course name: Environmental Engineering
Course number: (GI) ENGI 3001 PAFR
Programs offering course: Paris Open Campus
Open Campus track: STEM and Society
Language of instruction: English
U.S. semester credits: 3
Contact hours: 45
Term: Spring 2020

Course Description
This introductory course to environmental engineering emphasizes the protection of air, water, and land resources through engineered solutions that impact human society via energy, water, climate and nutrient cycles. Topics covered include water quality engineering, solid waste management, fate and transport of contaminants in the environment, and energy production. The course emphasizes material and energy balance, and life-cycle thinking as conceptual tools.

Learning Objectives
Completing this course, students will:
1. learn what types of problems are commonly encountered by environmental engineers, become familiar with common approaches adopted by engineers, and have enhanced understanding of the role of environmental engineers in solving new or emerging environmental problems, particularly ones that are complex or inter-disciplinary;
2. possess the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
3. demonstrate knowledge and skilled use of mathematics, science, and engineering in the identification, formulation, and solving of engineering problems;
4. become adept at applying material balances and life cycle analysis to engineering problems;
5. practice and expand oral communication skills;
6. practice leadership and teamwork in group projects and assignments;
7. become enlightened and engaged stakeholders regarding the appropriate use of engineered solutions for environmental challenges, at home and abroad.

Course Prerequisites
Two (2) semesters of university-level courses in engineering, chemistry, or physics.
Methods of Instruction
This course is taught through the use of lectures, discussions, and readings, and assigned problem sets. The problem sets are not graded, but serve to prepare students for weekly quizzes. Also, students investigate and report to their peers on real-life applications of engineering tools (analytical/quantitative).

Assessment and Final Grade

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Participation</td>
<td>20%</td>
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<tr>
<td>Group presentation (oral report)</td>
<td>10%</td>
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<tr>
<td>Weekly quizzes (3)</td>
<td>30%</td>
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<tr>
<td>Midterm exam</td>
<td>20%</td>
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<tr>
<td>Final exam</td>
<td>20%</td>
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Course Requirements
Important: all course assignments must be turned in on time. While students will not be penalised for submissions up to and including 1 hour late,
- Students submitting work from 1 hour and 1 minute late up to and including 24 hours late will be penalised 15% from the assignment;
- Student work submitted from 24 hours and 1 minute late onwards will receive a zero (0%) grade.

Participation (20%)
Participation is valued as meaningful contribution in the digital and tangible classroom, utilizing the resources and materials presented to students as part of the course. Meaningful contribution requires students to be prepared in advance of each class session and to have regular attendance. Students must clearly demonstrate they have engaged with the materials as directed, for example, through classroom discussions, online discussion boards, peer-to-peer feedback (after presentations), interaction with guest speakers, and attentiveness on co-curricular and outside-of-classroom activities.

Group presentation (10%)
Students work in groups of 2 or more to select a methodology presented in Chapter 2. Using online sources, they investigate real-life applications of the methods and give an oral presentation to the class. The format is a 20-minute PowerPoint presentation. Students provide the justification for the use of the methodology, explain the analytical tool, and interpret the results of its application.

Weekly quizzes (3 x 10%). Weekly quizzes draw from the problem sets at the end of each assigned chapter of the textbook. To prepare for the quizzes, students are strongly encouraged to practice solving the problems.
Midterm exam (20%)
Students take a 60-point exam consisting of questions in the format of multiple choice, short answer questions, and calculations on lecture and reading materials.

Final Exam (20%)
Students take a 80-point exam consisting of questions of multiple choice and short answer questions, and calculations.

Course Attendance and Punctuality
Regular class attendance is required throughout the program, and all unexcused absences* may result in a lower participation grade for any affected CIEE course. Due to the intensive schedules for Open Campus and Short Term programs, unexcused absences that constitute more than 10% of the total course will result in a written warning and the final grade for the course will be lowered by 3 percentage points.

*Students who transfer from one CIEE class to another during the add/drop period will not be considered absent from the first session(s) of their new class, provided they were marked present for the first session(s) of their original class. Otherwise, the absence(s) from the original class carry over to the new class and count against the grade in that class.

For CIEE classes, excessively tardy (over 15 minutes late) students will be marked absent. Attendance policies also apply to any required co-curricular class excursion or event*, as well as to Internship, Service Learning, or required field placement.

*With the exception that some class excursions cannot accommodate any tardiness, and students risk being marked as absent if they fail to be present at the appointed time.

