

Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

The sections shown on this interface are based on the templates [UG OBTL+](#) or [PG OBTL+](#)

If you are revising/duplicating an existing course and do not see the pre-filled contents you expect in the subsequent sections e.g. Course Aims, Intended Learning Outcomes etc. please refer to [Data Transformation Status](#) for more information.

Expected Implementation in Academic Year	AY2024-2025
Semester/Trimester/Others (specify approx. Start/End date)	Semester 1
Course Author * Faculty proposing/revising the course	Professor Ng Kee Woei
Course Author Email	KWNG@ntu.edu.sg
Course Title	Carbon Markets 101: Strategies for a Low-Carbon Future
Course Code	MS6007
Academic Units	2
Contact Hours	26
Research Experience Components	

Course Requisites (if applicable)

Pre-requisites	
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

“Carbon Markets 101: Strategies for a low-carbon future” aims to provide you (as a student) with a solid understanding of the fundamentals of carbon markets, as a market-based approach to cap carbon emissions, and therefore mitigate climate change. By the end of the course, you will have mastered how carbon markets function (including the different types of carbon credits and their pricing mechanism), and you will have built some precious real life skills (team work; public speaking in front of peers). Learning about the various options available to companies to reduce their carbon footprint and crafting your own opinion will be very valuable for your future career.

Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	Evaluate Current Impact of Carbon Credits by industry and/or company.
ILO 2	Critique Regulatory Frameworks of Carbon Credits by Region.
ILO 3	Assess the Origins and Current Trends of Carbon Credits.
ILO 4	Identify and appraise carbon credits projects, including economic sense, climate mitigation and co-benefits (social, biodiversity).

Course Content

Mechanism of carbon markets

Carbon pricing

Tools for climate action per industry and region (US, APAC, EU)

Reading and References (if applicable)

1. World Bank. (2022). State and Trends of Carbon Pricing 2022. Washington, DC: World Bank.
2. Mercure, J.F., Pollitt, H., Edwards, N.R., Holden, P.B., Chewpreecha, U., Salas, P., Lam, A., Knobloch, F., & Vinuales, J.E. (2021). Environmental impact assessment for climate policy with the simulation-based integrated assessment model E3ME-FTT-GENIE. *Nature Energy*, 6(9), 776-785.
3. Rackley, S.A. (2021). Carbon pricing in the United States: The insufficiency of federal policies and necessity of state action. *Energy Policy*, 157, 112563.
4. Johansson, B., Zhu, S., & Linderholm, C. (2021). China's Emissions Trading Scheme Design: Key issues and Implications. *Economics of Energy & Environmental Policy*, 10(2).
5. World Bank. (2021). Carbon Pricing in East Asia and Pacific: Coverage, Challenges and the Path Ahead. World Bank East Asia and Pacific Economic Update.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	<p>1. Towards net-zero (the Paris Agreement; UN Climate Framework; COP28 Policy Outcomes) 2. The role of carbon markets in climate action. 3. From the origins of the global carbon market to the current situation. 4. Carbon market mechanism 5. The carbon markets stakeholders 6. Course briefing</p>	2, 3	<p>EDB, GIC, Mc Kinsey & Company (2021). The development of robust and transparent carbon markets could help decarbonise the global economy. The development of robust and transparent carbon markets could help decarbonise the global economy Singapore EDB</p> <p>UNDP (2022). What are carbon markets and why are they important? https://climatepromise.undp.org/news-and-stories/what-are-carbon-markets-and-why-are-they-important</p> <p>JPMorgan Chase & Co. DiMarino, B., Wright, T. (2023). Carbon market principles. https://www.jpmorganchase.com/content/dam/jpmc/jpmorgan-chase-and-co/documents/carbon-market-principles.pdf</p>	In-person	1h of in-person lecture + 2h of discussion (Discussion in groups)
2	<p>1.The economic theory behind carbon trading. 2.Pricing carbon emissions 3.MRV, baseline standards and integrity of emissions reductions 4. compliance markets vs VCM 5.The three types of carbon credits: avoidance, reduction, removal.</p>	2,3	<p>UNEP (2021). The role of market mechanisms in bridging emissions gap. https://wedocs.unep.org/bitstream/handle/20.500.11822/36998/EGR21_CH7.pdf</p> <p>VCMI (Voluntary Carbon Markets Integrity Initiative). (2023). Claims Code of Practice. https://vcmintegrity.org/wp-content/uploads/2023/06/VCMI-Claims-Code-of-Practice.pdf</p> <p>Cambridge Elements, Betz, R., Michaelowa, A., Castro, P. (2022). Chapter 4 of The Carbon Market Challenge. The Carbon Market Challenge (cambridge.org) DOI: https://doi.org/10.1017/9781009216500</p>	In-person	1h of in-person lecture + 2h of discussion (Discussing the concepts. Shaping and expressing one's own opinion.)

