UNIVERSITÀ DEGLI STUDI DI TRIESTE

Dipartimento di Ingegneria e Architettura

MASTER DEGREE

ENGINEERING FOR THE ENERGY TRANSITION

CLASS LM-24 AND LM-30

PLAN OF STUDY

Academic Year 2024 - 2025

The Engineering for the Energy Transition Master's Degree Program has two curricula:

- Sustainable Building Design and Technology
- Sustainable Industrial Systems

The courses are classified based as follows (type of educational activity, "TAF"):
TAF A = base courses
TAF B = characterizing courses
TAF C = complementary courses
TAF D = elective courses
TAF E = final thesis
TAF F = other activities

Curriculum "Sustainable Building Design and Technology"					
1st Year – 54 credits ("CFU")					
Course	*Modules*	*Code*	*Disciplinary Area "SSD"*	*TAF*	*CFU*
Fundamentals of the Energy Sector and Renewables	Fundamentals of the Energy Sector		ING-IND/09	B/C	3
	Renewable Energy Technologies		ING-IND/09	B/C	6
Industrial Energy Management			ING-IND/08	B/C	6
Economics, Evaluations, Legislation, and Social Aspects for the Energy Transition	Environmental Economics		SECS-P/06	B/C	3
	Economic Evaluation of Projects for the Energy Transition		ICAR/22	B/C	3
	Legislation and Social Change		IUS/10	B/C	3
Fundamentals of modern Power Systems			ING-IND/33	B	9
Building HVAC Systems	HVAC System Design		ING-IND/10	B	6
	HVAC Load Calculation		ING-IND/10	B	3
Environmental Hydraulics: Pollutants, Emissions and Global Warming			ICAR/01	B/C	6
Elective Courses				D	6
2nd Year – 66 credits ("CFU")					
Course	*Modules*	*Code*	*Disciplinary Area "SSD"*	*TAF*	*CFU*
Building Envelopes and Structural Integration	Technologies for Building Skins		ICAR/10	B/C	3
	Structural Design		ICAR/09	B/C	9
Materials and Systems for the Energy Transition	Materials for the Energy Transition		ING-IND/22	C	3
	Electrical Systems for the Energy Transition		ING-IND/31	B/C	3
Photovoltaics and E-Mobility	Photovoltaic Systems		ING-IND/31	B/C	3
	E-Mobility		ING-IND/32	B/C	3
Integrated Ecosystem Design	Regenerative and Smart Building Technologies		ICAR/10	B/C	6
	Regulatory Framework and Building Energy Design		ING-IND/10	B	3
	Informative 3D Modeling for Project Design and Management		ICAR/17	B/C	3
Building Energy Simulation			ING-IND/10	B	6
Elective Courses				D	6
Other Activities				F	6
Final Thesis				E	12

Curriculum "Sustainable Industrial Systems"					
1st Year – 63 credits ("CFU")					
Course	*Modules*	*Code*	*Disciplinary Area "SSD"*	*TAF*	*CFU*
Fundamentals of the Energy Sector, Renewables and Energy Systems	Fundamentals of the Energy Sector		ING-IND/09	B/C	3
	Renewable Energy Technologies		ING-IND/09	B/C	6
	Elements of Fluidmachinery and Energy Systems		ING-IND/09	B/C	6
Industrial Energy Management			ING-IND/08	B/C	6
Economics and Evaluations for the Energy Transition	Environmental Economics		SECS-P/06	B/C	3
	Economic Evaluation of Industrial Projects		ING-IND/10	B/C	3
Fundamentals of modern Power Systems			ING-IND/33	B	9
Design and Simulation of HVAC Systems	HVAC System Design		ING-IND/10	B	6
	HVAC Load Calculation		ING-IND/10	B	3
	Introduction to Computational Fluid Dynamics		ING-IND/10	B	3
Environmental Hydraulics: Pollutants, Emissions and Global Warming			ICAR/01	B/C	6
Elective Course				D	9
2nd Year – 57 credits ("CFU")					
Course	*Modules*	*Code*	*Disciplinary Area "SSD"*	*TAF*	*CFU*
Alternative Energy Technologies 1	Electrical Energy Storage		ING-IND/31	B/C	3
	Materials for the Energy Transition		ING-IND/22	C	3
	Electrical Systems for the Energy Transition		ING-IND/31	B/C	3
Alternative Energy Technologies 2	Wind Energy and Fundamentals of Nuclear Energy		ICAR/08	B/C	3
	Wave and Tidal Power Plants		ICAR/01	B/C	3
	Hydrogen and Fuel Cells		ING-IND/08	B/C	6
Integrated Spatial and Energy Planning	Spatial Planning for Photovoltaic Systems		ICAR/20	B/C	3
	E-Mobility		ING-IND/32	B/C	3
Design for Sustainability of Products and Processes	Design for sustainability of processes		ING-IND/24	C	3
	Sustainable materials: selection and design		ING-IND/22	C	3
Models and Data for the Electricity Market	Electricity Market Modeling		ING-IND/31	B/C	3
	Data Analytics in the Electricity Market		ING-IND/33	B	3
Other Activities				F	6
Final Thesis				E	12

In the study plan, the student must register for elective courses (TAF D). All courses listed in the table below require no approval, i.e. students can add them directly through the online system "esse3". The student can propose other elective courses, but they are subject to approval. The student cannot enroll in an elective course if s/he has already given the same or equivalent exam in previous courses of study.

ELECTIVE COURSES					
Course	*Modules*	*Code*	*Disciplinary Area "SSD"*	*TAF*	*CFU*
Transport Phenomena			ING-IND/24	D	9
Computational Fluid Dynamics and Heat Transfer	Introduction to Computational Fluid Dynamics		ING-IND/10	D	3
	Computational Methods for Fluid Dynamics and Heat Transfer		ING-IND/10	D	6
Fundamentals and methods for design			ING-IND/08	D	6
Control Theory			ING-INF/04	D	9
Embedded Systems			ING-INF/01	D	6
Entrepreneurship & Business Modelling			SECS-P/08	D	9
Mathematical Optimization			MAT/09	D	6
GIS (Geographic Information Systems);			ICAR/06	D	6
Strategic and Critical Materials	Strategic and Critical Raw Materials		CHIM/07	D	3
	Substitution of Critical Materials		ING-IND/22	D	3
Maritime and near shore infrastructures			ICAR/01	D	3

EVALUATION

The level of knowledge will be evaluated by oral and/or written exams, as detailed by each instructor in the syllabus and at the beginning of the course.

FURTHER INFORMATION

1. The master degree ("Laurea magistrale") in Engineering for the Energy Transition is an interclass degree ("corso di Laurea interclasse"), i.e. it can be conferred in one of two different "degree classes" of the Italian system ("classi di laurea"): either Building Systems Engineering (LM-24), or Energy and Nuclear Engineering (LM-30). The student is required to choose the degree class before the beginning of the second year;
2. Courses marked as "TAF B/C" are "characterizing" for one class and "complementary" for the other;
3. The final thesis consists in an original and independent work in the field of building systems and/or of energy engineering. It can take the form of an extensive analysis of the scientific literature on a current relevant topic, or a design project, or a research project based on experiments, theory, or computational simulation. The work can be carried out entirely at the University of Trieste and/or in collaboration with other universities, research centers, and industries – both domestic and international.