Students who miss class for personal travel, including unforeseen delays that arise as a result of personal travel, will be marked as absent and unexcused. No make-up or re-sit opportunity will be provided.

An absence in a CIEE course will only be considered excused if:
- a doctor’s note is provided
- a CIEE staff member verifies that the student was too ill to attend class
- satisfactory evidence is provided of a family emergency

Unexcused absences will lead to the following penalties:

<table>
<thead>
<tr>
<th>Percentage of Total Course Hours Missed</th>
<th>Equivalent Number of Open Campus Semester classes</th>
<th>Minimum Penalty</th>
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<tr>
<td></td>
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<tr>
<td>Percentage</td>
<td>Weekly Participation Grade Reduction</td>
<td>Final Grade Reduction &amp; Warning</td>
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<tr>
<td>Up to 10%</td>
<td>1</td>
<td>Possible reduction of weekly participation grade</td>
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<tr>
<td>10 – 20%</td>
<td>2</td>
<td>Reduction of final grade by 3%; written warning</td>
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<tr>
<td>More than 20%</td>
<td>3 content classes, or 4 language classes</td>
<td>Automatic course failure, and possible expulsion</td>
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**Weekly Schedule**

NOTE: this schedule is subject to change at the discretion of the instructor to take advantage of dynamic experiential learning opportunities.

**WEEK 1  INTRODUCTION**

**Class 1.1  Introduction to the course.**
We will review the syllabus, learning objectives, and assessment methods, including aspects of participation and engagement in class. The introduction will cover the scope of the course, a conceptual framework, plus fundamental concepts and definitions.

**Readings:**


**Class 1.2  Co-curricular activity (to be confirmed):** visit to the Petite Ceinture, a so-called “ecological corridor” in Paris. Discussion with a member of association Espaces on the work done in these urban areas.

**WEEK 2  ENGINEERING FOR SUSTAINABILITY:**
WHAT IT IS AND HOW TO MEASURE IT
Class 2.1  This session includes a lecture and discussion of the assigned articles. Lecture. Sustainable design, engineering, and innovation. The evolution of environmental protection to sustainability; the imperative for sustainable design, engineering, and innovation. How to operationalize sustainability: life cycle thinking, systems thinking, resilience thinking, and frameworks for sustainable design. How to measure sustainability in engineered systems. Great challenges and opportunities for environmental engineers.

Readings:
Textbook, Chapter 1: Sustainable design, engineering, and innovation.

Class 2.2  This session includes a lecture and Quiz 1. Lecture. Environmental measurements. Mass concentration units; volume/volume and mole/mole units; partial-pressure units; mole-volume units; normality; concentrations of greenhouse gases.

Readings:
Textbook, Chapter 2: Environmental measurements.

Quiz 1 (drawn from problem sets in Chapter 1).

WEEK 3  CHEMISTRY FOR ENGINEERS

Class 3.1  This session has a lecture and an assigned reading. Lecture. Chemistry for engineers. Part 1. Approaches in environmental chemistry. Activity and Concentration. Reaction stoichiometry. Thermodynamic laws.

Readings:
Textbook, Chapter 3.1 – 3.4: Chemistry.


Readings:
Textbook, Chapter 3.5-11: Chemistry.

Class 3.3  This session is devoted entirely to the Midterm Exam (25%). Students take a 60-point exam consisting of questions in the format of multiple choice, short answer questions, and calculations on lecture and reading materials to date.
WEEK 4  PHYSICAL PROCESSES: 
MASS AND ENERGY BALANCES, AND MASS TRANSPORT

Class 4.1  This session includes a lecture and required readings.
Mass balances: mass balance equation for the completely mixed flow reactor (CMFR); batch and plug-flow reactor; retention time; materials flow analysis and urban metabolism.

Readings:
Textbook, Chapter 4.1 Physical Processes (Mass balances).

Class 4.2  This session includes a lecture, required readings, and Quiz 2
Lecture. Physical processes for the environmental engineer, Part 2. Energy balances: forms of energy; conducting an energy balance; the greenhouse effect and impacts of GHG emissions on Earth energy balance; energy efficiency in buildings; urban heat islands.

Readings:
Textbook, Chapter 4.2-4.3: Physical Process (Energy balances)

Quiz 2 (drawn from problem sets in Chapters 5 and 7).

Class 4.3  This session includes a lecture and group oral presentations.

Readings:
Textbook, Chapter 4.4. Physical Processes (Mass transport).

Oral group presentation.

