UNIVERSITAT ROVIRA i VIRGILI
Fundació URV

Lifelong Learning Master's Degree in Industrial and Social Decarbonisation Management

Program

Module 1: Introductory theoretical block

Fundamentals of Climate Change (8 Credits)		

Overview of Climate Science: Causes and Consequences
- Concept of Climate
  o Weather and Climate
  o Climatogenic Factors
  o Distribution of Climates on Earth
- Climate Variability and Change
  o Definition of Concepts
  o Climate Variability Factors
  o Climate Change Factors
- Current Climate Change
  o Anthropogenic Origin of Current Climate Change (Changes in the Composition of the Atmosphere)
  o Observed Changes
  o Expected Changes According to Shared Socioeconomic Trajectories
  o Consequences of Climate Change: Review of Expected Impacts
  o Concepts of Adaptation and Mitigation
	1C	E. Aguilar

Mitigation, adaptation and climate resilience - Climate change and global change. - The interplay between climate and biodiversity crises. - Mitigation: concepts and practice. - Adaptation: concepts and practice. - Synergies between adaptation and mitigation. - Climate resilience and climate action: concepts and practice. - Climate resilience in coastal systems. - Climate resilience and water management	1C	Carles Ibañez (EUT) online
New needs related to construction and urban planning: The last years of unlimited construction - Inhabiting extraction - The planned models - The social catalysts - The construction of the dream habitat	1C	J. Valero
Economic impact analysis of climate policies	2C	Juan Antonio Duro

International and European climate change law
Topic 1. International climate change law
- Introduction to International Law
  o The major international conferences on the environment: from the Stockholm Conference in 1972 to the Rio Conference in 1992.
  o The adoption of the United Nations Framework Convention on Climate Change: objectives, principles and mechanisms
  o The subsequent international negotiation process through the Conferences of the Parties
  o The Kyoto Protocol
  o The Paris Agreement: climate action (NDCs, mitigation, adaptation and losses and damages)
 	
Topic 2. EU climate law
- Introduction to EU Law
- European Green Pact
- European climate change law
- The 2030 Energy and Climate Framework and Objective 55 ("Fit for 55")
- Adaptation to climate change in the EU: the European Adaptation Strategy
- Information obligations regarding climate change in the EU
- The EU before the UN Framework Convention on Climate Change
- Energy and Climate Change Package 2013-2020
	2C	Susana Borràs Pentinat

Fundamentals of environmental, scientific and climate change communication (SPANISH, ONLINE)	1C	Jordi Prades

Decarbonization Concepts (8 credits)		
Definition and importance of decarbonization - What do we mean by decarbonization? - Why is decarbonization important? - The 3 scopes of the carbon footprint - Decarbonization strategies - Decarbonization challenges - How to decarbonize your company? - Examples of decarbonization by sector - Sectors difficult to decarbonize - Calculating the carbon footprint	0.25C 0.75C	Enric Aguilar Joan Manel Valles
Greenhouse gases: emissions, sources, properties - General introduction - Main greenhouse gases (GHG) - Sources of GHG emissions - Impacts of the increase in GHG - Measurement and monitoring of emissions - Solutions and reduction strategies - Practical activities and final reflection	1C	Maria Dolores Fernandez Martinez
Carbon Budget and Mitigation Goals - Definition of the Carbon Budget Concept - Climate Scenarios and Emissions Trajectories - Mitigation Goals: From Kyoto to Paris - Allocation of the Carbon Budget and Climate Justice	0.75C	Miquel Àngel Bové (from November)
Previous State of Transformation in Construction: Timeless Principles for Future Strategies in Architecture - Inhabiting Symbiosis - Recognized Models - Territorial Preexistence - Building Rooted Habitat.	1C	J. Valero
Decarbonization Economy, Green Finance and Investment - Costs and Benefits of Decarbonizing the Economy - Policies and Economic Instruments for Decarbonization - Green Finance and Sustainable Investment - Just Transition and Socioeconomic Implications	0.5C	Miquel Àngel Bové (from November)
EU political and regulatory framework for the energy transition - European strategies and legal basis for energy transition - Energy Transition and Innovation - Support Schemes and Market-Based Design in Renewable Energy Law and Policy	1C	Leonie Reins(Erasmus Rotterdam Endrius Cocciolo/Kaisa Huhta (UEF) Theodoros Iliopoulos (Hasselt) Laura Kaschny(Erasmus Rotterdam)

