



Course syllabus

Climate Change

August - December 2026

Term IX

Professor

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I. General Course Information

Subject:	Climate Change		
Pre-requisite:	100 credits	Code:	12279
Precedent:	None	Semester:	2026-2
Credits:	3	Term:	IX
Weekly Hours:	3 academic hours	Course type:	Remote
Type Program(s):	Elective unit at Environmental Management Engineering	Course Coordinator:	Mayra Arauco Livia marauco@esan.edu.pe

II. Course Summary

This interdisciplinary course examines climate change as a scientific, economic, governance, and management challenge, with Latin America as its principal applied context. Students learn to interpret climate evidence, distinguish hazards from business risks, screen greenhouse-gas emissions, and evaluate how international commitments and national policies influence organizations, value chains, investment, competitiveness, and communities.

Designed primarily for international business students while retaining sufficient technical rigor for engineering students, the course uses cross-country comparison, Latin American cases, three Real Situation Analyses (RSAs), and a progressive team Capstone Project. Teams develop an evidence-based climate risk and resilience strategy for a real or well-documented SME, startup, value chain, or economic sector, integrating mitigation, adaptation, circularity, climate finance, NDC alignment, and responsible communication.

III. Course Objective

To develop students' capacity to use climate science, emissions evidence, policy frameworks, and managerial analysis to diagnose climate-related risks and opportunities and design feasible mitigation and adaptation strategies for organizations and economic sectors, particularly in Latin America.

IV. Learning Outcomes

- Explain the physical foundations of climate change and interpret climate indicators, uncertainty, and regional evidence relevant to organizational decisions.
- Identify major greenhouse gases and screen Scope 1, Scope 2, and material Scope 3 emission sources using transparent assumptions and appropriate emission factors.
- Compare climate perceptions and narratives across demographic and national contexts and assess their implications for markets, stakeholders, and organizational action.
- Interpret the Paris Agreement, NDCs, and Latin American climate-governance instruments and translate them into regulatory, financial, operational, and reputational implications.

- Assess physical and transition risks through the IPCC hazard-exposure-vulnerability framework and a business-oriented likelihood-impact matrix.
- Evaluate mitigation, adaptation, circular-economy, and climate-finance options using impact, feasibility, equity, cost, and implementation criteria.
- Design and defend an integrated, evidence-based climate strategy for an SME, startup, value chain, or sector, aligned with relevant NDC priorities and SDGs.
- Use collaborative and AI-enabled digital tools critically, document sources and assumptions, disclose AI assistance, and communicate recommendations professionally in English.

V. Methodology

The course uses problem-based, comparative, and participatory learning in a remote environment. The weekly synchronous block comprises three 45-minute academic hours, combining concise concept briefings, case discussion, data or policy labs, breakout teamwork, and feedback. Short asynchronous preparation supports the live session but does not replace the scheduled class.

Collaborative learning. International, interdisciplinary teams use Miro as a shared workspace for stakeholder maps, emissions maps, policy comparisons, risk matrices, strategy canvases, peer feedback, and Capstone integration. Roles rotate so that business, policy, data, and technical perspectives are represented.

Applied Latin American lens. Peru and other Latin American cases are compared with students' home countries. Cases emphasize SMEs, value chains, informality, inequality, biodiversity, infrastructure, finance constraints, and just-transition considerations.

Evidence and technical practice. Students work with IPCC, NASA GISTEMP, UNFCCC, Climate Watch, GHG Protocol, ECLAC, World Bank, and national sources. Calculations must state boundaries, data sources, emission factors, assumptions, uncertainty, and limitations.

Responsible digital and AI use. Generative AI may support brainstorming, coding assistance, visualization, scenario exploration, or critique when an activity permits it. Students remain responsible for reasoning and accuracy, verify claims against authoritative sources, protect confidential data, cite sources, and append a brief disclosure of tools, prompts, verification steps, and material changes. Undisclosed or unverified AI-generated work is not acceptable.

Capstone coaching. Two progressive milestones within Permanent Evaluation receive instructor and peer feedback. Capstone Deliverable 3 is not part of Permanent Evaluation: it is the Final Evaluation (30%) and consists of the integrated report and oral defense. Primary data are encouraged when feasible and ethically appropriate; otherwise, teams must build a traceable secondary-data case.

VI. Assessment

The evaluation system is continuous, comprehensive, and aligned with the learning outcomes. The final grade combines Permanent Evaluation (70%) and Final Evaluation (30%).

