

1. COURSE SYLLABUS OF Fundamentals of Precision Horticulture

Accad. year 2013/14

2. PROFESSOR	Fabrizio Mazzetto	3. ECTS CREDITS	3
OFFICE	Building K, Room 2.06A	SCIENTIFIC FIELD	Farm Machinery and Mechanisation (AGR/09)
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COURSE PAGE	http://www.unibz.it/en/sciencetechnology/people/academic/default.html		
4. COURSE HOURS	LECTURES	18	
	EXERCISES AND LABS	12	
	OTHERS	-	
5. STUDY PROGRAMME	International Master of Fruit Science	6. MAJOR IN	-
7. YEAR	2 nd	SEMESTER	1 st
8. PROGRAMME STATUS	Optional	9. COURSE LANGUAGE	English
10. DESCRIPTION	<p>The course consists of 18 hours of frontal lectures and 12 hours of practical activities to be carried out both in field and in computer lab. The formers firstly aims to introduce the student to issues related the different aspects of applications of Information Technologies (IT) in farms. In fact, horticulture farms – together with any type of enterprise involved in the fruit supply chain – are well suited to site specific data techniques and information management systems. These techniques include GIS database structure, handheld data capture devices, identifications systems for automating the monitoring of field activities, remote and proximal sensing equipment, database management at different levels in the supply chain. They can be used to optimise biological, physical and economic aspects of crop production systems along with provision of reliable audit for product security, traceability and certification tasks. Relevant emphasis will be given to some management tools that will be extremely useful in students' future professional life (automation and data-logging systems, GPS, GIS). Practical activities, therefore, have even the aim of involving the student in quick practical experiences with direct surveys, field measures and lab data treatments, thus also providing an integrated overview of all the various topics of the course.</p>		

<p>11. TEACHING FORMAT and ORGANIZATION</p>	<p>This is a lecture-lab course divided between lectures and practical activities (18 and 12 hrs, respectively, with relevant direct computer applications) to provide students with direct information process experiences on measured data previously collected in common field surveys. All activities will be managed by the teacher of the course. All PowerPoint presentations will be made available immediately after their discussion in class. The teacher will also provide supplementary educational materials during the course.</p>
<p>12. LEARNING OUTCOMES</p>	<p>By the end of the course the student will be able to:</p> <ul style="list-style-type: none"> • Evaluate the usefulness and functionality of the various technical components of an information system designed for applications in the horticulture sector; • Handle sufficient autonomy in the integrated applications of GIS and GPS for management purposes; • Knowing how to intervene with the right components on agricultural equipments in order to integrate the possibilities of automation of processes and monitoring activities with the management needs of a farm information system.
<p>13. TOPICS</p>	<p>The course will cover the following topics:</p> <ol style="list-style-type: none"> 1. IT REQUISITES FOR PRECISION HORTICULTURE (PH). The IT's frontier in the context of agro-environmental and horticulture farming systems, between the emerging needs of precision farming and information management. The new requirements of the fruit supply full chain for traceability, reporting of processes and activities, automation in field process controls, site-specific farm management. The importance of automating data-logging and farm monitoring; types of monitoring and surveys classifications (environmental, crop and operational). 2. IT COMPONENTS. Their <u>general classifications</u> in view of their use within the horticultural contexts. <u>Basic electronic devices</u>: sensors, actuators and identification systems; stand-alone and integrated applications in horticulture farming systems. <u>Positioning systems</u>: general classifications and viable solutions; short introduction to GPS, spatial, control and user segments; GPS receivers; outlines on positioning data processes; DGPS; receivers costs and selection criteria; land and farm applications; GPS and DGPS solutions for farm machinery. <u>Computing hardware solutions</u>: data-loggers, handhelds, personal computers and servers; data-transfer and communication systems, client-server architectures. <u>Computing software solutions</u>: general outlines on Farm-databases and necessity of a reference Farm-ontology; software-packages classifications and developing platforms; the need of inference engines in the automated monitoring applications; GIS outlines: mapping systems and geo-reference problems; backgrounds and layers; entities and attributes; links to databases; importing of GPS-paths from farm machinery activities. 3. PH APPLICATIONS. <u>Operational monitoring</u>: the role of moving- and stationary-user point mechanisation; the tractor as data-logger and information carrier; Computerized Farm Registers (CFR): general features and functionalities; basic structural frameworks (tractor-oriented e implement-oriented); inference engine algorithms to interpret the meaning of farm operational raw-data: from the elementary and single field-activity to the farm historical memory. <u>Crop monitoring</u>: optical and acoustic sensors for performing remote- and proximal-sensing applications; discussion of some case-studies to detect the vigour and the volume of the crop canopy; from thematic maps to prescription-maps. Outlines on <u>prescription farming</u> solutions and related VRT technologies for automating field processes.

<p>14. BASIC BIBLIOGRAPHY</p>	<ul style="list-style-type: none"> • E.C. Oerke, R. Gerhards, G. Menz (2010). <i>Precision Crop Protection - the Challenge and Use of Heterogeneity</i>. Springer, London - New York, pp.441. • M. A. Oliver Springer (2010). <i>Geostatistical Applications for Precision Agriculture</i>. Springer, London - New York, pp.331. • T.A. Brase (2006). <i>Precision agriculture</i>. Thomson Delmar Learning, pp.224. • B. Hofmann-Wellenhof, H. Lichtenegger, and J. Collins, (2001). <i>GPS Theory and Practice</i>, Springer-Verlag, Wien, pp.370. • E. D. Kaplan and C. Hegarty (Editors), (2006). <i>Understanding GPS: Principles and Application</i>. Artech House Inc, Norwood (USA). Pp. 707.
<p>15. ELIGIBILITY</p>	<p>Students regularly enrolled at the 2nd year of the International Master in Fruit Science. Students regularly enrolled at the 3rd year of the Bachelor Study Programme "Agricultural Science and Agricultural Technology".</p>
<p>16. RECOMMENDATIONS</p>	<p>It is suggested to combine this course with the other optional course "<i>Basics of Farm Information Technologies for Fruit Science</i>", which is preparatory to the introduction of fundamental aspects of information technology for PH.</p>
<p>17. STUDENT ASSESSMENT</p>	<p>Prior of giving the final exam, at the end of the course the student must to perform a computer exercise on the elaboration (using MS Excel) of raw data coming from operational or crop monitoring activities previously carried out on farms (raw data will be directly provided by the teacher). The final exam will be then divided into two parts: A) performing a test with multiple-choice questions (20 questions with 4 possible answers per question); B) a short oral interview (it will be carried out only if the A-test will have a sufficient result). The final exam score will be weighted as follows: Computer exercise = 25%; Multiple-choice test = 35%; Final Oral Exam = 40%. It will not be possible to pass the exam if the final oral exam is insufficient.</p>