- Energy Justice and Social Dimension of Energy Transition		
Decarbonization policy and laws and competition - Introduction to European competition law and competition policy - Agreements and dominance: practices that may be competition law problematic seen from an energy and decarbonization context - EU Carbon Pricing and EU Competition and Industrial Policy - 4. New EU Net Zero industrial instruments: The Net Zero Industry Act and the Critical Raw Minerals Act	1C	Ignacio Herrera Anchustegui (Univ. Bergen)
European policy and regulatory framework for hydrogen and renewable gases - The EU's Hydrogen and Gas Market Policy and Legal Framework 2h (Ruven) - Regulation for cross sectoral Hydrogen Economy 1h (Jaquey) - Certification Schemes for Sustainable Hydrogen 1 (Francisca) - Public Participation in the Hydrogen Economy 1h (Lorenzo&Alba) - Hydrogen, Circular Economy and Tecnological Neutrality 1h (Álvaro) - 6. Hydrogen, Sustainable Mobility and Refuelling Stations 2h (Kelsey and Endrius)	1C	Endrius Cocciolo Ruven Fleming(Groningen) Lorenzo Squintani (Groniengen) Alba Forns (Groningen) Francisca Gallego (UEF) Jaqueline Pinto (UEF) Kelsey Pailman (Groningen)
Transitions for the decarbonization of transport	1C	Aaron Gutierrez
The social construction of the environment	0.75C	Jordi Prades

Energy transition (5 Credits)		
Transition from fossil fuels to renewables - Climate context and dependence on fossil fuels - Electrification and new energy carriers (hydrogen, e-fuels) - Decarbonization of industry and transport - Technological, economic, and regulatory challenges - Case studies and transition models	1C	Miriam Díaz de los Bernardos
Energy storage technologies	0.5C	Juan Carlos Bruno
Energy efficiency (building, industrial and transport) Energy efficiency in Industries (1 hour) - Introduction and context - Concepts of energy management and audits - Overview of energy efficiency technologies and measures - Examples of applications Energy efficiency in the transport sector (1 hour) - Introduction and current situation - Improvement in vehicle efficiencies and electrification - Renewable energy integration and fuels - Smart mobility and infrastructure integration	0.5C	Juan Carlos Bruno (industrial + transport) Arturo Ordoñez (edification)
Policy instruments for the energy transition: carbon pricing mechanisms and renewable energy incentives - Economic approach to decarbonisation: the economic problem of environmental externalities - Instruments to internalize externalities: taxes, direct controls and other measures. - Beyond externalities: decarbonisation. - Energy transition: measures and consequences. - A vision of the future: objectives and strategy.	1.5C	Maria Llop
Communication of multi-party environmental conflicts (ENGLISH-IN PERSON/ONLINE)	0.5C	Jordi Prades Fiametta Brandajis

