DEPARTMENT	Scienze Agrarie e Forestali
ACADEMIC YEAR	2014-2015
DEGREE STUDY PROGRAM	**MSc AGRO-INGEGNERIA**
COURSE	Biomass and energy crops
PARTITION IN MODULES	YES
SUBJECT	Tree crop ecosystems
NUMBER OF MODULES	2
SCIENTIFIC SECTOR	AGR/03
TEACHER	Riccardo Lo Bianco Researcher Università di Palermo
NUMBER OF CREDITS	6
NUMBER OF INDIVIDUAL STUDY HOURS NECESSARY TO ACHIEVE FULL LEARNING	90
NUMBER OF TEACHING HOURS	60
PREREQUISITES	None
STUDY PROGRAM YEAR	Second
LOCATION	Indicated in the Class schedule
TEACHING ORGANIZATION	Lectures, Practical exercises
ATTENDANCE	Recommended
EVALUATION METHOD	one written midterm (open/multiple choice) and one written final (open/multiple choice); each exam will cover one half of the course material. Alternatively, students may take 1 comprehensive oral exam on scheduled dates.
EVALUATION RESULT	Score ranging from 18 to 30
SEMESTER	Second semester
AGENDA OF TEACHING ACTIVITIES	According to the class schedule (to be published before classes start)
TIMETABLE OF STUDENT RECEPTION	Appointments can be required at riccardo.lobianco@unipa.it

EXPECTED LEARNING OUTCOMES

This discipline is designed to acquaint the student with the basic theory and practice needed to plan and manage tree crop plantings for wood and energy production. Emphasis is placed on the physiological mechanisms regulating tree-environment interactions in addition to the basic botanical and horticultural concepts related to tree crop cultivation for energy and biomass production.

Hours	Lectures
1	Introduction to the course. Definition of tree ecosystem and importance of tree crop farming.
8	Review and basic concepts of tree anatomy, morphology, ecology and physiology.
4	Trees and ecosystems: The water cycle.
4	Nutrient cycles with particular emphasis on nitrogen.
4	The carbon cycle.
3	Integrating water, nutrient, carbon, and light resources into tree growth and management.
1	Planning and design of tree crop plantings.
6	Choosing the right location. Pre-planting cultural practices: soil preparation; fertilization; planting operations.

1	Nursery material. Propagation methods: seeds, rooted-cuttings, grafting, micro-propagation.
4	Post-planting cultural practices: irrigation; fertilization; pruning; thinning; pest management.
2	Main and accessory species. Species-dependent planting types: mono-specific, mixed, for production of wood and energy. Planting design and density.
2	Biomass production models: SRF, MRF. The American and European models.
1	Harvest and primary processing. Harvesters; log splitters; shredders.
1	Wood characteristics related to energy production. Physical and chemical transformation processes. Heat value.
2	Definition of wood biomass. Types of wood: pellet, briquette; chip-wood. Production, storage, properties, strengths and weaknesses.
2	Pruning residues and other residues for energy production.
4	Examples of wood biomass production and utilization for energy production. The mulberry. The olive pomace.
	Exercises
10	Discussion of provided readings and articles
Suggested references	– Mercurio R. Minotta G. Arboricoltura da legno. Clueb – Accademia Nazionale di Agricoltura. Arboricoltura da legno in collina e montagna. Edagricole – Brunori A. Legno ed energia. Edagricole – Baldini E. Arboricoltura generale. Clueb – Journal articles provided in pdf format