Course Title	:	The Process of Science
Course Code	:	CCC8013
Recommended Study Year	:	Year 2
No. of Credits/Term	:	3
Mode of Tuition	:	Lecture-Lab
Class Contact Hours	:	One 1.5-hour lecture (class size: 250-300) and one 1.5-hour lab (class size: 35) each week
Category	:	Common Core Curriculum
Discipline	:	Nil
Prerequisite	:	Nil
Co-requisite	:	Nil
Exclusion	:	Nil
Exemption Requirement	:	Nil

Brief Course Description:

This course introduces students to the process of science and the role that science plays in today's world. Students will meet once per week for a 1.5-hour lecture and a 1.5-hour lab section. The lecture portion develops the students' understanding of how science works, the role of science in the world, and introduce some of the concurrent science. Instructional methods include lectures, short videos, small group class activities, and individual reflection. The lab portion introduces students to the process of science through lectures, lab demonstrations and small group class activities, and allow them to conduct their own independent research project. Where appropriate, blended learning activities will be implemented in this course.

Aims:

The aims of this course are to introduce students to the process of science, facilitate and stimulate students to appreciate, and to think critically of the power, and limitations of science as a way of learning about the world. This course examines the role of science in helping to address many of the global challenges facing us today. In addition, this course strives to develop the skills and motivation that will contribute to life-long learning.

Learning Outcomes (LOs):

On completion of the course, students will be able to:

1. Discuss the foundations of knowledge and inquiry about science, and how science has influenced society.
2. Apply intellectual and practical skills (inquiry and analysis, critical thinking, written communication, quantitative/data literacy, and information literacy) across a range of scientific contexts.
3. Demonstrate the ability to integrate and apply learning about the process of science to new settings and complex problems.
4. Develop personal and social responsibility (glocal civic knowledge and engagement, intercultural competence, and ethical reasoning foundations) focused on real-world challenges.
5. Demonstrate the motivation and ability for life-long learning about science-related issues.

Indicative Content:

Scientific methods
Science literacy
Experimental design/hypothesis testing protocol
Basic statistical analyses and quantitative/data literacy
History of science
Scientific revolutions
Pseudoscience and mistrust of science
Science and Sustainable Development Goals
Science and Climate Change

Teaching Method:

Students will meet twice per week:
1.5-hour lecture in large lecture hall and
1.5-hour lab section in smaller groups (approx. 35 students).

Measurement of Learning Outcomes:

Intended Learning Outcomes

Assessment Method	**1**	**2**	**3**	**4**	**5**
Lab Continuous Assessment	X	X	X	X	
Lecture Continuous Assessment	X	X		X	X
Science Literacy Assignment	X		X		X
SDG Assignment		X	X	X	X
Individual Research Project	X	X	X	X	X

Course Assessment:

Lab Continuous Assessment (in-class short quizzes)	20%
Lecture Continuous Assessment (in-class reflections and worksheets)	20%
Scientific Literacy Assignment	15%
SDG Assignment	15%
Individual Research Project and Report	30%

Essential Readings:

The Scientific Endeavor: A Primer on Scientific Principles and Practice. 2000. J. A. Lee.

The Process of Science. 2004. M. A. McGinley.

Supplementary Readings:

Supplementary Readings from a variety of sources will be uploaded on Moodle.

Important Notes

1. Students are expected to spend a total of 9 hours (i.e. 3 hours of class contact and 6 hours of personal study) per week to achieve the course learning outcomes.
2. Students shall be aware of the University regulations about dishonest practice in course work, tests and examinations, and the possible consequences as stipulated in the Regulations Governing University Examination and Course Work (https://www.ln.edu.hk/f/upload/57867/arue21.pdf). In particular, plagiarism, being a kind of dishonest practice, is "the presentation of another person's work without proper acknowledgement of the source, including exact phrases, or summarised ideas, or even footnotes/citations, whether protected by copyright or not, as the student's own work". Students are required to strictly follow university regulations governing academic integrity and honesty. Plagiarism (unattributed copying) will be heavily penalized and may attract zero mark and disciplinary action.
3. Students are required to submit writing assignment(s) using Turnitin.
4. To enhance students' understanding of plagiarism, a mini-course "Online Tutorial on Plagiarism Awareness" is available on https://pla.ln.edu.hk/.

