

Τίτλος (ΕΛΛ.)	Τίτλος (Αγγλ.)	Υπεύθυνος Head	Διδάσκοντες Lecturers
Βιο-ενέργεια	Bio-energy	Γ. ΠΑΠΑΔΑΚΗΣ (G. Papadakis)	Γ. ΠΑΠΑΔΑΚΗΣ (G. Papadakis) Α. ΜΠΑΛΑΦΟΥΤΗΣ (A. Balafoutis) Μ. ΧΡΗΣΤΟΥ (M. Christou) Ε. ΑΛΕΞΟΠΟΥΛΟΥ (E. Alexopoulou) Α. ΚΟΥΤΙΝΑΣ (A. Koutinas) Σ. ΠΑΠΑΝΙΚΟΛΑΟΥ (S. Papanikolaou) Γ. ΜΑΡΚΟΥ (G. Markou)
Περιγραφή – Description			
<p>Bio-energy course provides an understanding to biomass, biomass to low-carbon energy systems including biopower, bioheat and biofuels, with a scientific examination of feedstocks, conversion technologies and scale up for industrial production, end products, and their applications. The course will also provide entry level understanding of the concepts of sustainability, systems thinking and Life Cycle Analysis (LCA) and incorporation of these concepts into bioenergy systems. The class will explore the potential advantages of low-carbon energy in developing a low-carbon economy and society.</p>			
Learning objectives			
<p>This course will be focused on academic achievement, acquisition of knowledge and enhancement of comprehension of information regarding biomass and bioenergy technologies and their sustainable applications. Students will practice knowledge-based critical thinking and solution offering about emerging innovative bioenergy technologies. Students completing this course will be able to:</p> <ul style="list-style-type: none"> - Identify potential biomass feedstocks, including energy crops; - Have an understanding of the existing and emerging biomass to energy technologies; - Have an understanding of LCA and applications; - Develop a critical thinking about sustainability & resilience; and - Determine potential solutions for energy needs and problems by incorporating the bioenergy technologies being explored. 			

WEEK	Lectures
1 ST	Bioenergy Concepts- Introduction – (Papadakis) - Systems thinking - Biopower, bioheat - Biofuels, advanced liquid fuels, drop-in fuels - Biobased products
2 ND	Biomass Feedstocks I- Harvested Feedstocks – (Christou/Alexopoulou) - Feedstocks for first generation biofuels - Feedstocks for second generation Biofuels - Feedstocks for third generation feedstocks
3 RD	Biomass Feedstocks II- Residue Feedstocks – (Christou/Alexopoulou) - Agricultural waste - Forestry waste - Farm waste - Organic components of residential, commercial, and industrial waste

4 TH	Biomass Conversion Technologies I- Biorefinery Concept – (Koutinas) - Understanding biorefinery concept - Biorefineries & end products
5 TH	Biomass Conversion Technologies II- Biochemical Conversion I – (Papanikolaou) - Hydrolysis, enzyme & acid hydrolysis - Fermentation
6 TH	Biomass Conversion Technologies II- Biochemical Conversion II – (Markou) - Anaerobic digestion - Trans-esterification
7 TH	Biomass Conversion Technologies III- Thermochemical Conversion I (Papadakis) - Combustion - Gasification
8 TH	Biomass Conversion Technologies III-Thermochemical Conversion II (Papadakis) - Pyrolysis - Other thermochemical conversion technologies - Scaling up emerging technologies
9 TH	Sustainability & Resilience - (Balafoutis) - Understanding sustainability - Environmental sustainability - Bioenergy & sustainability
10 TH	Bioenergy & Environment, Criteria Pollutants, Carbon Footprint - (Balafoutis) - Emissions of biomass to power generation applications - Emissions from biofuels, indirect land use change (ILUC) issues
11 TH	Life Cycle Analysis I – (Balafoutis) - General understanding of LCA - Cradle-to-grave, field to wheels concepts - Goal and scope determination, defining LCA boundaries
12 TH	Life Cycle Analysis II – (Balafoutis) - Life Cycle Inventory - Life Cycle Assessment
13 TH	Advanced low-carbon fuels from waste – (Papadakis)

Assignments – project

- Two-page papers (3)
- Project(s)

Exams, marking and student assessment

Papers 30%, Project(s) 30%, Written exam(s): 40%