

Ecologia Industrial

Codi: 42405
Crèdits: 9

Titulació	Tipus	Curs	Semestre
4313784 Estudis Interdisciplinaris en Sostenibilitat Ambiental, Econòmica i Social	OT	0	1

Professor/a de contacte

Nom: Gara Villalba Mendez

Correu electrònic: Gara.Villalba@uab.cat

Equip docent

Martí Rufí Salís

Susana Toboso Chavero

Utilització d'idiomes a l'assignatura

Llengua vehicular majoritària: anglès (eng)

Prerequisits

NO REQUIREMENTS

Objectius

This course is an introduction to the field of Industrial Ecology (IE) as a multidisciplinary effort to evaluate anthropogenic systems, minimizing their negative effect on our planet. The students are taught the methods, tools, and strategies within IE, aimed to recreate our industrial system in such a way that it can be sustainable and in harmony with the rest of the natural ecosystem.

Competències

- Analitzar, sintetitzar, organitzar i planificar projectes relacionats amb la millora ambiental de productes, processos i serveis.
- Aplicar la metodologia de recerca, les tècniques i els recursos específics per a investigar i produir resultats innovadors en l'àmbit dels estudis ambientals.
- Que els estudiants sàpiguen aplicar els coneixements adquirits i la seva capacitat de resolució de problemes en entorns nous o poc coneguts dins de contextos més amplis (o multidisciplinaris) relacionats amb la seva àrea d'estudi.
- Tenir coneixements que aportin la base o l'oportunitat de ser originals en el desenvolupament o l'aplicació d'idees, sovint en un context de recerca.
- Treballar en un context internacional i multidisciplinari.

Resultats d'aprenentatge

1. Analitzar els resultats de recerca per obtenir nous productes o processos i valorar-ne la viabilitat industrial i comercial per a transferir-los a la societat.
2. Aplicar els coneixements de les diferents eines d'ecologia industrial a sistemes independentment de l'escala.

3. Aplicar la metodologia de recerca, les tècniques i els recursos específics per a investigar i produir resultats innovadors en l'àmbit dels estudis ambientals.
4. Conèixer els principals elements de l'ecologia industrial: teoria de sistemes, termodinàmica, anàlisi de flux de materials i consum de recursos.
5. Conèixer els sistemes urbans i els seus indicadors per avaluar-los.
6. Conèixer les eines d'ecoinnovació aplicables a entorns urbans.
7. Interpretar i desenvolupar anàlisis de cicle de vida per a productes i processos.
8. Ser capaç d'aplicar els conceptes de la classe, avaluar i prendre decisions basades en els resultats.
9. Treballar en un context internacional i multidisciplinari.

Continguts

This course is an introduction to the field of Industrial Ecology (IE) as a multidisciplinary effort to evaluate anthropogenic systems, minimizing their negative effect on our planet. The students are taught the methods, tools, and strategies within IE, aimed to recreate our industrial system in such a way that it can be sustainable and in harmony with the rest of the natural ecosystem. To achieve this general goal, the module contains the following objectives:

- Understand the concepts of IE, its framework as a multidisciplinary area of research based on system theory; resources: environmental goods and services, externalities.
- Understand Material Flow Analysis (MFA), and be able to apply this tool to different systems, such as a product, process, or region.
- Understand Life Cycle Analysis (LCA) and how to implement methodology: goal and scope definition, inventory analysis, impact assessment and interpretation, to different real-life cases, such as products or services. Learn how to evaluate and interpret the results, assumptions and uncertainties in case studies
- Understand the concepts of urban metabolism, carbon footprint, including differences in scope, results, and policy implications.
- Understand both process-based approach, MFA-LCA (or Material Flow Analysis coupled with Life-Cycle Assessment) and EIO-LCA (or Economic Input-Output coupled with Life-Cycle Assessment); apply the fundamentals of these approaches to be used for various analyses (e.g., GHG, pollution, water, land, toxics, materials use, etc).
- Learn how to use the SimaPro software and its basic functionalities and be able to calculate the environmental impacts of a system by means of it.
- Apply the SimaPro software to compare a sustainability product and a conventional good from a life cycle perspective and represent its results in a poster.
- Learn how to use the Gabi software and its basic functionalities and be able to calculate the environmental impacts of a system by means of it.