Permanent Evaluation follows the learning process through applied online activities, quizzes and participation, three RSAs, and Capstone Milestones 1 and 2. Team products include individual accountability through contribution records, targeted questions, reflections, or peer assessment.

Weights within Permanent Evaluation are shown below. All weights in this table sum to 100% of the Permanent Evaluation component.

PERMANENT EVALUATION (70% OF FINAL GRADE)		
Assessment type	Description	Weight within PE
Applied online activities	Miro labs, cases, data exercises, policy simulations, peer feedback, and short individual reflections.	15%
Quizzes and participation	Two applied quizzes plus prepared, evidence-based participation; lowest eligible low-stakes score may be dropped.	15%
Real Situation Analyses (RSA 1-3)	Three team analyses with concise reports, visual evidence, and online presentations; individual accountability applies.	30%
Capstone Milestones 1 and 2	Milestone 1: emissions/value-chain baseline. Milestone 2: climate risk and opportunity assessment. Both include feedback and revision.	40%

The Final Evaluation is Capstone Milestone 3: the integrated report and live online presentation with Q&A during the final-evaluation week. It must incorporate feedback from Milestones 1 and 2.

Criteria:

- evidence and methodological transparency (25%);
- risk/opportunity diagnosis (20%);
- mitigation, adaptation, and circular strategy (25%);
- feasibility, finance, roadmap, and indicators (15%);
- NDC/SDG alignment, equity, and trade-offs (10%); professional communication and individual Q&A (5%).

The Final Grade (FG) is calculated as follows:

$$FG = (0.70 \times PE) + (0.30 \times FE)$$

Where:

FG = Final Grade

PE = Permanent Evaluation average

FE = Final Evaluation

VII. Weekly Course Sequence

Week and exact dates	Contents	Activities / Evaluation
Week 1 17-22 August	Climate change as a Latin American management challenge	Core concepts: Course roadmap; weather vs. climate; greenhouse effect; observed change and uncertainty; why small temperature shifts matter; climate impacts on organizations and value chains. Miro / applied work: International climate-experience map; distinguish event, trend, hazard, impact, and business consequence; stakeholder discussion. Assessment: Launch RSA 1 and Capstone; form interdisciplinary teams; responsible research and AI-use briefing.
Week 2 24-29 August	Greenhouse gases, carbon cycle, and Latin American emissions	Core concepts: Natural and anthropogenic carbon cycle; CO₂, CH₄, N₂O; GWP; carbon budgets; sectoral inventories; land-use change, agriculture, energy, transport, extractives, and cities in Latin America. Miro / applied work: Country-sector emissions comparison and causal map; RSA 1 survey review, sampling plan, consent language, and analysis plan. Fieldwork: Deploy RSA 1 survey and document sample limitations.
Week 3 31 August-5 September	RSA 1: Climate perceptions, narratives, and market implications	RSA 1 deliverable: Team report and 7-minute presentation based on at least 80 valid responses across two meaningful national or demographic contexts; dashboard, disaggregation, limitations, and comparison with authoritative surveys. Data lab: NASA GISTEMP anomaly interpretation; perception-evidence gap; implications for communication, demand, trust, and organizational action. AI activity: Generate a draft interpretation or visualization, then verify units, baseline, trends, and claims against the original dataset; submit disclosure.
Week 4 7-12 September	Carbon accounting: boundaries, scopes, and decision use	Core concepts: GHG Protocol principles; organizational and operational boundaries; Scope 1, 2, and material Scope 3; activity data, emission factors, CO₂e, double counting, uncertainty, and greenwashing risks. Miro / applied work: Map emissions for a Latin American SME/value chain; classify sources and identify missing data. Assessment: Launch RSA 2; personal footprint is used only as a comparative bridge to organizational accounting.
Week 5 14-19 September	Value-chain hotspots and credible emissions evidence	Core concepts: Hotspot screening; procurement, logistics, energy, land use, and product/service life cycles; data quality hierarchy; allocation and proxy data.