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
3	<p>1.The role and mechanism of Emissions trading systems (EU ETS, RGGI)</p> <p>2.Discussion on the opportunities and challenges that offer carbon markets.</p>	1, 2	<p>European Parliament (2023). Review of the EU ETS. https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/698890/EPRS_BRI%282022%29698890_EN.pdf</p> <p>Berkeley College of Natural Resources. California-China Climate Institute (2021). China launches world's largest carbon market. https://ccci.berkeley.edu/news/2021/07/china-launches-world-s-largest-carbon-market</p> <p>European Commission (2023). EU ETS Handbook. https://climate.ec.europa.eu/system/files/2017-03/ets_handbook_en.pdf</p> <p>Kleinman Center for Energy Policy. Sun, A. (2022). East meets West. Linking the China and EU ETS's. https://kleinmanenergy.upenn.edu/wp-content/uploads/2022/06/KCEP-Digest46-East-Meets-West.pdf</p>	In-person	1h of in-person lecture + 2h of discussion (Class discussion and debate)

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
4	<p>1. Case studies: assessment of published projects from several industries (Energy, Forestry, Cook stove, Oceans, Carbon capture and storage, Waste) and various registries (e.g., Verra), through the lens of several frameworks such as the CCP (Core Carbon Principles) and the student's own judgement. Criteria include additionality, quantification of emissions benefits compared to baseline, no double-counting, co-benefits.</p> <p>2. Corporate case studies from several industries (Oil&Gas; Maritime; Steel)</p> <p>3. Critical reading of corporate communication</p>	1,4	<p>The integrity council for the voluntary carbon market (2024). The Core Carbon Principles assessment framework. https://icvcm.org/assessment-framework/</p> <p>Carbon credits.com (2023). Is REDD+ dead? A deep dive into the flaws and recommendations for REDD+ Project methodologies. https://carboncredits.com/study-reveals-redd-plus-project-methodologies-are-flawed/</p> <p>Verified Carbon Standard. (2022). Verification Report "Improved cook stove market development in rural Nepal". Version 4.1 https://www.ecosoul.io/wp-content/uploads/2023/05/FVR_VKU.VER_07.22_VCS_2357-1.pdf</p> <p>Verra. (2023). Verra Review Findings Report Kasigau Corridor REDD Project. https://verra.org/wp-content/uploads/2024/02/verra-review-findings-report-612-562.pdf</p> <p>Transition credits for the coal industry. https://www.climateimpactx.com/cix-perspectives/bringing-to-life-a-robust-transition-credits-ecosystem</p>	In-person	1h of in-person lecture + 2h of discussion (Class discussion around case studies)

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
5	1. Carbon project analysis. (Waste, water, transport, energy) 2. Blue carbon 3. Is the market fair? Critical thinking on host countries' benefits	1,4	UNEP (2023). Chapter 1,2,3,6,7 of Climate risks in the oil and gas sector. Oil-and-Gas-Sector-Risks.pdf (unepfi.org)	In-person	1h of in-person lecture + 2h of discussion (Team work Opportunity to discuss the challenges faced while preparing the exams.)
6	Continuous Assessment 1 - Mid-term assessment: Critical analysis of published articles. Correct answers shared. Lecture on industry challenges	1,2,4	N/A	In-person	1h of assessment + 1h of lecture + 1h of class discussion (CA1 Mid-term quiz)
7	1. Challenges and opportunities per industry 2. Corporates pathways to net zero 3. Plastic credits, biodiversity credits, carbon credits	1,3	ArcelorMittal (2024). Climate Action Report. https://corporate.arcelormittal.com/sustainability/climate-action-reports	In-person	1h of in-person lecture + 2h of discussion (Team work. Opportunity to discuss the challenges faced while preparing the end-term assessments.)