Carbon capture, storage and use (CCSU) (6 credits)		
CO2 capture, transport and storage technologies - Introduction to CCS and its role in decarbonization (2h) - Fundamentals of CO_2 capture: processes and technical challenges (2h) - Capture technologies: solvents, membranes, adsorbents (3h) - Negative Emission Technologies: Direct Air Capture (DAC) and BECCS (3h) - Transport of CO_2 (2h) - Geological storage of CO_2 (2h) - Real cases and international experiences (2h) - Practical workshop: conceptual design of a complete CCS system (2h) - Future perspectives (2h)	2.5C	Laureano Jimenez Carlos Pozo Belen Rodriguez
Alternative fuel production - General introduction - Main types of alternative fuels o Biofuels o Hydrogen and carriers o E-fuels and synthetic fuels - Alternative fuel production routes - Applications and sectors of use - Challenges and opportunities - 6. Case studies and current projects	1.5C	Roger Miro Lola Fernández
Carbon markets and trading	1C	Juan Antonio Duro
European regulatory framework for CCS and CCU - CCS regulation - CCU regulation	0.5C	Kim Talus (UEF) Sirj-Leena Penttinen (Lapland Univ.)
Game Based Learning workshop (SPANISH-IN PERSON)	0.5C	J.Gonzalo /J. Prades

Integrated decarbonization approaches (3 credits)		
Successful decarbonization case study	3C (1/1/1)	Laureano Jimenez Ricard Garcia Valls Felix Llovell

Module 2A: Specialization in industrial decarbonization

Carbon Capture, Storage and Use (CCSU) (9 Credits)		
Capture technologies (post-combustion, pre-combustion, oxyfuel) - Fundamentals of Process Engineering (4h) - Technical introduction to CCS and the capture role (2h) - Post-combustion capture: principles and practical cases (2h) - Design and operation of absorption systems with amines (DAC) and BECCS (2h) - Emerging post-combustion capture technologies (2h) - Pre-combustion capture: fundamentals and schemes (2h) - Pre-combustion capture: separation technologies (2h) - Combustion: theory, design and technical challenges (2h) - Technical comparison between capture routes (2h) - Simplified design workshop of a capture system (2h) - Companies, real cases (Javier Rubio) (4h)	3,25	Laureano Jimenez Carlos Pozo Seminar: Javier Rubio (DOW) Belen Rodriguez
Direct air capture technologies - Fundamentals of direct air capture (DAC) (2h) - DAC technologies: liquid absorption and solid adsorption (2h) - BECCS (4h) - Comparison: DAC vs. BECCS as negative emissions technologies (2h) - Real case study workshop (2h)	1.5	Laureano Jimenez Carlos Pozo Belen Rodriguez
Transport and storage of captured CO2 - Transportation by pipeline and boat (2h) - Logistics and planning of CO_2 networks (2h) - Geological storage of CO_2 (2h) - Integrated technical evaluation of a CCS chain (4h)	1.25	Laureano Jimenez Carlos Pozo Belen Rodriguez

Catalytic processes for CO2 transformations (CCU)
- Introduction to the valorization of CO_2
- Fundamentals of catalysis applied to the conversion of CO_2
- Main catalytic routes for the conversion of CO_2
  o Conversion to fuels
  o Conversion to chemical products of added value
  o Carboxylation and carbonylation reactions
	3	Roger Miro
		Lola fernández

- Emerging technologies for the conversion of CO_2 - Design and characterization of catalysts for CO_2 - Industrial CO_2 conversion processes - Case studies and current projects		

Circular Economy, Sustainable Practices (6 Credits)		
Principles of circular economy in industry - Introduction to the basic economic concepts necessary to understand the functioning of production and consumption systems. - Analysis of the traditional linear economic model: extraction, production, use and disposal. - Presentation of the fundamental principles of the circular economy and their implications for resource management and the reduction of environmental impacts. - Comparison between linear and circular models from an economic, environmental and industrial perspective. - Application of circular economy concepts to the industrial sector, with emphasis on strategies such as reuse, recycling, design for circularity and eco-efficiency. - Review of the role of public policies and regulatory and fiscal instruments in the promotion of circular models at European, national and regional levels. - Analysis of the role of public and private actors in the governance of the circular economy, with special attention to the framework of the European Green Deal and decarbonization plans. - Exploration of the spatial dimension of the circular economy: territorial dynamics, local industrial ecosystems and differential roles of regions, cities and industrial estates.	2	Josep Maria Arauzo
- Environmental impacts of supply chains: water, soil and air quality. - Sustainable territorial management models and technologies to reduce emissions and recover resources in logistics environments. - Circular economy and ecodesign in the industrial and logistics context. - Waste management and energy efficiency. - The transition to renewable energies in the industrial context. - Industrial symbiosis as a strategy for sustainability.	1	X. Martinez (4h) F. Clarens (4h)

