Code: ENVE 553  
Course: Treatment Technologies of Agro-industrial Waste

Mandatory:  
Elective: X  
Specialization:  

Semester: F X S  
Teaching Units: 3  
ECTS: 5  

Teaching Hours per week:  
T 2  
E 1  
L 0  

Instructors: Dr. Charis M. Galanakis

Textbooks (Eudoxus):  

Other recommended books:  

Notes: They will be delivered by the Instructor in electronic form

Labs:  
# of lab exercises:  
Individual Reports  
Team Reports  
Lab final written exam  
% of Final Lab Grade

Final Grade:  
Final Exam 50 %  
Project 30 %  
Labs %  
Other (Intermediate Exam) 20 %

Course Syllabus:  
Week 1  
Introduction to agro-industrial waste, basic concepts and issues (definitions, properties, pollution load of agro-chemicals activities, gaseous, solid and liquid waste).  
Week 2  
Organization and environment (inputs, outputs, life cycle analysis, ISO Standards).  
Week 3  
Hygiene designing in food processing (requirements, HACCP principles, general designing principles,
equipment specifications, cleaning and disinfection, energy cleaning, CIP design).

**Week 4**
Food Industry, environment and recovery (waste production stages in the supply chain, functional components for recovery purposes, recovery steps, conventional technologies, emerging non-thermal technologies, comparison of conventional and emerging technologies in terms of energy efficiency and cost).

**Week 5**
The “Universal Recovery Strategy” (macroscopic pretreatment, macro- and micro-molecules separation, extraction, isolation and purification, product formation).

**Week 6**
Commercial applications of recovered components from food waste (commercialization stages, legal issues, implementation problems of innovations, scale up, marketing, real products).

**Week 7**
Separation of functional macromolecules and micromolecules using ultrafiltration and nanofiltration.

**Week 8**
Agriculture and environment (agrochemicals, insecticides, classification and mechanism of action, fungicides, herbicides and their classification, fertilizers, gaseous, solid and liquid pollutants, pesticides residues in food and health effects, the Venom Circle, farming, control and distribution of organic products).

**Week 9**
Agriculture and energy management (energy greenhouses needs, heat pumps, combined heat and power systems and electricity, use of solar energy for heating, use of geothermal energy, solid biomass and biogas to heat the greenhouse, anaerobic treatment, Biodiesel production, generation of pellets from oil-pruning and other agricultural residues).

**Weeks 10 & 11**
Waste treatment (pre-treatment, primary treatment, secondary treatment, aerobic treatment, anaerobic treatment, activated sludge treatment, tertiary treatment, composting, biochar production).

**Week 12**
Livestock & environment unit (choice of waste treatment system, septic precipitation tank, neutralization unit of gases, wetland feeding well).

**Week 13**
Management of treated wastewater (biological treatment, surface flow wetland, vegetation species in wetlands, optimal wastewater treatment, chlorination system, performance of artificial wetland, water reuse, control of environmental impacts).

**Project**
1. Bibliographic report for the recovery of valuable components from different products of food industry (e.g. from the oil mill effluent, whey, waste of wineries, etc.).