



# UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Agrarie, Alimentari e Forestali		
ACADEMIC YEAR	2021/2022		
BACHELOR'S DEGREE (BSC)	VITICULTURE AND OENOLOGY		
SUBJECT	GENERAL ARBORICULTURE		
TYPE OF EDUCATIONAL ACTIVITY	B		
AMBIT	50125-Discipline della produzione vegetale		
CODE	01395		
SCIENTIFIC SECTOR(S)	AGR/03		
HEAD PROFESSOR(S)	MOTISI ANTONIO	Professore Ordinario	Univ. di PALERMO
OTHER PROFESSOR(S)			
CREDITS	6		
INDIVIDUAL STUDY (Hrs)	90		
COURSE ACTIVITY (Hrs)	60		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	2		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	<b>MOTISI ANTONIO</b> Monday 8:00 14:00 Studio Prof. Motisi presso il Dipartimento SAAF Wednesday 11:00 13:00 Sede CdL Viticoltura ed Enologia Thursday 09:00 12:00 Sede CdL Viticoltura ed Enologia		

<b>PREREQUISITES</b>	The dynamics of ecophysiological processes in relation to environmental variables and mechanisms of growth regulation of tree organs are central to this course. Knowledge requirements consist of basic courses of mathematics, physics, inorganic and organic chemistry, botany (morphology and physiology), biochemistry, agronomy and crop ecology and fundamental concepts of plant genetics.
<b>LEARNING OUTCOMES</b>	<p>Knowledge and understanding</p> <p>Acquiring the fundamentals of ecology and physiology of woody plants, with a focus on viticultural systems.</p> <p>Knowledge of woody species cultural principles with specific reference to agricultural systems. Principles of plant propagation and fundamental knowledge on rootstock/scion interactions in woody species. Fundamentals of orchard planting systems and canopy management.</p> <p>Applying knowledge and understanding</p> <p>Ability to recognize, and to autonomously organize, the information required to formulate cultural technical choices at the basis of the establishment of an orchard/vineyard (suitability of the environment, choice of cultivar to adopt, training system) with a special focus to viticultural systems</p> <p>Making judgements</p> <p>Ability to produce general criteria for the establishment of an orchard/vineyard in relation to specific production objectives. Ability to apply the acquired physiological principles to specific cultural practices.</p> <p>Communication</p> <p>Ability to express motivations and results of cultural choices taken to accomplish specific production and quality targets. Being able to support their importance and to stress the outcomes both on the production and on the environmental side.</p> <p>Learning skills</p> <p>Ability to gather relevant information on cultural systems in arboriculture and viticulture. Knowledge of reputable information sources of planting and propagation material. Ability to search and acquire fundamental environmental variables and usage of information and knowledge support systems.</p>
<b>ASSESSMENT METHODS</b>	<p>Oral exam consists of a colloquium aiming to ascertain the level of competences and knowledge acquired within the course. Grading will be done in a scale from 1/30 to 30/30; threshold grading for passing is 18/30.</p> <p>Exam questions will aim to assess: a) knowledge acquired, b) ability to elaborate on course subjects, c) ability to adequately express with a good degree of synthesis and effectiveness.</p> <p>In detail, oral assessment will be performed as follows:</p> <p>a) knowledge and comprehension acquired within the course will be assessed through specific questions on woody species morphology and organography, vegetative and reproductive growth, regulatory mechanisms and seasonal dynamics of most important physiological processes;</p> <p>b) the ability to elaborate on course subjects will be assessed within at least one of the following scopes:</p> <p>    b1) ability to express autonomous reasoning about the interactions between woody plants morphological and physiological aspects;</p> <p>    b2) overall comprehension of their role within the discipline and ability to identify cause/effect relationships between environmental and/or cultural variables and physiological response of woody species;</p> <p>    b3) elaborate a general framework integrating course contents within a real-world example, with particular reference to the analysis of woody species cultural systems in relation to the environmental, socio-economic and cultural context.</p> <p>c) evaluation of communication skills will give a minimum grading when the student is able to communicate with the specific language of the professional field but not in a fully structured expression. Maximum evaluation will be given when a full control of the field-specific language will be shown together with a distinct knowledge of the professional lexicon.</p>
<b>EDUCATIONAL OBJECTIVES</b>	This course aims to provide the fundamentals of woody species agro-ecosystems productivity, with a particular attention to the most important physiological processes occurring at plant level and their interaction with environmental variables. A specific focus will be dedicated to viticultural systems. Starting from basic knowledges on plant physiology already acquired in previous courses, the study of the regulation of physiological processes by

