

Unit title	Code	Module title	Details	Hours number	ECTS Credits
BIOREF T1					
Sustainability in industrial systems	T1A	Material and substance flow analysis	<p>The students will be able:</p> <ul style="list-style-type: none"> -To explain the role of key substances and materials in today's societal metabolism and their potential interactions with the environment -To define material flow analysis (MFA) systems that are adequate to reflect on practical problems and potential solutions -To point out and reflect on strengths, limitations, and specific areas of application of different MFAs (including other industrial ecology tools that build on them) and to interpret the results in terms of their policy implications (e.g., judge the effectiveness of different interventions) 	40	10
	T1B	Territorial and Industrial Ecology	<ul style="list-style-type: none"> -Definition and stakes of industrial and territorial ecology -Principles of eco-restructuring of the industrial society -Principles of implementation of industrial and territorial ecology approaches : projects typology, methods, tools, human factors -Return on operating experiences (REX) of projects in Europe and the world -Land-use planning -Multi-actors projects management 	60	
BIOREF T2					
Bioeconomy	T2A	Bioeconomy : concepts, principles, economic and sustainability challenges	<p>Understand and acquire bioeconomy's vocabulary, knowledge, scientific concepts and current paradigms (from bioeconomics to bioeconomy ; bioeconomy in weak and strong sustainability)</p> <ul style="list-style-type: none"> -Grasp the benchmarks of experts' discussions and scientific debates on the sustainability evaluation of bio-based value chains, for agricultural, forest and algae biomass -Know how to identify the sustainability stakes of biomass production and valorization in a variety of geographic and economic contexts -Be able to organize and formalize the key elements of a sustainability analysis at different geographic scales (territorial, regional and global) and different system scales (biorefinery system, value chain) -Know the economic, institutional and legal framework and main economic actors of the bioeconomy agribusiness sector (production and valorization of biomass, existing and emerging markets) in Europe and the world -Know the public policies and private stakeholders' strategies of biomass production, valorization and biorefineries in Europe and other world regions 	60	12
	T2B	Group project : implementing the sustainable biorefinery : economic, environmental, territorial and legal issues	<p>Implement on a biorefinery system case study a sustainability analysis at the territorial scale, taking into consideration its links to the agricultural production upstream and market valorization downstream</p> <ul style="list-style-type: none"> -Understand and integrate in the sustainability analysis the legal, institutional and industrial risk prevention framework (by applying skills acquired in other UE of the master, BI01 and EV04) -Use and adapt the material flow analysis approach acquired in ME05 to the sustainability analysis of a biorefinery system -Use field trips to challenge sustainability benchmarks created for the sustainability analysis of the biorefinery system case study -Be able to recommend appropriate methods for environmental, social and economic impacts assessment of the biorefinery system case study -Be able to suggest technical or organizational changes to improve the sustainability of the biorefinery system case study -Know how to cooperate and organize as a team for the implementation of the sustainability analysis of the case study 	60	

BIOREF T3					
Basics un environment	T3A	Prospective and philosophy of the environment	<p>The study of the great ecological challenges and their stakes requires a global thinking of future, environment and technics as a whole ; and to consider global environmental changes through the perspective of humanities and especially philosophy</p> <ul style="list-style-type: none"> -Identifying the great material and political challenges of sustainability -Identifying the planetary and global issues of sustainability (biodiversity, climate change, etc.) and considering their tangible and intangible consequences -Analyze and debate the promises and limits of technologies to tackle those issues 	45	8
	T3B	Environmental risks : managing and controversy	<p>Analyze the drivers of social management of environmental risks</p> <ul style="list-style-type: none"> -Precaution principle, prevention and zero risk principle : to compare and contrast those principles, to analyse the arguments linked to the precaution principle and comment the related mistakes -From vigilance to crisis: to understand how a crisis builds up. To identify the common mistakes and suggest possible solutions -Participation: introduction to participatory processes, hybrid forums. To develop participatory processes. To understand the stakes, their potential and limits 	45	