General Information	
Academic subject	Soilless cultivation systems **(Choice module)**
Degree course	Agricultural Sciences and Technologies
Curriculum	
ECTS credits	6
Compulsory attendance	No
Language	Italian (English will be used when required for foreign students into didactic material)

Subject teacher	Name Surname	Mail address	SSD
	Pietro Santamaria	pietro.santamaria@uniba.it	AGR/04

ECTS credits details	Area		
Basic teaching activities	Crop production		

Class schedule	
Period	Second semester
Year	Second or third year
Type of class	○ Lectures 4 ECTS (32 hours) ○ Laboratory and field classroom, working groups, study case, and transferring of stakeholders' experiences 2 ECT (28 hours) ○ E-learning using public (eg Teams).

Time management	
Hours	150
In-class study hours	60 (32 Lectures + 28 Lab & field cl.)
Out-of-class study hours	90

Academic calendar	
Class begins	2021 March 1
Class ends	2021 June 11

Syllabus	
Prerequisites/requirements	Basic knowledge of "Agronomy" and "Vegetable and floriculture crops".
Expected learning outcomes	• *Knowledge and understanding* ○ Knowledge of planning and sustainable management of soilless crops to improve the qualitative, quantitative and sanitary aspects of productions. • *Applying knowledge and understanding* ○ Ability in innovative design and management of greenhouse production through soilless cultivation systems even in urban areas. • *Making informed judgements and choices* ○ Ability to analyze the different situations of a production and market context, to plan actions and manage interventions to improve the quality and efficiency of horticultural productions, also in terms of sustainability and eco-compatibility. • *Communicating knowledge and understanding* ○ Personal skills aimed at communication, multidisciplinary group work and judgmental skills both at the technical and the human and ethical levels. • *Capacities to continue learning*

	○ The acquisition of judgment autonomy is verified by evaluation of the teaching. The results of the expected learning, in term of knowledge and ability, are listed in the Annex A of the Didactic Regulation of the Bachelor Course (expressed by the European descriptors of the study title).
Contents	Lessons (32 hours and 4 ECT) 1. Presentation of the program and teacher (2 hours and 0.25 ECT) 2. History and spread of soilless crops (1 hour and 0.125 ECT) 3. Classification of soilless crops (1 hour and 0.125 ECT) 4. Advantages and disadvantages of soilless crops (1 hour and 0.125 ECT) 5. Nutrients and elemental composition of plants (1 hour and 0.125 ECT) 6. Essential (macro and microelements) and non-essential elements (1 hour and 0.125 ECT) 7. Nutrient mobility and deficiency symptoms (1 hour and 0.125 ECT) 8. Methods to express the concentration of nutrient solutions (2 hours and 0.25 ECT) 9. Fertilizers, composition and calculation of the nutrient formulations of the nutrient solution (4 hours and 0.5 ECT) 10. Calculations for the formulation of the nutrient solution: use of a spreadsheet, preparation and verification (2 hours and 0.25 ECT) 11. Electrical conductivity, O_2, pH and temperature of the nutrient solution (2 hours and 0.25 ECT) 12. Characteristics of the water (1 hour and 0.125 ECT) 13. Chemical and physical characteristics of the main substrates used (4 hours and 0.5 ECT) 14. Cultivation methods: substrate cultivation, rockwool, sub-irrigation, ebb and flow, NFT, floating system and aeroponics (2 hours and 0.25 ECT) 15. Management of the closed cycle and efficiency of use of the nutrient solution in soilless crops (2 hours and 0.25 ECT) 16. Programming of fertigation and control systems (2 hours and 0.25 ECT) 17. Quality of soilless productsl and comparison with those obtained on soil (2 hours and 0.25 ECT) 18. Production of microgreens (1 hour and 0.125 ECT). Laboratory and field classroom, working groups, study case, and transferring of stakeholders' experiences (28 hours and 2 ECT) 1. Visit to the "La Noria" Experimental Farm (4 hours and 0.3 ECT) 2. Characteristics of fertilizers to be used in soilless crops (2 hours and 0.15 ECT) 3. Exercises for the formulation of the nutrient solution: use of a spreadsheet, preparation and verification (4 hours and 0.3 ECT) 4. Analysis of nutritional solutions: pH, electrical conductivity, dissolved oxygen, temperature, concentration of the main inorganic anions and cations (4 hours and 0.3 ECT) 5. Production of microgreens (4 hours and 0.3 ECT) 6. Recognition and rapid analysis of substrates: pH, electrical conductivity, hydrological characteristics, porosity, apparent mass (2 hours and 0.15 ECT) 7. Fertigation and planning of fertigation interventions (2 hours and 0.15 ECT) 8. Technical visits to some commercial and experimental soilless crops (6 hours and 0.45 ECT).

Course program	
Bibliography	- SANTAMARIA P., 2007. I sistemi di allevamento in vaso con subirrigazione a ciclo chiuso (a cura di). Aracne editrice, Roma. - SIGNORE A., SERIO F., SANTAMARIA P., 2016. A targeted management of the nutrient solution in a soilless tomato crop according to plant needs. Front. Plant Sci. 7:391. - DI GIOIA F., SANTAMARIA P., 2015. Microgreens. Nuovi alimenti freschi e funzionali per esplorare tutto il valore della biodiversità (a cura di). Eco-logica editore, Bari. - PARDOSSI A., GIANQUINTO PROSDOCIMI G., SANTAMARIA P., INCROCCI L., Orticoltura. Principi e pratica (a cura di). Edagricole - New Business Media, Milano, 2018.
Notes	All texts are recommended for in-depth study. To study, students will be able to use lecture notes and documents shared by the teacher via Dropbox. Example of website: www.soilless.it
Teaching methods	Lectures will be presented through PC assisted tools (Power Point). The course will also be managed with a series of electronic documents (pdf of the lesson, scientific publications for in-depth study and questions for self-assessment).
Assessment methods (indicate at least the type written, oral, other)	Oral
Evaluation criteria (Explain for each expected learning outcome what a student has to know, or is able to do, and how many levels of achievement there are.	A written exemption test is required for students enrolled in the year of the course in which teaching is carried out. The evaluation is expressed in thirtieths and the achievement of a minimum grade of 18/30 is needed. The mark of the midterm exam contributes proportionally to the ECTs to the final evaluation of the exam, but only within one academic year.
Further information	**Visiting hours:** From Monday to Friday, by appointment to be agreed by email.