Unit information

Program	Mechanical Science (53001010053P0)
Course unit	Energy and Environment
Unit code	PCMEC
Unit number	3937
Credit points	4
Period	01/01/2012 -
Professor	Edgar Amaral Silveira
Prerequisites	No

Unit outline

Objective:

This unit aims to discuss contemporary issues associated with the availability of energy for society and the sustainability of technological alternatives for the conversion processes and transport of electricity and heat. The unit is structured into conceptual modules and case studies. In addition, the unit aggregates speakers on relevant sustainability topics for energy infrastructure.

Purpose:

The course aims to discuss, analyze, and understand the synergy between energy and the environment. It addresses the discussion of the energy transition to a low-carbon economy based on sustainable and regenerative concepts. The subject characterizes different sustainable energy vectors, their interaction with the environment, and the possible environmental impacts of different energy conversion routes. In addition to the theoretical basis, techniques and numerical tools are discussed, clarifying the concepts, and stimulating critical thinking about the uncertainties in attributing environmental impacts to energy systems.

Contents:

Module 1 - Conventional and renewable energy sources; **Module 2** - Thermodynamics: the 2nd law, efficient use of resources, exergy; **Module 3** - Life Cycle Assessment: characterization of the environmental costs of power generation systems; **Module 4** - Energy Systems (Fossil, Biomass, Wind, Hydro, Solar); **Module 5** - Energy and Urban Metabolism; **Module 6** - Energy and mobility; **Module 7** - Technological innovation policies for the development of renewable energy technologies.

Assessment

Article manuscript and presentation (50% of the grade); Reviews - Book, article, and report from international and national agencies (30% of the grade); Class reports (20% of the grade).

Obs:

Reference:

1) BAKSHI, B. R.; GUTOWSKI, T. G.; SEKULIC, D. P. (EDS.). Thermodynamics and the Destruction of Resources. Cambridge: Cambridge University Press, 2011. **2)** DUNLAP, R. A. Sustainable Energy. 2nd. ed. Boston: Cengage Learning, 2018. **3)** DUNLAP, R. A. Renewable Energy: Volume 1: Requirements and Sources. Combined ed. California: Morgan & Claypool, 2020a. **4)** DUNLAP, R. A. Renewable Energy: Volume 2: Mechanical and Thermal Energy Storage Methods. Combined ed. California: Morgan & Claypool, 2020b. **5)** DUNLAP, R. A. Renewable Energy: Volume 3: Electrical, Magnetic, and Chemical Energy Storage Methods. Combined ed. California: Morgan & Claypool, 2020c. v. 3. **6)** IBRAHIM DINCER, M. A. R. Exergy. 2nd. ed. Ontario: Elsevier Ltd., 2013. **7)** RISTINEN, R. A.; KRAUSHAAR, J. J.; BRACK, J. T. Energy and the Environment. 4th. ed. Hoboken: John Wiley & Sons, Ltd, 2022.