	environmental factors will be developed within the course at various scales from the single leaf or plant to the orchard/vineyard level, with the aim of giving a general framework for the comprehension woody perennials agricultural ecosystems. Main subject of the course are: the ecophysiological basis of productivity, both at the plant and at the system level, morphology and organography of woody species, from root systems to the above-ground part of the plant, physiology of vegetative and reproductive growth, principles of plant propagation, within canopy and between trees interactions and main growth regulation systems and assimilate partitioning in woody species. The most important implications of morphological and physiological traits of woody perennials will be analyzed within the framework of cultural systems productivity control, from propagation techniques to pruning principles and cultural systems management practices with specific attention to viticultural systems.
<b>TEACHING METHODS</b>	Classroom lectures and exercises, field trips
<b>SUGGESTED BIBLIOGRAPHY</b>	Autori Vari. 2012. Arboricoltura Generale, Patron editore, Bologna Baldini E. 1986. Arboricoltura generale. CLUEB. Larcher, W. 1993. Ecofisiologia vegetale, Edagricole, Bologna. Autori Vari, 2005. Manuale di Viticoltura, Edagricole, Bologna Materiale didattico fornito dal docente

## SYLLABUS

Hrs	Frontal teaching
3	Ecophysiological determinants of productivity: relationship between solar radiation and gas-exchange of woody perennials agricultural systems. Radiation and energy balance at leaf and orchard scale.
3	Tree canopy as a solar radiation interception system. LAI, canopy structure and solar radiation utilization. Principles of orchard design: maximizing solar radiation interception vs. agricultural constraints. Fruit tree culture in plains and in slopes. Effects of slopes aspect. Main types of planting systems.
4	Regulation of transpiration from trees. The Soil-Plant-Atmosphere continuum. Stomatal control of transpiration. Water deficit and trees response strategies.
4	Regulation of photosynthesis in the field. Stomatal and non-stomatal limitations. Environmental factors (temperature, water, nutrients), physiological factors (leaf developmental stages, feed-back effects).
3	Organography of woody species: structure and function of the tree. Epigeous and hypogeous parts. Main fruiting structures.
3	Phenology of woody species. Annual vegetative and reproductive growth cycle in deciduous and evergreen species. Bud dormiancy in deciduous species. Chilling requirements.
3	Assimilates and reserves utilization, growth and maintenance of vegetative and reproductive organs. Growth processes and curves, definition of growth rates. Main growth processes prevailing in different parts of vegetative season. Growth seasonality in roots, cambium, vegetative apex. Fruit growth.
4	Regulation of growth and effects of apical dominance and acrotony. Source-sink relationships. Limitations to growth and competition for assimilates between vegetative and reproductive organs. Cultural techniques for the regulation of competitions. Pruning and manipulation of canopy, growth regulators, nutritional deficit, water deficit. Competition between root systems and allelopaties. Growth control through the use of rootstocks.
4	Propagation of woody perennials. seed reproduction and genetic, physiological and sanitary aspects. Juvenility in woody perennials. Plants multiplication by grafting, cuttings and micropropagation: genetic, anatomical and physiological aspects; topophysis, polarity, soma-clonal variation
4	Rootstocks in arboriculture. Grafting affinity and techniques to overcome disaffinity. Impact of disaffinity on growth, yield and quality. Main usages of rootstocks and tolerance to adversities. Growth and productivity control by rootstocks
4	Biology of reproduction. Bud fertility. Flower initiation and differentiation. Biology of the flower, sterility, self-incompatibility, monoicism, dioicism. Phenology of blooming, proterandry, proterogyny, pollination and ovule fertilization. Fruit setting and dropping, parthenocarp. Alternate bearing.
3	Fruit growth, maturation and quality. Main types of fruit growth models. Fruit ripening types. Evaluation of fruit quality and post-harvest treatment and processing.
Hrs	Practice
4	Light interception and productivity. Estimation of the amount of light intercepted by orchards in relation to geometry and canopy structure.
4	Field trip. Study and recognition of plant morphological and phenological traits.
4	Field trip: methodologies of measurements of ecophysiological variables
3	Field trip: acrotony and basitony in trees. Implications for the application of pruning techniques
3	Field trip: pruning techniques in woody species. Illustration and practicing of main types of cuts