SISP 1001
Innovation in STEM projects

Course Description

The course aims to introduce STEM projects and state-of-the-art technologies in science and engineering to solve environmental problems in daily life. This experiential course will provide an overview to potential students who wish to engage in STEM education. Students will design and develop a prototype through various innovative learning activities under the guidance of instructors, explain the underlying scientific principles, integrate the multidisciplinary knowledge with innovation and creativity to critically evaluate complex, real-world problems. The course also serves to strengthen students' concepts in science and engineering, and improves their organization and presentation skills, which are important in their future study.

Schedule & Topics

Schedule	Topics
Day 1	**Introduction** Pollutants vs Ocean/Freshwater resources Types of Water pollutants Microplastics detection Wastewater treatment processes **Projects** Conceptual design of smart fish for microplastics detection Wastewater treatment processes with functional materials
Day 2	**Lectures on** Water pollutants Wastewater treatment Process design for Wastewater treatment Activities Group discussion for the selected project Draft design for the treatment process
Day 3	**Experiment 1** Microplastics sampling and characterization Lab report and findings Group discussion on experiment findings
Day 4	**Experiment 2** Water pollutant treatment process Dye adsorption process and adsorbent Lab report and findings Group discussion on experiment findings

Day 5	**Experiment 3** 3D-printing technology Programming and Exercises for the Product design
Day 6	**Experiment 4** Photocatalytic oxidation process Theory of photocatalysis and properties of the functional materials
Day 7	Group Presentation & Submission of Project Report

Grading Scheme

- Project report (60%)
- Project presentation (20%)
- Course participation (10%)
- Peer evaluation (10%)

[Topics and grading schemes are subject to change as deemed appropriate. Students will receive information and guidelines in class on how they will be assessed for the course.]

Teaching Mode
The course will be delivered face-to-face.

Attendance Requirement
Attendance is expected and required. The minimum attendance required is 70%. Attendance for the assessment activities [e.g. group presentation and final exam] is mandatory.

Instructor(s) Profile

Prof. Cindy LAM	**Prof. Leung Yuk Frank LAM**
Prof. Cindy Lam obtained her PhD in Marine Environmental Science at the University of Oldenburg, Germany in 2007. She has joined the Department of Ocean Science at HKUST as Lecturer since 2012 with extensive experience in organizing experiential learning and ocean science-related education projects for secondary and university students. She has extended her interest in incorporating innovative tools (e.g. AR, VR, gamification) to enhance students' motivation and active engagement in lectures and lab courses. With her research interests in investigating the potential impacts of microplastics on marine ecosystems, she has enthusiasm to develop autonomous device and speed up monitoring and detection of microplastics in the ocean.	Prof. Frank Lam is currently Associate Dean of Students and Assistant Professor of Engineering Education at the Department of Chemical and Biological Engineering at HKUST. He received his PhD at the HKUST in 2005 and has been a Visiting Assistant Professor in the Department of Chemical Engineering in the Technion Israel Institute of Technology (TIIT) in Israel and Department of Chemistry at The University of Hong Kong, conducting research on functional materials for environment and teaching on the environmental engineering. His research is focused on separation, air pollution control, and wastewater treatment through adsorption and heterogeneous catalysis. He also concentrates on the Education via Experiential Learning approach and Visual Reality for knowledge delivery.