Metodologia

The key concepts of this class will be transferred through theory classes (33 hours), hands-on exercises in lab classes (21 hours), and a hefty load of autonomous and group work (120 hours).

Activitats formatives

Títol	Hores	ECTS	Resultats d'aprenentatge
Tipus: Dirigides			
Industrial Ecology- Theory Classes	12	0,48	
LCA-IOTables Theory Classes	9	0,36	

MFA - Theory Classes	12	0,48
Tipus: Supervisades		
Gabi Computer Lab	9	0,36
SimaPro Computer Lab	12	0,48
Tipus: Autònomes		
Gabi project	14,5	0,58
Input-Output tables and LCA	11,5	0,46
LCA projects - Readings, study, work in groups and preparation for presentations	24	0,96
MFA project - Readings, study, work in groups and preparation for presentations	38	1,52
SimaPro project	33	1,32
SimaPro- Readings, study, work in groups and preparation for presentations	35	1,4

Avaluació

The daily quiz will be given at the beginning of class, and will serve to count assistance and timely arrival to the class. They will only last 10 minutes. There will also be peer evaluation that will be taken into account for the presentations. The MFA project will be at the urban scale, and will be explained in detail in class.

Activitats d'avaluació

Títol	Pes	Hores	ECTS	Resultats d'aprenentatge
Individual daily quiz	15%	1,5	0,06	2, 3, 4, 8, 9
Gabi- Project presentation	20%	0	0	3, 5, 6, 7, 8, 9
MFA Final Class Project	30%	11,5	0,46	1, 2, 3, 8, 9
Sima Pro project presentation	20%	2	0,08	2, 4, 7, 8
input output exercise	15%	0	0	2, 3

Bibliografia

A more comprehensive syllabus will be available at the beginning of class.

These are some articles published by the Sostenipra research group:

Farreny R, Oliver-Solà J, Montlleó M, Escribà E, Gabarrell X, Rieradevall J (2011) Transition Towards Sustainable Cities: Opportunities, Constraints and Strategies in Planning. A Neighbourhood Eco-Design Case Study in Barcelona (Spain). *Environment and Planning A* 43(5) 1118 - 1134

Oliver-Solà J, Josa A, Arena AP, Gabarrell X, Rieradevall J (2011) The GWP-Chart: An environmental tool for guiding urban planning processes. Application to concrete sidewalks. *Cities* 28(3): 245-250.