Life cycle assessments - Fundamentals of sustainable chains: triple bottom line, competitive advantage and resilience. - Systemic thinking, system dynamics - Debate on green growth vs. post-growth. - Introduction to LCA and its use as a strategic support tool. - Methodology according to ISO 14040/44, application to decision-making and comparison with other methodologies such as carbon footprint. - Practical application of LCA: use of software (OpenLCA, SimaPro) - Modeling of products and logistics processes. - Complete case studies, interpretation of results and environmental communication (KPIs).	2	EUT Jose Daniel Cruz (4h+4h) Felipe Parada (8h)
Waste and circular economy laws	1	Aitana de la Varga Pastor

Decentralized Energy Systems (3 Credits)		
"Multi-energy systems" - Definitions and concepts: Cogeneration, trigeneration, multi-energy (1h). - Power generation technologies: engines, gas turbines and fuel cells (2h) - Bioenergy systems (2h) - Integrated energy systems: configurations (1h) - Energy and economic assessment of multi-energy systems (2h)	1	J.C. Bruno
Distributed energy resources - Introduction and base concepts about distributed generation (1h) - Types of energy sources for distributed generation (1h) - Solar PV technology (2h) - Wind technology (2h) - Electrical storage technology (1h) - Integration of distributed energy sources (1h)	1	Adriana Coca
Microgrids - Introduction and base concepts (1h) - Islanded microgrids (2h) - Hybrid microgrids (2h) - Energy community approach (1h) - Simulation and modelling approaches (2h)	1	Adriana Coca

Process optimization and electrification (6 crèdits)		
Optimization of industrial processes for energy efficiency (16h) - Introduction to process optimization – Nonlinear programming (NLP) (2h) - Linear programming (LP) (2h) - Mixed-Integer linear programming (MILP) (2n) - Mixed-integer nonlinear programming (MINLP) (2h) - Optimization with GAMS (2h) - Heat integration – Part 1 (composite curves, cascade diagram, transshipment model) (2h) - Heat integration – Part 2 (HEN design) (2h) - Case study (2h)	2	C. Pozo
Electrification of industrial processes - Introduction to electrification in the industry - Fundamentals of electrical energy systems - Electrification technologies I – Heating and heat pumps - Electrification technologies II – Electrical drives and motor systems - Electrification technologies III – Electrochemical processes - Electrification technologies IV - Power to X - Process Integration and retrofit strategies - Safety in electrical systems - Case studies	2	J. Rubio (DOW) English Face to face
"Heat recovery systems" - Heat recovery applications - Heat transfer and heat exchangers - Waste heat recovery boilers - Compression heat pumps: types and applications - Thermally driven heat pumps. types and applications - Waste heat recovery for power generation: Rankine, ORC and Kalina cycles. - Waste heat recovery for cooling production - District heating and cooling networks	2	J.C. Bruno

Integrated Approaches to Decarbonization (6 crèdits)		
Advanced case study of successful decarbonization	6 (2/2/2)	Laureano Jimenez Ricard Garcia Valls Felix Llovell

Mòdul 2B: Specialization in social decarbonization

Decarbonization of transport (6 Credits)		
- Mobilities: conceptualization, general situation, current challenges, etc. - Principles of sustainable, healthy and fair mobility - Mobility planning and relationship with planning - Specific problems and strategies for mobility management	4	Xavier Delclòs-Alió Daniel Miravet
Transport Economics - Goods: general situation, current challenges, etc. - Sustainable infrastructures: construction and management - Instruments and mechanisms for transport and infrastructure management	2	Monica Martin Alba Puig