Week and exact dates	Contents	Activities / Evaluation
		Lab: Build a transparent mini-inventory with activity data, emission factors, assumptions, range/uncertainty, and a short managerial interpretation. Capstone: Select organization/sector, define problem, boundaries, stakeholders, data access, and Latin American relevance.
Week 6 21-26 September	RSA 2: Carbon hotspot screening and management priorities	RSA 2 deliverable: Team report and presentation comparing individual/country context and an organizational or sector hotspot screen; include boundaries, sources, factors, calculations, uncertainty, and priority actions. Applied work: Peer audit of calculation traceability and claims; translate tonnes CO ₂ e into operational decisions without false precision. Capstone: Begin Milestone 1 emissions/value-chain baseline.
Week 7 28 September-3 October	Climate evidence, attribution, scenarios, and uncertainty	Core concepts: Detection and attribution; extremes; scenarios and pathways; model uncertainty versus decision uncertainty; regional limitations; communicating risk without exaggeration. Applied activity: Evidence-quality ladder and scenario stress test for a Latin American sector; critique misleading climate claims. Assessment: Quiz 1; Capstone Milestone 1 coaching.
Week 8 5-10 October	Capstone Milestone 1 and global climate governance	Milestone 1: Present problem definition, stakeholder/value-chain map, emissions boundary, hotspot baseline, evidence gaps, and data-improvement plan. Core concepts: UNFCCC, Paris Agreement, COP process, global stocktake, climate justice, CBDR-RC, and the role of non-state actors.
Week 9 12-17 October	NDCs and policy-to-business translation	Core concepts: NDC structure, mitigation and adaptation targets, conditionality, finance, transparency, implementation gaps, and Peru/Latin America governance. Miro / applied work: NDC-to-business pathway: commitment → instrument → sector → organizational exposure/opportunity. Assessment: Launch RSA 3; compare Peru, another Latin American country, and one additional country relevant to the team.
Week 10 19-24 October	Economics, carbon pricing, trade, and climate finance	Core concepts: Costs of inaction; externalities; carbon taxes and ETS; standards and disclosure; climate-related trade measures; green credit, blended finance, insurance, and constraints facing SMEs. Case lab:

Week and exact dates	Contents	Activities / Evaluation
		Compare a policy instrument across Latin America and another region; identify who pays, who benefits, distributional effects, and strategic responses. RSA 3 workshop: Validate policy claims against official NDC and government sources; identify implementation evidence and gaps.
Week 11 26-31 October	RSA 3: NDC ambition, implementation, and organizational implications	RSA 3 deliverable: Comparative policy brief and presentation: targets, sector coverage, adaptation, finance, implementation status, equity, and concrete implications for organizations/value chains. Latin American lens: Institutional capacity, informality, Indigenous and local knowledge, biodiversity, just transition, and policy credibility. AI activity: Use AI to propose policy implications, then trace every material claim to official documents and submit a verification log.
Week 12 2-7 November	Physical and transition climate risk	Core concepts: IPCC hazard-exposure-vulnerability framework; chronic and acute physical risk; policy, technology, market, legal, and reputational transition risks; cascading and compound risks. Regional cases: Amazon drought/fire, Andean glacier and water stress, coastal flooding/El Niño, fisheries/ocean change, agriculture, tourism, logistics, and urban services. Capstone: Build risk register, likelihood-impact matrix, evidence trail, and top-risk rationale.
Week 13 9-14 November	Capstone Milestone 2 and mitigation pathways	Milestone 2: Present physical and transition risk/opportunity matrix, top priorities, affected stakeholders, time horizons, and sensitivity to assumptions. Core concepts: Avoid-reduce-substitute; efficiency, electrification, renewables, nature-based solutions, procurement and logistics; offsets and integrity; rebound effects and trade-offs. AI simulation: Stress-test 2-3 mitigation options using explicit baseline assumptions; independently verify feasibility and avoid fabricated precision.
Week 14 16-21 November	Adaptation, resilience, circularity, and just transition	Core concepts: Adaptation pathways; resilience; diversification; ecosystem-based adaptation; insurance and early warning; circular business models; maladaptation, equity, and distributional impacts. Miro strategy lab: Rank mitigation/adaptation/circular options by impact, feasibility, cost, co-benefits, equity, ownership, timeline, and indicators. Assessment: Quiz 2; Final Capstone drafting clinic.

Week and exact dates	Contents	Activities / Evaluation
Week 15 23-28 November	Final Capstone integration clinic and course synthesis	Formative preparation (not a separate graded milestone): Teams test their strategy logic: prioritized actions, implementation roadmap, owners, resources, finance option, indicators, NDC/SDG alignment, trade-offs, and communication approach. Peer review: Board-style challenge in Miro using evidence, impact, feasibility, equity, and coherence criteria; teams document revisions for the final submission. Course synthesis: From climate evidence to accountable management decisions in Latin America. Last regular class week; Saturday 28 November is the final day of classes.
Week 16 30 November-5 December	FINAL EVALUATION WEEK - no regular classes	Final Capstone Evaluation (30%): Integrated professional report and live online presentation with Q&A. The final version must incorporate milestone feedback and include executive summary, case context, emissions/value-chain baseline, risk and opportunity assessment, mitigation/adaptation/circular strategy, finance and implementation roadmap, indicators, NDC/SDG alignment, limitations, references, and appendices. Individual accountability: Each student must demonstrate command of evidence, assumptions, methods, trade-offs, and recommendations during Q&A and submit the required contribution/AI-use disclosure.