Assessment Rubrics

Rubric for Lecture Continuous Assessment

Criteria	Excellent (A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Poor (D+, D)	Fail (F)
Organization and accuracy of content (80%)	Ability to proficiently demonstrate genuine reflection and deep thinking of acquired knowledge and concepts, and integrate them into different issues from wide range of perspectives (e.g. different contexts, cultures, disciplines, daily lives, etc.); creative solutions and critical thinking skills demonstrated in the writing.	Showing satisfactory ability to relate acquired knowledge to previous experiences; demonstrating attempt to analyze the issues from a number of different perspectives.	Includes description of events, and a little further consideration behind the events using a relatively descriptive style of language; no evidence of using multiple perspectives in analyzing the issues.	Only includes mere descriptions of theoretical knowledge; no reflection is demonstrated beyond the descriptions.	Fail to include relevant descriptions of theoretical knowledge; no reflection is demonstrated.
Uses language effectively (20%)	Clear, engaging writing, with almost no mistakes in grammar or spelling.	Occasional mistakes in grammar or spelling which do not interfere with comprehension.	Substantial mistakes that sometimes make comprehension difficult.	Significant portions cannot be accurately assessed because of problems with the writing.	The content is difficult or impossible to evaluate.

Rubric for Lab Continuous Assessment

Criteria	**Excellent (A, A-)**	**Good (B+, B, B-)**	**Fair (C+, C, C-)**	**Poor (D+, D)**	**Fail (F)**
Organization and accuracy of content (40%)	Ability to reflect on acquired knowledge and concepts, and integrate them into different issues from wide range of perspectives (e.g. different contexts, cultures, disciplines, daily lives, etc.); creative solutions and critical thinking skills demonstrated in the writing.	Showing satisfactory ability to relate acquired knowledge to previous experiences; demonstrating attempt to analyze the issues from a number of different perspectives.	Includes description of events, and a little further consideration behind the events using a relatively descriptive style of language; no evidence of using multiple perspectives in analyzing the issues.	Only includes mere descriptions of theoretical knowledge; no reflection or deep thinking is demonstrated beyond the descriptions.	Fail to include relevant descriptions of theoretical knowledge; no reflection or deep thinking is demonstrated.
Data analysis and data illustration (50%)	Uses correct quantitative analysis, extremely accurate presentation of data in graphs or tables, and the results are interpreted extremely accurately and clearly.	Uses correct quantitative analysis, accurate presentation of data in graphs or tables, and the results are interpreted accurately and clearly.	Incorrect use of quantitative analysis. Weak presentation of data/evidence.	Poor use of quantitative analysis. Weak presentation of data/evidence.	Very poor use of quantitative analysis. Did not present any data/evidence. Plagiarism.
Uses language effectively (10%)	Clear, engaging writing, with almost no mistakes in grammar or spelling.	Occasional mistakes in grammar or spelling which do not interfere with comprehension.	Substantial mistakes that sometimes make comprehension difficult.	Significant portions cannot be accurately assessed because of problems with the writing.	The content is difficult or impossible to evaluate.

Rubric for Scientific Literacy Assignment

Criteria	Excellent (A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Poor (D+, D)	Fail (F)
Organization and accuracy of content (70%)	Addresses the assignment fully, follows instructions completely. Organizes the material in a coherent, effective, and accurate manner throughout, with no factual inaccuracies. Science information is fully complete, stated correctly, comes from reliable sources, and is explained extremely accurately and clearly. Contains well referenced evidence/data.	Addresses the assignment and follows most of the instructions. Organizes the material effectively but some ideas could be communicated more effectively, with very few inaccuracies. Science information is complete, stated correctly, comes from reliable sources and is explained accurately and clearly. Contains evidence/data but not well referenced.	Addresses most of the assignment and follows most of the instructions. Organization of the material could be improved, with some factual inaccuracies. Science information provided is adequate, generally are stated correctly, mostly comes from reliable sources, but could be explained more accurately and clearly. Weak presentation of data/evidence. References not well organized/hard to follow.	Addresses the assignment poorly and follows limited instructions. Organization of the material could be greatly improved, with major factual inaccuracies. Science information provided is not adequate, is not always stated correctly, may come from less-reliable sources, and is not explained accurately and clearly. Weak presentation of data/evidence. Minimal references and mostly irrelevant.	Fails to address the assignment or follow instructions. Fails to organize material and contains numerous factual inaccuracies. Fails to provide scientific information or information provided is irrelevant or comes from clearly unreliable sources. Explanation is wrong or impossible to understand. Did not present any data/evidence. Did not provide references. Plagiarism.
Uses language effectively (30%)	Clear, engaging writing, with almost no mistakes in grammar or spelling.	Occasional mistakes in grammar or spelling which do not interfere with comprehension.	Substantial mistakes that sometimes make comprehension difficult.	Significant portions cannot be accurately assessed because of problems with the writing.	The content is difficult or impossible to evaluate