- Núñez M, Oliver-Solà J, Rieradevall J, Gabarrell X (2010) Water management in integrated service systems: accounting for water flows in urban areas. *Water Resources Management* 24(8):1573-1650.
- Oliver-Solà, J., Josa, A., Gabarrell, X., Rieradevall, J., 2009. Environmental optimization of concrete sidewalks in urban areas. *The International Journal of Life Cycle Assessment* 14(4), 302-312.
- Oliver-Solà, J., Rieradevall, J., Gabarrell, X., 2009. Environmental impacts of the infrastructure for district heating in urban neighbourhoods. *Energy Policy* 37(11): 4711-4719.
- Oliver-Solà, J., Gabarrell, X., Rieradevall, J., 2009. Environmental impacts of natural gas distribution networks within urban neighborhoods. *Applied Energy* 86(10), 1915-1924.
- Oliver-Solà, J., Núñez, M., Gabarrell, X., Boada, M., Rieradevall, J., 2007. Service Sector Metabolism: Accounting for Energy Impacts of the Montjuïc Urban Park in Barcelona. *Journal of Industrial Ecology* 11(2): 83-98.
- R. Farreny, J. Oliver-Solà, M. Montlleó, E. Escribà, X. Gabarrell, J. Rieradevall (2011) The ecodesign and planning of sustainable neighbourhoods: the Vallbona case study (Barcelona). *Informes de la Construcción* Vol. 63, EXTRA, 115-124
- Sanyé E, Oliver-Solà J, Gasol CM, Farreny R, Rieradevall J, Gabarrell X (2012) Life cycle assessment of energy flow and packaging use in food purchasing. *Journal of Cleaner Production* 25, 51-59
- Mendoza JMF, Oliver-Solà J, Gabarrell X, Rieradevall J, Josa A (2012) Planning strategies for promoting environmentally suitable pedestrian pavements in cities. *Transportation Research Part D: Transport and Environment* 17(6): 442-450.
- Farreny R, Oliver-Solà J, Escuder-Bonilla S, Roca-Martí M, Seigné E, Gabarrell X, Rieradevall J (2012) The metabolism of cultural services. Energy and water flows in museums. *Energy and buildings* 47:98-106.
- Mendoza JMF, Oliver-Solà J, Gabarrell X, Rieradevall J, Josa A (2012) Life cycle assessment of granite application in sidewalks. *The International Journal of Life Cycle Assessment*, 17(5): 580-592.
- Sanyé-Mengual E, Cerón-Palma I, Oliver-Solà J, Montero JI, Rieradevall J (2012) Environmental analysis of the logistics of agricultural products from roof top greenhouses in Mediterranean urban areas. *JSci Food Agric.*, DOI: 10.1002/jsfa.5736
- Ceron-Palma I, Oliver-Solà J, Sanyé-Mengual E, Montero JI, Rieradevall J (2012) Barriers and opportunities regarding the implementation of Rooftop Greenhouses (RTEG) in Mediterranean cities of Europe. *Journal of Urban Technology*, in press
- Ceron-Palma I, Sanyé-Mengual E, Oliver-Solà J, Montero JI, Rieradevall J. (2012) Towards a green sustainable strategy for social neighbourhoods in Latin America: Case from social housing in Merida, Yucatan, Mexico. *Habitat International* 38 (2013) 47-56
- Fundació La Caixa (2007) *Ecodiseño. Área de Medio Ambiente y Ciencia - Fundació La Caixa*, Barcelona.
- González-García S, García Lozano R, Estévez J, Pascual R, Moreira MT, Gabarrell X, Rieradevall J, Feijoo G (2012a) Environmental Assessment and Improvement Alternatives of a Ventilated Wooden Wall from LCA and DfE Perspective. *Int J LCA* 17 (4): 432-443.
- González-García S, García Lozano R, Buyo P, Pascual RC, Gabarrell X, Rieradevall J, Moreira MT, Feijoo G (2012b) Eco-innovation of a Wooden Based Modular Social Playground: Application of LCA and DfE Methodologies. *J Cleaner Production* 27: 21-31.
- González-García S, García Lozano R, Moreira MT, Gabarrell X, Rieradevall J, Feijoo G, Murphy RJ (2012c) Eco-innovation of a Wooden Childhood Furniture Set: An Example of Environmental Solutions in the Wood Sector. *Sci Total Environ* 426: 318-26.
- González-García S, Gasol CM, Lozano RG, Moreira MT, Gabarrell X, Rieradevall J, Feijoo G (2011a) Assessing the Global Warming Potential of Wooden Products from the Furniture Sector to Improve Their Eco-design. *Sci Total Environ* 410-411: 16-25.

González-García S, Silva FJ, Moreira MT, Castilla Pascual R, García Lozano R, Gabarrell X, Rieradevall J, Feijoo G (2011b) Combined Application of LCA and Eco-design for the Sustainable Production of Wood Boxes for Wine Bottles Storage. *Int J LCA* 16 (3): 224-237.

González-García S, Salinas-Mañas L, García-Lozano R, Gabarrell X, Rieradevall J, Feijoo G, Moreira MT (2013) The application of ecodesign methodology in SMEs run according to lean management: the case of a furniture publishing company. *Environ Eng Management J* (in press).

Rieradevall J, Bala A, Domenech X, Gazulla C, Milà Canals L (2005) *Ecoproducte Ecodisseny*. Vol. 4. Barcelona: Museu de les Arts Decoratives. Institut de Cultura. Departament d'Imatge i Producció Editorial, Barcelona.

Rieradevall J, Domenech X, Bala A, Gazulla C (2000) *Ecodiseño De Envases*. El Sector De La Comida Rápida. Elisava edicions, Barcelona.

Rieradevall J, Domenech X, Milà Canals L, Gazulla C, Bala A (2003) *Household Ecoproducts*. Environmental Education Guides 16: 23.