**City University of Hong Kong**
**Course Syllabus**

**offered by School of Energy and Environment**
**with effect from Semester A 2022/2023**

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## Part I Course Overview

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|---|---|
| **Course Title:** | Experimental Techniques in Energy and Environment |
| **Course Code**: | SEE6119 |
| **Course Duration:** | One semester |
| **Credit Units**: | 3 |
| **Level**: | P6 |
| **Medium of Instruction:** | English |
| **Medium of Assessment:** | English |
| **Prerequisites**: *(Course Code and Title)* | Nil |
| **Precursors**: *(Course Code and Title)* | SEE 6101 Energy Generation and Storage Systems |
| **Equivalent Courses**: *(Course Code and Title)* | SEE8126 Experimental Techniques in Energy and Environment |
| **Exclusive Courses**: *(Course Code and Title)* | Nil |

## Part II Course Details

### 1. Abstract

The course aims to equip students with the experimental skills and further practical appreciation on the various energy and environmental technologies. Being an experimental-based course, the course will also impart essential skills in data collection, critical analysis of experimental data to good practice in report writing. Through this course, students will grow appreciation in bridging theoretical knowledge with experimental practice.

### 2. Course Intended Learning Outcomes (CILOs)

*(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)*

| No. | CILOs | Weighting (if applicable) | Discovery-enriched curriculum related learning outcomes (please tick where appropriate) | | |
|---|---|---|---|---|---|
| | | | *A1* | *A2* | *A3* |
| 1. | Apply the theory of thermodynamics and heat transfer, to systems of energy efficiencies, for instance refrigeration cycle and heat exchanger design; collect and analyse relevant experimental data; apply good practice in report writing. | 25% | | ✓ | |
| 2. | Apply the theory of renewable energy conversion systems, such as photovoltaic solar cells, fuel cells and biofuel conversion; collect and analyse relevant experimental data; apply good practice in report writing. | 25% | | ✓ | |
| 3. | Apply the theory of environmental abatement techniques in air and wastewater purification; collect and analyse relevant experimental data; apply good practice in report writing. | 25% | | ✓ | |
| 4. | Apply good practice in verbal presentation of experimental findings. | 25% | | ✓ | |
| | | 100% | | | |

*A1:* *Attitude*
*Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.*

*A2:* *Ability*
*Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.*

A3: *Accomplishments*
*Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.*

## 3. Teaching and Learning Activities (TLAs)

*(TLAs designed to facilitate students' achievement of the CILOs.)*

| TLA | Brief Description | CILO No. | | | | Hours/week (if applicable) |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | |
| Lecture | Explain key concepts and principles behind each experimental module | ✓ | ✓ | ✓ | | 0.5 hr/week |
| Lab-based experiment and oral presentation | Hands-on lab session to acquire and analyze data; present experimental findings | ✓ | ✓ | ✓ | ✓ | 2.5 hr/week |

## 4. Assessment Tasks/Activities (ATs)

*(ATs are designed to assess how well the students achieve the CILOs.)*

| Assessment Tasks/Activities | CILO No. | | | | Weighting | Remarks |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | | |
| Continuous Assessment: 100% | | | | | | |
| Lab report, lab quiz | ✓ | ✓ | ✓ | | 85% | |
| Oral presentation | | | | ✓ | 15% | |
| Examination: 0% (duration: N/A , if applicable) | | | | | | |
| | | | | | 100% | |

To pass a course, a student must do ALL of the following:

1) obtain at least 30% of the total marks allocated towards coursework (combination of assignments, pop quizzes, term paper, lab reports and/ or quiz, if applicable);
2) obtain at least 30% of the total marks allocated towards final examination (if applicable); and
3) meet the criteria listed in the section on Assessment Rubrics.

## 5. Assessment Rubrics

*(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)*

Applicable to students admitted in Semester A 2022/23 and thereafter

| Assessment Task | Criterion | Excellent (A+, A, A-) | Good (B+, B) | Marginal (B-, C+, C) | Failure (F) |
|---|---|---|---|---|---|
| 1. Lab report, lab quiz | Ability to understand the objectives of the experiments, set up the experiments, acquire and analyze data, and draw conclusions based on the findings | High | Significant | Moderate to Basic | Not even reaching marginal levels |
| 2. Oral presentation | Ability to orally present the key information related to the experiments | High | Significant | Moderate to Basic | Not even reaching marginal levels |

Applicable to students admitted before Semester A 2022/23

| Assessment Task | Criterion | Excellent (A+, A, A-) | Good (B+, B, B-) | Fair (C+, C, C-) | Marginal (D) | Failure (F) |
|---|---|---|---|---|---|---|
| 1. Lab report, lab quiz | Ability to understand the objectives of the experiments, set up the experiments, acquire and analyze | High | Significant | Moderate | Basic | Not even reaching marginal levels |

| | | | | | | |
|---|---|---|---|---|---|---|
| | data, and draw conclusions based on the findings | | | | | |
| 2. Oral presentation | Ability to orally present the key information related to the experiments | High | Significant | Moderate | Basic | Not even reaching marginal levels |

**Part III Other Information** (more details can be provided separately in the teaching plan)

**1. Keyword Syllabus**

*(An indication of the key topics of the course.)*

**Energy efficiencies:**
Refrigeration cycle
Heat exchanger design

**Renewable energy conversion:**
Solar cells assembly and assessment
Fuel cells assembly and assessment
Waste to biofuel conversion

**Environmental abatement**
Advanced oxidation techniques in wastewater treatment
Treatment of wastewater

**2. Reading List**

**2.1 Compulsory Readings**

*(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)*


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|---|---|
| 1. | Cengel, Y.A., Boles, M.A., Thermodynamics: An Engineering Approach, McGraw-Hill, 2006. |
| 2. | Incropera, F.P., DeWitt, D.P., Bergman, T.L., Lavine, A.S., Fundamentals of heat and mass trasnfer, John Wiley & Sons, New York, 2011. |
| 3. | Hagfeldt, A., Boschloo, G., Sun, L., Kloo, L., Pettersson, H., Dye-sensitized solar cells, Chem. Rev. 2010, 110, 6595. |
| 4. | O'Hayre, R., Cha, S.-W., Colella, W., Prinz, F.B., Fuel Cell Fundamentals, John Wiley and Sons, New York, 2006. |
| 5. | Tchobanoglous, G., Burton, F., David Stensel, H., Wastewater Engineering: Treatment and Reuse, Metcalf and Eddy, McGraw-Hill, 2002. |
| 6. | Burch, R., Knowledge and know-how in emission control for mobile applications, Catal. Rev.-Sci. Eng., 2004, 46, 271. |


**2.2 Additional Readings**

*(Additional references for students to learn to expand their knowledge about the subject.)*

Nil