Form AR 140

The Hong Kong Polytechnic University

Subject Description Form

Please read the notes at the end of the table carefully before completing the form.

Subject Code	ABCT5041
Subject Title	Sustainable Chemistry for Circular Economy
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	NIL
Objectives	This subject aims to provide students with a comprehensive understanding of the sustainable practices implemented in industrial sectors, as well as strategies for a sustainable world. Students will gain knowledge about various technologies for achieving sustainability in various industries. The subject aims to foster critical thinking and problem-solving skills in the context of sustainable management and resource recovery and recycling.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: a. Realize the challenge and climate crisis facing the planet, the importance of sustainable development goals and the fundamental knowledge of sustainability in chemical processes; b. Appreciate the benefits and shortfalls of green technologies adopted in industries; c. Recognize the responsibilities of incorporates and individuals in building a circular economy and society; d. Demonstrate critical skills and analytical ability in the evaluation of sustainable practices implemented in various industries; e. Formulate and propose sustainable solutions to address industry-specific sustainability challenges; f. Realize the latest research and advancements in sustainable practices across industries;
Subject Synopsis/ Indicative Syllabus *(Note 2)*	1. Sustainability and ethical issues Sustainable manufacturing in Industry 4.0; Challenges and opportunities for global sustainability; Ethical issues associated with sustainability; driving ethics and sustainability around the world. 2. Sustainability in the textile industry Natural & synthetic dyes; natural & synthetic fibres; green technology in the textile industry; textile life cycles; upcycling of textile products. 3. Sustainable wastewater remediation

<table>
<tr><td></td><td>Wastewater characteristics; primary, secondary and tertiary treatment of wastewater; physical, chemical and biological treatment processes; wastewater analysis; Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), suspended solids, and turbidity.

4. Sustainability in the energy field
Recycling status in the energy industry; specific technology and process for recycling energy devices and related materials; energy recovery from waste; evaluation of recycling technologies in energy field.

5. Sustainable catalysis/chemistry in environmental protection
Heterogeneous and homogenous catalysis; novel and functional materials for catalysis; plastic recycling and biomass conversion.</td></tr>
<tr><td>Teaching/Learning Methodology
(Note 3)</td><td>Interactive lectures
To facilitate communication between lecturers and students to enhance students' comprehension of the key concepts.

Tutorials and discussion
To promote interaction among students and their awareness of the ethical issues associated with sustainability and the sustainable practices in industries and daily life.

Quizzes
To reinforce students' knowledge they learn from the subject, and strengthen their comprehension of sustainable strategies and concepts, quizzes will be set up based on the lectures in the Forms of Microsoft Teams in each class.

Individual presentation
To enhance students' ability in literature research, analysis, and summary, and present their findings effectively and reasonably.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes
(Note 4)</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td></tr>
<tr><td>1. Pop-up quizzes</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td>✓</td></tr>
<tr><td>2. Individual Presentation</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>3. Examination</td><td>50%</td><td>✓</td><td>✓</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

We adopt a continuous assessment which consists of three components, i.e., quiz, individual presentation, and examination. All the intended subject learning outcomes will be assessed.</td></tr>
<tr><td rowspan="8">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture</td><td>26 Hrs.</td></tr>
<tr><td>▪ Tutorial</td><td>13 Hrs.</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Preparation of presentation</td><td>25 Hrs.</td></tr>
<tr><td>▪ Self study (reading on literatures, reference books, textbooks and reports)</td><td>45 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>109 Hrs.</td></tr>
<tr><td>Reading List and References</td><td colspan="2">1. Ghauri P N, Elg U, Melén Hånell S. Creating a Sustainable Competitive Position: Ethical Challenges for International Firms. Emerald Publishing, 2023.

2. Dunn, P. J., Hii, K. M., Krische, M. J., & Williams, M. T. (Eds.). (2013). Sustainable catalysis: challenges and practices for the pharmaceutical and fine chemical industries.

3. Dunmade, I. S., Daramola, M. O., & Iwarere, S. A. (Eds.). (2024). Sustainable Engineering: Concepts and Practices. Springer Nature.

4. Rather, L. J., Shabbir, M., & Haji, A. (Eds.). (2021). Sustainable Practices in the Textile Industry. John Wiley & Sons.

5. Gholami, H., Abdul-Nour, G., Sharif, S., & Streimikiene, D. (Eds.). (2023). Sustainable Manufacturing in Industry 4.0: Pathways and Practices. Springer.

6. Luque, R., Burange, A. S. (2022). Heterogeneous Catalysis. United States: American Chemical Society.

7. Al-Salem, S. (2018). Plastics to Energy: Fuel, Chemicals, and Sustainability Implications. United Kingdom: Elsevier Science.

8. Bajpai, P. (2019). Biomass to Energy Conversion Technologies: The Road to Commercialization. Netherlands: Elsevier Science.</td></tr>
</table>

Note 1: Intended Learning Outcomes
Intended learning outcomes should state what students should be able to do or attain upon subject completion. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/Indicative Syllabus
The syllabus should adequately address the intended learning outcomes. At the same time, overcrowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology
This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method
This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method is intended to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.