Rubric for SDG Assignment

Criteria	**Excellent (A, A-)**	**Good (B+, B, B-)**	**Fair (C+, C, C-)**	**Poor (D+, D)**	**Fail (F)**
Data analysis and interpretation (70%)	Uses correct quantitative analysis, extremely accurate presentation of data, and the results are interpreted extremely accurately and clearly. References extremely well organized and easy to follow.	Uses correct quantitative analysis, accurate presentation of data, and the results are interpreted accurately and clearly. References well organized and easy to follow.	Incorrect use of quantitative analysis. Weak presentation of data/evidence. References not well organized/hard to follow.	Poor use of quantitative analysis. Weak presentation of data/evidence. References not well organized/hard to follow.	Very poor use of quantitative analysis. Did not present any data/evidence. Did not provide references. Plagiarism.
Data illustration (30%)	Uses table/figure to effectively illustrate data; contains no/very few errors.	Uses table/figure to illustrate data, may contain a few errors.	Uses table/figure to illustrate data, but too simple in some parts and contains errors.	Significant portions cannot be accurately assessed because of problems with the writing.	Uses of table/figure is extremely poor or impossible to understand.

Rubric for Research Report

Evaluation Criteria	Excellent (A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Poor (D+, D)	Fail (F)
Format (10%)	Follows through the formal scientific report conventions (Title, Abstract, Introduction, Methodology, Results, Discussion, Conclusion, References).	Follows most of the format with occasional mistakes	Follow most of the format which sequences mixed	Fail to follow most of the format	Completely fail to follow the format
Organization and content (80%)	Reviews extensively the available studies on this topic and states thoroughly the problem investigated, methods employed and major conclusions achieved. Describes extensively how the data were collected/chosen and presents the data in a logical order with Data, Tables and Figures provided. Discusses topics thoroughly and objectively. Provide effective summary of the major points based on the data with references correctly cited in a consistent format	Reviews reasonable number of studies on this topic and mostly states the problem investigated, methods employed and major conclusions achieved. Describes extensively in a sound manner how the data were collected and presents the data mostly in a logical order with Tables and Figures provided with occasional errors. Discusses most topics thoroughly, adequately and objectively. Provide effective adequate summary of the major points based on the data with most references correctly cited in a consistent format	Reviews a fair number of studies on this topic and fairly states the problem investigated, methods employed and major conclusions achieved. Describes in a fair manner how the data were collected/chosen and presents the data in a fairly logical order with Data, Tables and Figures provided with a few errors. Discusses most topics fairly adequately. Provide fair summary of the major points based on the data with most references correctly cited, with some errors in a consistent format	Reviews a limited number (or lack of) of studies on this topic and basically fail to state some parts of the problem investigated, methods employed and major conclusions achieved. Describes in a sound inadequate manner how the data were collected/chosen and presents the data mostly in a logical order with some logical errors. Data, few Tables and/or Figures are provided. Discusses most topics inadequately. Summarizes major points with errors or inconsistency based on the data, with most references presented in a correctly cited but inconsistent format	Failed to form an organized report with mere relevant information and figures covered

Uses language effectively (10%)	Uses precise, technical/professional language, unified and coherent, varies sentence length and structure to keep reader's attention, connects ideas effectively.	Uses precise language with a few mistakes in grammar or spelling which basically do not interfere with comprehension.	Substantial mistakes that sometimes make comprehension difficult.	Significant portions cannot be accurately assessed because of problems with the writing.	The content is difficult or impossible to evaluate.