THE EDUCATION UNIVERSITY OF HONG KONG

Course Outline

Part I

Programme Title	**:** Bachelor of Education (Honours) (Science)
Programme QF Level	**:** 5
Course Title	**:** Materials Chemistry: Resource, Material & the Environment
Course Code	**:** SCC3005
Department	**:** Science and Environmental Studies
Credit Points	**:** 3
Contact Hours	**:** 39
Pre-requisite(s)	**:** Nil
Medium of Instruction	**:** English
Course Level	**:** 3

Part II

The University's Graduate Attributes and seven Generic Intended Learning Outcomes (GILOs) represent the attributes of ideal EdUHK graduates and their expected qualities respectively. Learning outcomes work coherently at the University (GILOs), programme (Programme Intended Learning Outcomes) and course (Course Intended Learning Outcomes) levels to achieve the goal of nurturing students with important graduate attributes.

In gist, the Graduate Attributes for Sub-degree, Undergraduate, Taught Postgraduate, Professional Doctorate and Research Postgraduate students consist of the following three domains (i.e. in short "PEER & I"):

- **P**rofessional **E**xcellence;
- **E**thical **R**esponsibility; **&**
- **I**nnovation.

The descriptors under these three domains are different for the three groups of students in order to reflect the respective level of Graduate Attributes.

The seven GILOs are:

1. Problem Solving Skills
2. Critical Thinking Skills
3. Creative Thinking Skills

4a. Oral Communication Skills

4b. Written Communication Skills

5. Social Interaction Skills
6. Ethical Decision Making
7. Global Perspectives

1. Course Synopsis

This course aims at providing students with an understanding of materials chemistry. Important materials such as polymers, metals, alloys, liquid crystals, semi-conductors, and nanomaterials are covered. A more thorough understanding of synthetic polymers including thermoplastics, thermosetting plastics, polymeric biomaterials and biodegradable plastics will also be introduced. Participants who complete the course should be able to describe the synthetic materials in modern life and understand the development progress of new materials in meeting the needs of modern and green life. The course thus equips participants with the essential concepts and knowledge to teach the module of material and environmental chemistry, (either in Chemistry, Combined Science or Integrated Science) and topics in Elective Part – Material Chemistry at senior secondary level.

2. Course Intended Learning Outcomes ($CILO_s$)

Upon completion of this course, students will be able to:

$CILO_1$: Demonstrate knowledge and understanding of the material chemistry related to chemistry applications and issues relevant to Hong Kong society, and properties of materials in relation to everyday life;

$CILO_2$: Show understanding of the significance of chemistry related to such materials and their applications, and issues when considering and taking an opinion on them;

$CILO_3$: Incorporate the acquired scientific knowledge and the scientific investigation skills for effective teaching of the secondary Science subject into their teaching practice;

$CILO_4$: Reflect critically on the impact of the use of materials on the environment and humanity, and the associated moral and ethical issues.

3. Content, CILOs and Teaching & Learning Activities

Course Content	CILOs	Suggested Teaching & Learning Activities
<u>Raw materials and products from the Earth</u> - Air: The atmosphere, fuel, and air quality; - Water: Water cycle, water sources, water purification, and wastewater treatment; - Metals: Metal extraction, alloys and recycling; - Silicon materials: Glass, ceramics and superconductors, cement and concrete, and silicon chips	$CILO_{1,2,3,4}$	Mini-lecture; group discussion; student presentation; demonstration and experiments

<u>Synthetic materials</u> - Plastics: Polymers, preparation of plastics from crude oil, natural and synthetic plastics, disposal of plastics, plastics and fire hazards; - Acids and bases: Indicators, pH, strength of acids and bases,	CILO1,2,3,4	Mini-lecture; group discussion; student presentation; demonstration and experiments
buffers, neutralization and salts, antacids; - Composite materials and nanomaterials: plywood, fibre glass, carbon fibre composites and carbon nanotubes		
Materials, their properties and their utilization: ceramics, plastics, composite materials, and semiconductors;	CILO1,2,3,4	Mini-lecture; group discussion; student presentation; demonstration and experiments
Material chemistry and Environment: Application of material to solve problem on air, water and solid waste environmental	CILO1,2,3,4	Mini-lecture; group discussion; student presentation; demonstration and experiments

4. Assessment

Assessment Tasks	Weighting (%)	CILO
(a) Assignment Lab report: Individual work: two laboratory reports for the experiments done in class.	30%	*CILO1,2,3*
(b) Examination	40%	*CILO1,2,3*

(c) In-class participation All students are required to participate in in-class activities below: • In-class online activities (10%) • Exercises in Moodle after the field visit (10%) • A 25-minutes group (5 members) presentation. Select a topic related to an environmental pollution happened in the past ten years in Hong Kong. Discuss any aspects, such as causes, control, impacts and suggested remediation with reference to the Hong Kong context. (10%)	30%	*CILO1,2,3,4*

5. Use of Generative AI in Course Assessments

Please select one option only that applies to this course:

☐ ***Not Permitted***: In this course, the use of generative AI tools is not allowed for any assessment tasks.

☑ ***Permitted***: In this course, generative AI tools may be used in some or all assessment tasks. Instructors will provide specific instructions, including any restrictions or additional requirements (e.g., proper acknowledgment, reflective reports), during the first lesson and in relevant assessment briefs.

6. Required Text(s)

Nil

7. Recommended Readings

Harry R. Allcock , (2008). Introduction to Materials Chemistry, Wiley

Herr, N. & Cunningham, J. (1999). Hands-on Chemistry activities with real-life applications. New York: Center for Applied Research in Education.

Hill, G., & Holman, J. (2011). Chemistry in context (6th ed.). U.K.: Nelson.

Hill, J.W., Terry W. McCreary & Kolb D.K. (2013). Chemistry for changing times (13th ed.). Prentice-Hall, Inc.

Holman, J. (1996). The material world. Walton-on-Thames, England: Nelson.

Hummel, R.E. (2004). Understanding materials science – history, properties, applications. New York: Springer-Verlag.

Ibanez, J.G., Hernandez-Esparza, M., Doria-Serrano, C., Fregoso-Infante, A., Singh, M.M. (2007). Environmental Chemistry Fundamentals, Springer

Joesten, M.D., Johnston, D.O., Netterville, J.T., & Wood, J.L. (1999). World of chemistry (2nd ed.). Philadelphia, PA: Saunders College Publishing.

Stanitski, C.L., Eubanks, L.P., Middlecamp, C.H., & Stratton, W.J. (2000). Chemistry in context: Applying chemistry to society (3rd ed.). Boston, Mass: McGraw-Hill, Inc.

Suchocki, J. (2007). Conceptual Chemistry: Understanding our world of atoms and molecules (3rd ed.). London: Benjamin Cummings.
Thrower, P.A. (2007). Materials in today's world (3rd ed.). New York: McGraw-Hill, Inc.
White, M.A. (1999). Properties of materials. Oxford: Oxford University Press.

8. Related Web Resources

Nil

9. Related Journals

Nil

10. Academic Honesty

The University upholds the principles of honesty in all areas of academic work. We expect our students to carry out all academic activities honestly and in good faith. Please refer to the *Policy on Academic Honesty, Responsibility and Integrity* (https://www.eduhk.hk/re/uploads/docs/00000000016336798924548BbN5). Students should familiarize themselves with the Policy.

11. Others

Nil

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