

**Hong Kong University of Science and  
Technology Department of Civil and  
Environmental Engineering**

Rubric Title of course Instructor Teaching Assistants	CIVL 4450 Carbon footprint analysis and reduction ZHOU, Wenwen TBA
Co-Requisite Credit	CIVL 4450 3
Text book	Textbook: Shelley Zhou (2020) Carbon Management for a Sustainable Environment <a href="https://www.springer.com/gp/book/9783030350611">https://www.springer.com/gp/book/9783030350611</a>
Reference book(s):	<ol style="list-style-type: none"> <li>1. Climate Change Information Kit</li> <li>2. Kyoto Protocol</li> <li>3. Paris Agreement <a href="http://unfccc.int/paris_agreement/items/9485.php">http://unfccc.int/paris_agreement/items/9485.php</a></li> <li>4. IPCC AR5 Summary for Policy Makers - Climate Change 2013: The Physical Science Basics</li> <li>5. IPCC Special Report 2018: Global Warming 1.5C</li> <li>6. ISO 14064: International Standard on Greenhouse Gases</li> <li>7. GHG Protocol: The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard.</li> <li>8. HKEPD and EMSD Guidelines: Guidelines to Account for and Report on Greenhouse Gas Emissions and Removals for Buildings (Commercial, residential or Institutional Purposes) in Hong Kong 2010</li> <li>9. PAS 2050:2008: Specification for the Assessment of the Life Cycle Greenhouse Gas Emissions of Goods and Services</li> <li>10. World Bank Group (2018) State and Trends of Carbon Pricing 2018</li> <li>11. BEAM Plus: Hong Kong Building Environmental Assessment Methods</li> <li>12. USEPA: Solid Waste Management and Greenhouse Gas, 2006</li> </ol>
Learning Objectives	<p>On successful completion of this course, students are expected to be able to:</p> <ol style="list-style-type: none"> <li>1) understand basic concepts of climate change, greenhouse gas (GHG) emission and carbon management;</li> <li>2) master the skill of carbon auditing;</li> <li>3) familiar with a typical carbon management project in a real business environment;</li> <li>4) understand the role of carbon consultant and the services and products offered; and</li> <li>5) develop the competence of facing clients in future job &amp; career development.</li> </ol>
Topics	<ol style="list-style-type: none"> <li>1) Climate change basics: <ol style="list-style-type: none"> <li>i) Greenhouse Effect and GHGs</li> <li>ii) Anthropogenic Evidences</li> <li>iii) Climate Change Consequences</li> <li>iv) The Climate Change Convention</li> </ol> </li> </ol>

	<ul style="list-style-type: none"> <li>v) Carbon Footprint Concept</li> </ul> <p>2) Carbon footprint measurement:</p> <ul style="list-style-type: none"> <li>i) Define the boundaries</li> <li>ii) Quantifying emission</li> <li>iii) baseline and base year</li> <li>iv) Reporting tools</li> <li>v) Product carbon footprint</li> <li>vi) Product carbon footprint of construction materials</li> </ul> <p>3) Carbon management:</p> <ul style="list-style-type: none"> <li>i) Carbon management concepts</li> <li>ii) Carbon trading and offsetting</li> <li>iii) Net zero and total carbon management cases</li> </ul> <p>4) Carbon reduction solutions</p> <ul style="list-style-type: none"> <li>i) Low carbon management in green buildings</li> <li>ii) Carbon reduction solutions: Waste; Transport</li> </ul>
Computer usage	None
Lab Tests	None
Relationships to the program objectives	<p><b>1. Provide professional skills in design, construction and management</b></p> <p>This course provides fundamental knowledge of climate change, carbon auditing and reduction solutions which aims to prepare the students with the required skills as a carbon management consultant.</p> <p><b>2. Train students with good communication skills</b></p> <p>The course requires students to form a company in a group project and present their carbon auditing results with proposed carbon management solutions for “clients”.</p> <p><b>3. Stimulate self-learning and innovative problem-solving skills</b></p> <p>The course requires students to identify different scopes and find suitable emission factors from online resources to complete a mini carbon auditing assignment.</p> <p><b>4. Expose students to real projects and cutting-edge research</b></p> <p>This course will introduce several real carbon auditing and management projects delivered in lecturer’s career life.</p>
Relationships to program outcomes	<p><b>2. Understand fundamental principles of engineering science</b></p> <p>This course conveys fundamental knowledge in climate change, carbon auditing and carbon management. Students will be able to identify different carbon management business cases and propose solutions for different scenarios.</p>

	<p><b>5. Formulate problems and propose feasible solutions</b></p> <p>Students will complete a mini carbon auditing project by finding the suitable factors and solutions from online resources.</p> <p><b>6. Obtain in-depth knowledge in at least on specialized area</b></p> <p>Students will cover the basis of climate change and learn in-depth knowledge of carbon auditing and management, which is the essential skill to work as a carbon consultant.</p> <p><b>9. Communicate ideas effectively and able to work in teams</b></p> <p>Students will collaborate with their group-mates to form a company and write carbon management reports. At the end of the semester, they need to make a short presentation on their proposal.</p> <p><b>10. Recognize the need of lifelong learning</b></p> <p>Students will realize the emerging importance of climate change issues and the urging need of carbon auditing, management and reduction.</p>
Assessment of Outcomes	<ol style="list-style-type: none"> <li>1. Assignments and mid-term exam will be given to assess students' understanding of the subject during the learning process. (Outcomes 2, 5 and 6)</li> <li>2. At the end of semester, a presentation and report will be graded to assess students' ability in a carbon management group project. (Outcomes 9)</li> <li>3. Grade: <ul style="list-style-type: none"> <li><input type="checkbox"/> Participation 10%</li> <li><input type="checkbox"/> Individual Assignment 10%</li> <li><input type="checkbox"/> Group Project Paper 20%</li> <li><input type="checkbox"/> Group Presentation 10%</li> <li><input type="checkbox"/> Final Exam 50%</li> </ul> </li> </ol>