THE EDUCATION UNIVERSITY OF HONG KONG

Course Outline

Part I

Programme Title **:** Bachelor of Science (Honours) in Integrated Environmental Management and Bachelor of Education (Honours) (Science)
Programme QF Level **:** 5
Course Title **:** Foundation Science: Matter, Energy & Change
Course Code **: SCI2113**
Department/Unit **:** Science and Environmental Studies
Credit Points **:** 3
Contact Hours **:** 39 hours
Pre-requisite(s) **:** NIL
Medium of Instruction **:** EMI
Course Level **:** 2

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 to establish participants' basic understanding of the physical concepts of matter and energy, including but not limited to those covered in the core primary Science and junior secondary Science curricula. It also investigates the change of states of matter, conversion of energy and their related phenomena. Three topics are discussed: properties and change of states of matter; various forms of energy and energy conversion; and force and motion. The course enables participants to grasp the concepts and knowledge about the states and properties of matter and the physical and chemical changes involved; energy in the form of light, sound, heat, and electricity and their conversion, transfer, and propagation; force, motions and the working principles of simple machines. Through mastering the relevant concepts and knowledge, participants are able to comprehend the scientific phenomena and the applications of technologies in daily life. The course equips participants with foundational physics knowledge and concepts to teach Science, including the primary and junior secondary school levels.

2. Course Intended Learning Outcomes (CILOs)

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

$CILO_1$	Demonstrate an understanding of fundamental princples and concepts in the topics of matter, energy, force and motion, physical changes and chemical changes;
$CILO_2$	Develop analytical and interpretation skills to explain scientific phenomena and evaluate scientific data;
$CILO_3$	Apply physics principles and skills to solve problems related to the topics of matter, energy, force and motion, physical changes and chemical changes in primary and junior secondary science curricula;
$CILO_4$	Acquire pedagogical content knowledge and skills relevant to teaching of physics and technological topics in primary and junior secondary science curricula.

3. Content, CILOs and Teaching & Learning Activities

Course Content	CILOs	Suggested Teaching & Learning Activities
Matter and changes: properties of matter; comparison of physical properties of various substances; heat and electrical conductivities of substances; the three states of matter and change of states; physical changes and chemical changes of matter; reversible and irreversible changes.	$CILO_{1,2,3\ \&\ 4}$	Lectures, tutorials, experimental investigations, investigations involving up-to-date educational technologies
Energy: energy sources, energy uses in daily life; various forms of energy including light, heat and sound; energy conversion; energy propagation; conservation of energy. Heat: temperature and thermometer; heat transfer including conduction,	$CILO_{1,2,\ 3\ \&\ 4}$	Lectures, tutorials, experimental investigations, investigations involving up-to-date educational technologies

convection, and radiation; zeroth and first law of thermodynamics. Electromagnetism: electric circuit; relationship between current, voltage and resistance; electrical conductors and insulators; heat effect and magnetic effects of current and their applications in daily life; electrical hazards and safety.		
Force and motion: kinematics and dynamics in three dimensions; Newton's laws of motion; gravitation; friction; conservation of energy and momentum; working principles of simple machines and their applications in daily life.	*CILO*$_{1,2,3\ \&\ 4}$	Lectures, tutorials, experimental investigations, investigations involving up-to-date educational technologies

4. Assessment

Assessment Tasks	Weighting (%)	CILO
(a) In-class participation and exercise	15	*CILO*$_{1,\ 2\ \&\ 3}$
(b) Two experimental reports	35	*CILO*$_{1,2,3\ \&\ 4}$
(c) Two-hour examination	50	*CILO*$_{1,2,3\ \&\ 4}$

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)

Halliday, D., Resnick, R.,Walker, J. (2013) *Fundamentals of physics* (10th ed). New York: Wiley

7. Recommended Readings

Atkins, P (2010).The Laws of Thermodynamics: A Very Short Introduction. Oxford: Oxford University Press

Bevington, P. R. & Robinson, D. K. (2002). *Data reduction and error analysis for the physical sciences* (3rd ed.). Boston: McGraw-Hill.

Edminister, J. A. & Nahvi, M. (2013). *Schaum's outlines of Electromagnetics*. (4th ed.) New York: McGrill-Hill Education.

Feynman, R.P. (2005). *The Feynman lectures on physics*. v.1-3. (2nd ed.) Redwood City, Calif.: Addison-Wesley.
Fornasini, P (2010). *The Uncertainty in Physical Measurements: An Introduction to Data Analysis in the Physics Laboratory*, New York: Springer
Fowler, R (2012). *Electricity: Principles and Applications* (8th ed.). New York: McGrill-Hill Education.
Giancoli, D.C. (2008). *Physics for scientists & engineers with modern physics* (4th ed.). Upper Saddle River, N.J.: Pearson Prentice Hall.
Hecht, E. (2017). *Optics* (Fifth ed.). Reading, Mass.: Addison-Wesley.
King, G. C. (2009). *Vibrations and waves. Chichester*, U.K.: Wiley
Stowe, K (2007), *An Introduction to Thermodynamics and Statistical Mechanics* (2nd ed.) New York: Cambridge University Press
Taylor, J. R. (2005) *Classical mechanics*. Sausalito, CA: University Science Books
Tipler, P.A. & Mosca, G. (2007). Physics for scientists and engineers v.1 (6th ed.). New York: W.H. Freeman.
Walker, J., & Walker, J. (2006). *The flying circus of physics* (2nd ed.). New York: John Wiley & Sons.

8. Related Web Resources

Interactive Web Physics
http://www.iwphys.org/
Molecular Workbench
http://mw.concord.org/nextgen/
PhET Interactive Science Simulations
http://phet.colorado.edu/
Physics Demonstration Resources Online
http://www.ph.utexas.edu/~phy-demo/resources/resources.html
Physlets (Physics Applets)
http://webphysics.davidson.edu/applets/applets.html
Schools and colleges web resource at the Institute of Physics website
http://www.iop.org/education/index.html

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/00000000001633679892454 8BbN5). Students should familiarize themselves with the Policy.

11. Others

Nil

Last update: July 2025