Energy decarbonization (6 Credits)		
Energy Transition: Energy Markets and Price Policies - Foundations of Climate Change Economics - Introduction to the Problem: o Relationship between energy production, environmental sustainability, and market failures (externalities, public goods). o Basic concepts of energy supply and demand. - The Role of Energy and Environmental Policy: o Policy objectives in the face of climate change. o Commons problem and property rights. o Theoretical underpinnings of energy and environmental policy. - Economic Instruments for Decarbonization - Price and Quota Interventions: o Direct and indirect interventions. o Welfare criteria in emission regulation. - Market-Based Mechanisms: o Carbon markets and regulation. o Emissions Trading Systems (ETS), focusing on the EU ETS. o Mitigation analysis (supply and demand). - Policy Levels: o National policy options.	4	Carlos Suarez

○ International policy options and agreements. ○ Case studies of policy implementation. - Economic Opportunities and Challenges of Decarbonization - Economic and Trade Impacts: ○ Porter Hypothesis: Regulation driving innovation and competitiveness. ○ Pollutant heavens and carbon leakage.		
Energy communities - Energy, community and habitability: introduction to the concept of energy community - Spaces and collective uses - Social structures and community governance - Overview of the EU legal framework for energy communities	1,75 0,25	J. Valero E. Cocciolo

Building and urban planning for decarbonization (6 Crèdits)		
TERRITORY - Geographic support (resources) **(1c)** - Evolution of resource utilization **(1c)**	2	J. Valero
CITY - Current plans and their impact on the ecosystem	1	J. Valero
HABITAT - Construction process + The life of buildings	1	J. Valero
Construction Economics - Fundamental concepts of economics applied to the construction sector - Characteristics of real estate - Interrelation with other markets - Construction and the environment: public policies and regulatory mechanisms that encourage decarbonization in the sector	1	Josep Maria Arauzo
European planning law, energy efficiency and energy efficiency of buildings - Overview of the EU legal framework for energy efficiency - The energy efficiency first principle	0.5 0.5	Paola Jiménez Casanova Other

Social communication for decarbonization (3 Credits)		
Communication and Branding for companies and public organizations (ENGLISH-ONLINE)	1	A. Jordà / Laura Sánchez / J. Suriñach / Helena Cabré / Ignacio Sánchez (Spanish) / Jordi Suriñach
Risk communication. Facing the communication crisis (ENGLISH-IN PERSON-ONLINE)	1	A. Jorda / J. Prades Laura Sánchez / Helena Cabré / Raquel Herrera
Social media management and social marketing campaigns (ENGLISH-ONLINE)	1	A. Jorda / Helena Cabré / Raquel Herrera /Mónica Marchesi

Behavioral changes and management of common resources (3 Credits)		
Consumer responsibility	0.3	Eleni Papaoikonomou
Social marketing to encourage changes in environmental behavior	0.2	Eleni Papaoikonomou
Policy approaches to consumer behavior	0.1	Eleni Papaoikonomou
Sustainable consumer behavior and impacts on the climate	0.4	Eleni Papaoikonomou
The problem of public goods: - incentives to fund non-excludable goods - Optimal government intervention level	0.5	José Manuel Giménez Gómez
Public Resources and Decarbonization: - Cost-effectiveness of green spending - Impact of carbon pricing - Role of public investment - Equity in transition policies	1	José Manuel Giménez Gómez
Political Approaches to Sustainability - Efficiency of market-based tools - Regulation and long-term regulations	0.5	José Manuel Giménez Gómez

Integrated Approaches to Decarbonization (6 Credits)		
Advanced case study of successful decarbonization	6	Ricard Garcia Valls Felix Llovell

UNIVERSITAT ROVIRA i VIRGILI
Fundació URV

URV Foundation. Lifelong Learning Centre
Av Onze de Setembre, 112.
43203 REUS (+34) 977 779 963
samantha.gasco@fundacio.urv.cat

www.fundacio.urv.cat/formacio

Linkedin | Twitter | Facebook | Instagram