UNIVERSIDADE FEDERAL DE SANTA CATARINA

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CENTRO TECNOLÓGICO (CTC)
Departamento de Engenharia Química e Engenharia de Alimentos (EQA)
Programa de Pós-Graduação em Engenharia Química (POSENQ)

PLANO DE ENSINO

TRIMESTRE 2023.3

I. IDENTIFICAÇÃO DA DISCIPLINA

Código	Nome da disciplina	Créditos	Período
ENQ410046	Materials and Sustainability	1 crédito = 15 horas	2023/3

II. PROFESSOR MINISTRANTE/RESPONSÁVEL

Rui Novais/Dachamir Hotza

III. TUTOR

N/A

IV.CURSO E PÚBLICO-ALVO

Mestrado/Doutorado em Engenharia Química,
Extensivo a Mestrado/Doutorado em Engenharia de Alimentos, e Ciência e Engenharia de Materiais

V. EMENTA

1. Introduction to sustainability:

Definition of sustainable development and its fundamental pillars.Tools to support the definition of sustainable actions in the exploration, use and recycling of resources. Application in the development of new products. Embodied energy and consumption upon using and recycling.

2. Energy:

Generation, accumulation and consumption. Challenges of future growing demands and expected impacts. Sustainability of new (green) forms of energy generation and interconnection with availability of materials. Case studies.

3. Materials:

Available resources and prospects for future growing demand. Definition of critical materials and supply chain risks. Implications for the development of new technologies (e.g. power generation). Circular economy in the use of materials: design of products, improvement of properties / durability and end of life options. Case studies.

4. Eco-selection of materials / products. Introduction to Life Cycle Analysis. Case studies.

5. Wastes recycling: case studies.

VI. OBJETIVOS

With the approval in this course the student should be able to:

- Understand the principles underlying sustainable development, and their interdependence on the availability / use of resources (materials and energy);

- Understand the actual energy generation array and its environmental impact, the relationship with available resources and novel (green) production and storage technologies to support the future growing consumption demands;

- Understanding the risks in the supply of critical materials and predict forms of mitigation, with emphasis on novel recycling alternatives;

- Elaborate reasoning critical analysis on the sustainable character of novel products/technologies, identifying the bottlenecks and key stakeholders in each case;

- Understand the principles of life cycle analysis and its importance in the selection/definition of eco-materials and sustainable processes.

VII. CONTEÚDO PROGRAMÁTICO

Materials, Energy and Sustainability:

Definition of sustainable development and its fundamental pillars. Tools to support the definition of sustainable actions in the exploration, use and recycling of resources. Application in the development of new products. Embodied energy and consumption upon using and recycling. Generation, accumulation and consumption. Challenges of future growing demands and expected impacts. Sustainability of new (green) forms of energy generation and interconnection with availability of materials. Case studies. Available resources and prospects for future growing demand. Definition of critical materials and supply chain risks. Implications for the development of new technologies (e.g. power generation). Circular economy in the use of materials: design of products, improvement of properties / durability and end of life options. Eco-selection of materials / products.

VIII. METODOLOGIA DE ENSINO / FORMA DE TRABALHO

The syllabus is defined to ensure that students at the end of UC achieve the defined objectives, that is, understand how to manage resources, considering energy and materials, seeking to contribute to the new paradigms of circular economy, in the selection, development and use of resources.

IX. METODOLOGIA DE AVALIAÇÃO

The evaluation involves 1 written exam (100%) guaranteeing the coherence between the vectors of teaching methodologies - assessment and - learning objectives of this curricular unit.

X. CRONOGRAMA (5 aulas de 3 horas cada)

1. Sustainability: concepts, importance and impact. Materials: available resources and prospects for future growing demand. Definition of critical materials and supply chain risks. Implications for the development of new technologies.
2. Critical raw materials in Technologies and Sectors.
3. Energy and Sustainability: generation source and consumption, future growing demands and expected impacts.
4. Circular economy in the use of materials: design of products, improvement of properties / durability and end of life options. Introduction Eco-selection of materials / products.
5. Wastes recycling: case studies.

XI. BIBLIOGRAFIA

- - M.F. Ashby, D.F. Ballas, J.S. Coral, Materials and sustainable development, Elsevier, 2015
- - H.F. Lund, McGraw-Hill recycling handbook, McGraw-Hill, 2001
- - L. Smith, J. Means, E. Barth, Recycling and reuse of industrial wastes, Battelle Press, 1995
- - B. Bilitewsski, G. Hardtle, K. Marek, A. Weissbach, H. Boeddicker, Waste management, Springer, 1997