

ACADEMIC YEAR: 2016-2017

COURSE: Plant Physiology

TYPE OF EDUCATIONAL ACTIVITY: Optional course

TEACHER: Adriano Sofo

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[Google Scholar Citation Profile](#)

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Language: Italian

ECTS: (lessons / tutorials/practice): 6	n. of hours: 32 hours of lessons 16 hours of practice	Campus: Potenza School: SAFE Program: LM Forest and Environmental Sciences	Semester: II
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EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course will cover the following topics: eco-physiological responses of plants to environmental stimuli and to abiotic stresses; plant metabolism and biochemistry; carbon cycle in plant ecosystems; transport of water and minerals in plants; function of plant secondary metabolites; biogeochemical cycles of major nutrients; studies of experimental systems and laboratory experiments.

PREREQUIREMENTS

- Inorganic and organic chemistry
- Botany

SYLLABUS

Lessons

Water and plant cell: chemical and water potential; diffusion and mass transport; osmosis; Measurement of water potential and its components.

The plant and the water: photosynthesis-transpiration compromise; structure, mechanical and stomatal control mechanisms.

Absorption of water and minerals: the water in the soil; absorption of water and salts by the roots; mycorrhizae; transport across membranes, absorption characteristics of the solutes; ascent of water in the plant: perspiration-cohesion theory.

Mineral nutrition: study methods, functions, and symptoms of deficiency of the essential elements.

Transport in the phloem: theories on the transport of assimilates, distribution and control mechanisms.

Carbon cycle: photosynthetic cycle control; structure and organization of the photosynthetic apparatus, the four major complexes of thylakoids, the oxygen evolving system, the electron transport in the chloroplast membranes, photophosphorylation; distribution of energy between the photosystems. Photosynthesis in bacteria. Carbon organization: C3, C4, CAM plants. Photorespiration.

Environmental and agronomic aspects of photosynthesis. Environmental factors affecting photosynthesis.

Nitrogen Assimilation: molecular nitrogen fixation. Free and symbiotic nitrogen-fixing microorganisms. Assimilation of nitrate and ammonium.

Assimilation of sulfates.

The development of plants: growth and development.



Plant hormones: biosynthesis, transport, effects, mechanisms of action and degradation of auxins, gibberellins, cytokinins, ethylene, abscisic acid. Other classes of hormones. Interactions between hormones.

Movements of plants: Nastic and tropisms.

Photomorphogenesis: phytochrome and cryptochrome. Physical and chemical properties, distribution in different species, cells, tissues, the phytochrome transformations. Responses induced by phytochrome. Interactions phytochrome-endogenous rhythm.

Totipotency of plant cells, and genetic modification of plants through biotechnology.

The seed and germination: events of seed germination, mobilization of the reserves. Seed dormancy. Effects of light and temperature on seed germination.

Practices

Laboratory training regarding eco-physiological plant and soil measurements.

TEACHING METHODS

32 hours of lessons 16 hours of laboratory and field practices. During practices, students will be asked to analyze specific case studies and to work in the laboratory.

EVALUATION METHODS

Groupwork + written examination at the end of the course. If the score of the writing exam is not enough (< 18/30), an oral examination is mandatory.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

Frank B Salisbury, Cleon W Ross. Fisiologia Vegetale. Zanichelli Editore

Reece, Urry, Cain, Wasserman, Minorsky, Jackson. La Forma e la Funzione nelle Piante. Pearson Editore.

Reviews and articles provided during the course.

INTERACTIONS WITH STUDENTS

- in the office at planned days/hours (usually on Tuesday, Wednesday and Thursday)

- email, skype (every time)

- mobile (every time)

EXAMINATION SESSIONS (Forecast)

Calendar online:

<https://unibas.esse3.cineca.it/Home.do>

Usually, the third Wednesday of every month (except August)

EVALUATION BOARD

Adriano Sofo

Antonio Scopa

Maria Nuzzaci

SEMINARS BY EXTERNAL EXPERTS: YES
