CENTRALE NANTES

ENGINEERING PROGRAMME

2024-2025

Year 3

Professional Option

Engineering for Ecological Transition

OP IECO

PROGRAMME SUPERVISOR

Jean-Marc BEN GUIGUI

Autumn Semester

Course unit	ECTS Credits	Track	Course code	Title
UE 92	4	Core course	IECO PRTECO	Engineering for Ecological Transition 1 Ecological Transition Project 1

Spring Semester

Course unit	ECTS Credits	Track	Course code	Title
UE 102	1	Core course	IECO PRTECO	Engineering for Ecological Transition 2 Ecological Transition Project 2

Engineering for Ecological Transition 1 [IECO]

LEAD PROFESSOR(S): Jean-Marc BEN GUIGUI

Requirements

Objectives

Faced with these environmental challenges, the objective of the "Engineering for Ecological Transition" option is to train responsible engineers. They must be capable of imagining and designing new ways of consuming, producing, working and living together. Tree concepts will be studied in order to meet this objective:

Low-tech: These are objects, systems, techniques, services, know-how, practices, lifestyles and even currents of thought, which integrate technology according to three main principles: Useful / Sustainable / Accessible

The circular economy - moving from a so-called linear economy to a virtuous circular model in order to produce goods and services that drastically reduce the consumption and waste of raw materials, the production of waste and the use of non-renewable energy.

Eco-design - integrating the environment from the design stage of a good or service, and at all stages of its life cycle to reduce the harmful effects of climate change, depletion of the ozone layer, air and water pollution, toxicity and waste generation.

Course contents

Challenges and stakeholders in ecological transition: climate change, global limits, ecological thinkers, politics, environmental law, Corporate Social Responsibility, Social and Solidarity Economy.

LOW-TECH -Being able to build a resilient and sober world
Introduction to Low-tech, exploration, low-tech approach and experimentation

CIRCULAR ECONOMY - the fundamental principles: responsible purchasing, green logistics, industrial ecology, functional economy, responsible consumption, longer life cycle, recycling, regulations, business models.

ECO-DESIGN - reducing carbon footprint and life cycle considerations: environmental impact assessment, carbon footprint, tools and approaches, life cycle analysis, recycled materials, recycling processes, eco-innovation, low-tech.

Ecological Transition Mornings with expert speakers: Jean-Marc Jancovici, Matthieu Orphelin, Timothée Parrique, Jean-François Jarrige, Vincent Liegey, Yannick Roudaut, ... (Past speakers)

The teaching programme comprises lectures, company visits, speakers from industry, participatory workshops, case studies and industrial projects.

Course material

BARJAVEL, René. Ravage. Folio, Gallimard, 1972.
BIHOUIX, Philippe. L'Âge des low tech. Vers une civilisation techniquement soutenable: Vers une civilisation techniquement soutenable. Le Seuil, 2014.
BOHLER, Sébastien. Le bug humain: pourquoi notre cerveau nous pousse à détruire la planète et comment l'en empêcher. Robert Laffont, 2019.
BOURG, Dominique. Une nouvelle terre. Desclée de Brouwer, 2018.
CABANES, Valérie. Un nouveau droit pour la Terre. Pour en finir avec l'écocide. Le Seuil, 2016.