Assessment Deliverables: Student Reference Guide

The following specifications clarify the minimum expected evidence. Page limits exclude the cover page, references, and annexes. The lecturer may provide a task-specific rubric or minor logistical adjustment in the virtual classroom without changing the learning outcome or weighting stated in this syllabus.

A. Real Situation Analyses (RSAs)

Deliverable and timing	Required contents	Format, evidence, and course role
RSA 1 - Climate perceptions, narratives, and market implications Week 3: 31 August-5 September	1. Research question and relevance. 2. Sampling and ethical/consent approach. 3. At least 80 valid responses across two meaningful national or demographic contexts. 4. Descriptive results disaggregated by relevant variables. 5. Comparison with authoritative climate-perception evidence. 6. Implications for customers, employees, trust, communication, and organizational action. 7. Limitations and references.	Team report: 4-5 pages. Annex: questionnaire, anonymized summary dataset, and dashboard. Presentation: 7 minutes + questions. Provides stakeholder and perception evidence for the Capstone context.
RSA 2 - Carbon hotspot screening	1. Purpose, subject, and system/organizational boundary. 2. Personal or country comparison as context, not as the final analysis.	Team report: 5-6 pages.

Deliverable and timing	Required contents	Format, evidence, and course role
and management priorities Week 6: 21-26 September	3. Organizational/sector Scope 1, Scope 2, and material Scope 3 source map. 4. Activity data, emission factors, calculations, units, and sources. 5. Data-quality and uncertainty discussion. 6. Hotspot interpretation and 2-3 management priorities. 7. Limitations and references.	Annex: calculation workbook and source log. Presentation: 7 minutes + questions. Builds the technical foundation for Capstone Milestone 1.
RSA 3 - NDC ambition, implementation, and business implications Week 11: 26-31 October	1. Compare Peru, another Latin American country, and one additional country relevant to the team. 2. Mitigation targets, adaptation priorities, conditionality, finance, and sector coverage. 3. Evidence of implementation progress and gaps. 4. Policy-to-business pathway: commitment, instrument, affected sector/value chain, organizational risk or opportunity. 5. Equity, institutional-capacity, and just-transition considerations. 6. Conclusions, limitations, and authoritative references.	Comparative policy brief: 6-7 pages. Annex: comparison matrix and verification log. Presentation: 8 minutes + questions. Provides the governance and NDC context for the final strategy.

B. Progressive Capstone Project - Climate Risk and Resilience Strategy

Teams of 4-5 students select a real or well-documented SME, startup, value chain, or economic sector with clear relevance to Peru or Latin America. Primary evidence is encouraged when feasible and ethically appropriate. If access is not possible, teams must construct a traceable secondary-data case and explicitly state its limitations.

Deliverable and timing	Required contents	Format, evidence, and assessment role
Milestone 1 - Case definition and emissions/value-chain baseline Week 8: 5-10 October Permanent Evaluation	1. Organization/sector profile and management problem. 2. Latin American relevance and stakeholder map. 3. Organizational, operational, and analytical boundaries. 4. Process/value-chain diagram. 5. Scope 1, Scope 2, and material Scope 3 source map or sector hotspot baseline. 6. Available data, preliminary calculation where feasible, data gaps, assumptions, and improvement plan. 7. Initial implications for decisions.	Brief: 5-7 pages. Evidence: Miro map plus calculation/data annex. Presentation: 8 minutes + questions. Receives feedback for revision in the final report.
Milestone 2 - Climate risk and opportunity assessment Week 13: 9-14 November Permanent Evaluation	1. Physical and transition risk register. 2. Hazard, exposure, and vulnerability analysis for physical risks. 3. Likelihood-impact scoring, time horizon, and evidence source. 4. Prioritization of the top 3-5 risks and relevant opportunities. 5. Affected operations, stakeholders, and value-chain links. 6. Sensitivity to assumptions, interdependencies, and limitations. 7. Strategic implications that will guide mitigation and adaptation.	Brief: 5-7 pages. Evidence: risk register and Miro heat map. Presentation: 8 minutes + questions. Receives feedback for revision in the final report.