WEEK 5  ECOLOGY AND ENVIRONMENT MEET THE ENGINEER

Class 5.1  This session consists of a lecture and assigned readings.
Readings:
Textbook, Chapter 5: Biology.

Class 5.2 This session consists of a lecture, assigned readings and Quiz 3.

Readings:
Textbook, Chapter 7: Water: Quantity and quality.

Quiz 3 (drawn from problem sets in Chapter 5).

Class 5.3 This session consists of a lecture, assigned readings, and oral group presentations.
Lecture. Treat water respectfully. Life cycle analysis of wastewater streams; global and local trends in waste water production; primary and secondary waste water management; facility design and function; facility levelized costs; compare and contrast water treatment plant with water cycles in nature. The role of the environmental engineering in mitigating environmental and social issues associated with waste water management practices.

Readings:
Textbook, Chapter 9: Wastewater and Stormwater: Collection, Treatment, and Resource Recovery.

Oral group presentations.

WEEK 6 SOLID WASTE AND ITS MANAGEMENT

Class 6.1 This session consists of a lecture and required readings as well as an onsite visit.
management; the landfill: facility design and function; plant longevity and levelized costs. Incineration: when, where, why, and how. Visit to the Egouts de Paris (the Parisian sewer system) or the Syctom, Paris’s metropolitan agency in charge of waste processing. To be confirmed.

**Readings:**
Textbook, Chapter 10: Solid waste management.

**Class 6.2** This session consists of a lecture and required readings

**Readings**

**Class 6.3** Final Exam.

**Course Materials**

**Course Textbooks**

**Readings**


**Online Resources**

https://works.bepress.com/ivanasup/
https://www.epa.gov/eco-research
https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid
https://www.epa.gov/ghgreporting
https://www.epa.gov/heat-islands
https://www.esrl.noaa.gov/
https://ghgprotocol.org/
https://www.oercommons.org/authoring/1660-the-sustainability-learning-suites/view
http://www.sustainablemeasures.com/
https://toxics.usgs.gov/

**Academic Integrity**

CIEE subscribes to standard U.S. norms requiring that students exhibit the highest standards regarding academic honesty. Cheating and plagiarism in any course assignment or exam will not be tolerated and may result in a student failing the course or being expelled from the program. Standards of honesty and norms governing originality of work differ significantly from country to country. We expect students to adhere to both the U.S. American norms and the local norms, and in the case of conflict between the two, the more stringent of the two will prevail.

Three important principles are considered when defining and demanding academic honesty. These are related to *the fundamental tenet that one should not present the work of another person as one’s own.*

The first principle is that *final examinations, quizzes and other tests must be done without assistance from another person, without looking at or otherwise consulting the work of another person, and without access to notes, books, or other pertinent information* (unless the professor has explicitly announced that a particular test is to be taken on an "open book" basis).
The second principle applies specifically to course work: *the same written paper may not be submitted in more than one course. Nor may a paper submitted at another educational institution be submitted to satisfy a paper requirement while studying abroad.*

The third principle is that *any use of the work of another person must be documented in any written papers, oral presentations, or other assignments carried out in connection with a course. This usually is done when quoting directly from another’s work or including information told to you by another person* (the general rule in U.S. higher education is that if you have to look something up, or if you learned it recently either by reading or hearing something, you have to document it).

There are three levels of escalation establishing the seriousness of the plagiarism in question.

- **Level one plagiarism**: minor or unintentional plagiarism; leading to passable grade/failing grade on the assignment, depending on perspective of lecturer. No opportunity for resubmission.
- **Level two plagiarism**: significant plagiarism, but potentially due to poor referencing rather than intellectual property theft. This leads to a failing grade (potentially zero points) on the assignment. No opportunity for resubmission.
- **Level three plagiarism**: significant plagiarism, requiring investigation by the Center/Resident/Academic Director, and subsequent disciplinary panel.

Faculty will report any suspected circumstances of plagiarism to the Center/Resident/Academic Director immediately. Faculty can, if they deem it appropriate, require students to submit the Plagiarism Declaration Form (Appendix D) with each assignment as it is submitted.

In any case where Academic Honesty is in question while the student is still onsite at the program, and will impact the grade for the assignment in question, the CIEE Academic Honesty form (Appendix E) will be completed by the Center/Resident/Academic Director, signed by the professor, delivered to the student for signature and added to the student’s permanent records. For any Level three violation, or repeated lower level violation, the Center/Resident/Academic Director will inform the student’s home institution of the infraction and subsequent penalty.