COCHET, Yves. Pétrole apocalypse. Fayard, 2005.
DIAMOND, Jared Mason. Effondrement: comment les sociétés décident de leur disparition ou de leur survie. Gallimard, 2006.
DIAMOND, Jared Mason. Collapse: how societies choose to fail or succeed. Viking Penguin, 2005.
DUMONT, René. L'utopie ou la mort. Le Seuil, 2016.
DUPUY, Jean-Pierre. Pour un catastrophisme éclairé. Quand l'impossible est certain: Quand l'impossible est certain. Le Seuil, 2009.
ELLUL, Jacques. Le bluff technologique. 1988.
FRESSOZ, Jean-Baptiste. L'apocalypse joyeuse. Une histoire du risque technologique, Points d'histoire, Points, 2020.
GEORGESCU-ROEGEN, Nicholas. La décroissance. Entropie-Écologie-Économie, Sang de la Terre, 2020.
HERVE-GRUYER Perrine et Charles : Permaculture : Guérir la Terre, nourrir les hommes » Acte Sud. Septembre 2014.
HOPKINS Rob. Manuel de Transition. De la Dépendance au pétrole à la résilience locale. Ecosociété. 2010.
JANCOVICI, Jean-Marc. Transition énergétique pour tous: ce que les politiques n'osent pas vous dire. O. Jacob, 2013.
LATOUCHE, Serge. Le pari de la décroissance. Fayard, 2006.
MEADOWS, Donella, MEADOWS, Dennis, et JORGEN, Randers. Les Limites à la croissance (dans un monde fini). L'écopoche. Rue de l'Échiquier, 2017.
MEADOWS, Dennis et RANDERS, Jorgan. The limits to growth: the 30-year update. Routledge, 2012.
PITRON, Guillaume. La guerre des métaux rares: la face cachée de la transition énergétique et numérique. Éditions Les Liens qui libèrent, 2018.
SALOMON, Thierry, MARIGNAC, Yves, JEDLICZKA, Marc, et al. Manifeste Négawatt: réussir la transition énergétique. Éditions Actes Sud, 2012.
SERVIGNE, Pablo, STEVENS, Raphaël, CHAPELLE Gauthier. Une autre fin du monde est possible. Vivre l'effondrement (et pas seulement y survivre). Le Seuil, 2018.

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	2	48 hrs	20 hrs	0 hrs	0 hrs	0 hrs

Ecological Transition Project 1 [PRTECO]

LEAD PROFESSOR(S): Jean-Marc BEN GUIGUI

Requirements

Objectives

Carry out sober projects with no impact on the environment

Course contents

Project examples:

- Organising the Ecological Transition Mornings
- Participation in the Pays de la Loire Sustainable Development Trophy panel
- Manufacture of a low-tech nursery dome - APALA
- Manufacture of a low-tech wind turbine
- Environmental analysis of low-tech solutions in a catamaran - EXPLORE
- Eco-design of a mushroom farm
- Life cycle analysis of catering packaging (Nantes Métropole)
- Carbon balance of a foundry (Lemer)
- Low-tech goods assessment tool (University of Nantes)
- Functional economy: student furniture in Nantes (Pays de la Loire Region)
- Implementation of a self-diagnostic tool on the circular economy
- Creation of educational materials on the circular economy

Course material

Assessment

Collective assessment: EVC 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	2	0 hrs	0 hrs	0 hrs	24 hrs	0 hrs

Engineering for Ecological Transition 2 [IECO]

LEAD PROFESSOR(S): Jean-Marc BEN GUIGUI

Requirements

Objectives

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Course contents

Challenges and stakeholders in ecological transition: climate change, global limits, ecological thinkers, politics, environmental law, Corporate Social Responsibility, Social and Solidarity Economy.

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Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	0.5	16 hrs	12 hrs	0 hrs	0 hrs	0 hrs

Ecological Transition Project 2 [PRTECO]

LEAD PROFESSOR(S): Jean-Marc BEN GUIGUI

Requirements

Objectives

Carry out sober projects with no impact on the environment

Course contents

Project examples:

- Organising the Ecological Transition Mornings
- Participation in the Pays de la Loire Sustainable Development Trophy panel
- Manufacture of a low-tech nursery dome - APALA
- Manufacture of a low-tech wind turbine
- Environmental analysis of low-tech solutions in a catamaran - EXPLORE
- Eco-design of a mushroom farm
- Life cycle analysis of catering packaging (Nantes Métropole)
- Carbon balance of a foundry (Lemer)
- Low-tech goods assessment tool (University of Nantes)

Course material

Assessment

Collective assessment: EVC 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	0.5	0 hrs	0 hrs	0 hrs	16 hrs	0 hrs