Deliverable and timing	Required contents	Format, evidence, and assessment role
Capstone Deliverable 3 - Integrated climate strategy Week 16: 30 November-5 December FINAL EVALUATION (30%)	- Executive summary and case context. - Revised emissions/value-chain baseline. - Revised risk and opportunity assessment. - Prioritized mitigation, adaptation, and circular-economy actions. - Feasibility, costs/resources, co-benefits, trade-offs, and equity. - Climate-finance option and implementation roadmap with owners and timeline. - Indicators, targets, and monitoring approach. - Alignment with relevant NDC priorities and SDGs. - Limitations, references, appendices, and AI-use disclosure.	Integrated report: 12-15 pages. Annexes: calculations, matrices, source log, interview/survey evidence where applicable, Miro link, contribution statement, and AI disclosure. Presentation: 12 minutes + Q&A. This is the Final Evaluation; it is not part of Permanent Evaluation.

C. Common submission and evidence standards

All submissions are in English and use APA 7th edition for in-text citations and references.

Claim, data, emission factors, policy statements, and calculations must be traceable to their original source; assumptions, units, boundaries, and limitations must be explicit.

Team submissions include a concise contribution statement. The lecturer may use individual questions, reflections, or peer evidence to adjust individual grades when contributions differ materially.

Permitted AI assistance must be disclosed in an appendix identifying the tool, purpose, relevant prompts or workflow, verification steps, and material changes made by the team. Confidential or personal data must not be entered into public AI tools.

Files, annexes, dashboards, calculation sheets, and Miro links must be accessible through the virtual classroom by the stated deadline.

VIII. Bibliography and Digital Resources

Dessler, A. E. (2021). *Introduction to modern climate change (3rd ed.)*. Cambridge University Press.

Economic Commission for Latin America and the Caribbean. (2026). *The economics of climate change in Latin America and the Caribbean, 2025: Climate action to overcome development traps*. <https://www.cepal.org/en/publications/83238>

Intergovernmental Panel on Climate Change. (2023). *Climate change 2023: Synthesis report*. <https://doi.org/10.59327/IPCC/AR6-9789291691647>

United Nations Framework Convention on Climate Change. (2015). *Paris Agreement*. https://unfccc.int/sites/default/files/english_paris_agreement.pdf

World Resources Institute, & World Business Council for Sustainable Development. (2004). *The greenhouse gas protocol: A corporate accounting and reporting standard (Rev. ed.)*. <https://ghgprotocol.org/corporate-standard>

Complementary bibliography (APA 7th edition)

Intergovernmental Panel on Climate Change. (2021). *Climate change 2021: The physical science basis*. Cambridge University Press. <https://doi.org/10.1017/9781009157896>

Intergovernmental Panel on Climate Change. (2022). *Climate change 2022: Impacts, adaptation and vulnerability*. Cambridge University Press. <https://doi.org/10.1017/9781009325844>

Intergovernmental Panel on Climate Change. (2022). *Climate change 2022: Mitigation of climate change*. Cambridge University Press. <https://doi.org/10.1017/9781009157926>

Task Force on Climate-related Financial Disclosures. (2017). *Recommendations of the Task Force on Climate-related Financial Disclosures*. <https://www.fsb-tcfd.org/recommendations/>

World Bank. (n.d.). Climate Change Knowledge Portal. Retrieved August 17, 2026, from <https://climateknowledgeportal.worldbank.org/>

Digital data and policy resources

Climate Watch. (n.d.). Climate Watch. Retrieved August 17, 2026, from <https://www.climatewatchdata.org/>

National Aeronautics and Space Administration, Goddard Institute for Space Studies. (n.d.). GISS Surface Temperature Analysis (GISTEMP v4). Retrieved August 17, 2026, from <https://data.giss.nasa.gov/gistemp/>

United Nations Framework Convention on Climate Change. (n.d.). Nationally determined contributions registry. Retrieved August 17, 2026, from <https://unfccc.int/NDCREG>

Ministerio del Ambiente. (n.d.). Ministerio del Ambiente. Retrieved August 17, 2026, from <https://www.gob.pe/minam>

Additional current readings, national policy documents, datasets, and case materials will be assigned through the virtual classroom. Teams must prioritize authoritative original sources and record retrieval dates for dynamic resources.

IX. Lecturer

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