

Advanced Technologies in Hydroponics Systems

Description
The course " Advanced Technologies in Hydroponics Systems " aims to provide fundamental knowledge in managing, and controlling greenhouse hydroponics systems. The curriculum includes the analysis of basic design considerations, systems of an hydroponic system and its use for greenhouse crop production. The course introduces optimal control methods using experts and AI systems. Additionally, it provides insights into the preparation and use of nutrients solutions in hydroponics systems.
Learning objectives
Upon completion of this course, students will be able to: <ul style="list-style-type: none"> ● Recognise the main design and structural characteristics of hydroponic systems. ● Design considerations for different substrates and hydroponic system ● Recognise basic components of open and recirculating hydroponic systems ● Create nutrient solutions using salts or mixed fertilizers ● Chooses the Hardware and ICT components of an hydroponic system ● Implement Control strategies of hydroponics systems ● Calculate required ventilation, cooling, and heating for greenhouses and select appropriate systems.

WEEK	Lectures
1 ST	Hydroponic production – Basic principles (Bartzanas)
2 ND	Historical Perspectives Advantages/Disadvantages (Bartzanas/Kavga)
3 RD	Types of Hydroponics Systems (Bartzanas/Kavga)
4 TH	Design characteristics of hydroponic systems (Bartzanas/Kavga)
5 TH	Growing Substrate (Bartzanas/Kavga)
6 TH	Plant Nutrition, Nutrient Solution and System Monitoring: EC, pH (Bartzanas/Kavga)
7 TH	Preparation of nutrient solution (Bartzanas/Savvas)
8 TH	Controlled Environment Agriculture – Indoor Vertical Farming – Plant Factory (Bartzanas/Avgoustaki)
9 TH	Hydroponics Systems in vegetables (Bartzanas/Savvas)
10 TH	Aquaponics (Bartzanas/Katsoulas)
11 TH	Control and automation of hydroponic systems (Arvanitis/Loukatos)
12 TH	ICT components and AI in hydroponic systems (Arvanitis/Loukatos)

Assignments – project

1. Online tools for nutrient solutions preparation
2. Use of AI for hydroponics systems
3. Estimation of irrigation and fertilization needs of vegetables
4. Estimation of irrigation and fertilization needs of leafy crops

Exams, marking and student assessment

Project(s) 70%, Written exam(s): 30%