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
8	<p>1.The role of technology and innovation to improve the transparency, efficiency, accuracy and accessibility of carbon markets. Blockchain with tokenisation and distributed ledger technology; financial innovation ; AI and satellite monitoring) 2. .What future for carbon markets?</p> <p>3.Carbon tax: effectiveness and challenges.</p> <p>4. Critical reading of newspaper articles. 5.How trading from banks impact the market and co-benefits (environment, social)</p>	1,2,3 ,4	<p>United Nations. Chichilnisky, G. (2023). Financial Innovations and Carbon Markets. https://www.un.org/en/chronicle/article/financial-innovations-and-carbon-markets</p> <p>European Commission (2024). Blockchain for climate action. https://digital-strategy.ec.europa.eu/en/policies/blockchain-climate-action</p> <p>McKinsey & Company, Blaufelder, C., Levy, C., Mannion, P., Pinner, D. (2021). A blueprint for scaling voluntary carbon markets to meet the climate challenge. A blueprint for scaling voluntary carbon markets to meet the climate challenge (mckinsey.com)</p> <p>KPMG Singapore (2024). How can we scale a trusted voluntary carbon market? How can we scale a trusted voluntary carbon market? (kpmg.com)</p>	In-person	1h of in-person lecture + 1h of discussion (Class discussion around case studies)

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
9	<p>Continuous Assessment 2 - End-term group verbal presentation: Each group presents its finding on its project analysis in front of the class.</p> <p>Continuous Assessment 3 - End-term individual research report: written final assessment shall be handed.</p>	1,2,3,4	N/A	In-person	3h: each group of 4-5 students has 15min to present and do Q&A. (Verbal presentation of project analysis.)

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Case studies	This will engage you in real-life scenarios and seamless learning of this course content. Reading and reacting to cutting-edge situations that are currently demanding the attention of private companies and public sector organisations, will keep you up to date with the latest carbon market developments and innovation for climate action, which will be very valuable for your future career.
Group work on published carbon credit projects	This will provide the opportunity for you to articulate the recently learned content, learn from other students, and develop skills that are highly valued by employers (such as problem solving, leadership, critical thinking, time management, capacity to state clearly one's opinion while being respectful of others' suggested solutions).

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Test/Quiz(Component Continuous Assessment 1 - Mid-term assessment)	1,2,3		30	Individual	Analytic	Extended Abstract
2	Continuous Assessment (CA): Presentation(Continuous Assessment 2 - End-term group verbal presentation)	4		40	Team	Holistic	Extended Abstract
3	Continuous Assessment (CA): Report/Case study(Continuous Assessment 3 - End-term individual research report)	1		30	Individual	Analytic	Extended Abstract

Description of Assessment Components (if applicable)

- Continuous Assessment 1 - Mid-term assessment
You will have to complete 1 close book critical analysis of one or several article(s) that will be provided during the test. This test will last 1 hour. The test will be held during one of the scheduled lecture hours.
- Continuous Assessment 2 - End-term group verbal presentation
You will have to complete a group assignment which consists of a team verbal presentation. Each team is composed of 4-5 students. Each team will have 15 minutes to present its analysis of a real life case study chosen by the team (inclusive of Q&A). The assessment will be held during one of the scheduled lecture hours.
- Continuous Assessment 3 - End-term individual research report
You will deliver an individual research report based on one industry (e.g., energy; cement, steel) of your choice. An assignment brief on the expected deliverables and structure of the written essay will be provided to students.

Formative Feedback

- Continuous Assessment 1 - Mid-term assessment
You will receive customized written feedback. The correct answers will also be shared and explained to the class during contact hours.
- Continuous Assessment 2 - End-term group verbal presentation
You will receive verbal feedback after your presentation.
- Continuous Assessment 3 - End-term individual research report
You will receive customized written feedback.

Students are encouraged to attend coordinator's consultation hours to clarify any doubts in the lecture and discuss any issues, if needed.

NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
Information Literacy	Intermediate
Critical Thinking	Basic
Systems Thinking	Intermediate

Course Policy

Policy (Academic Integrity)

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values. As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Policy (General)

You are expected to complete all assigned readings, activities, assignments, attend all classes punctually and complete all scheduled assignments by due dates. You are expected to take responsibility to follow up with assignments and course related announcements. You are expected to participate in all project critiques, class discussions and activities.

Policy (Absenteeism)

In-class activities make up a significant portion of your course grade. Absence from class without a valid reason will affect your participation grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. There will be no make-up opportunities for in-class activities.

Policy (Others, if applicable)

Last Updated Date: 16-05-2024 06:49:37

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