



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare		
ACADEMIC YEAR	2023/2024		
BACHELOR'S DEGREE (BSC)	NATURAL AND ENVIRONMENTAL SCIENCES		
INTEGRATED COURSE	BOTANY - INTEGRATED COURSE		
CODE	01690		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	BIO/03, BIO/02		
HEAD PROFESSOR(S)	TOMASELLO AGOSTINO Professore Associato Univ. di PALERMO		
OTHER PROFESSOR(S)	MANCUSO	Ricercatore a tempo	Univ. di PALERMO
	FRANCESCO PAOLO	determinato	Univ. di PALERMO
	TOMASELLO AGOSTINO	Professore Associato	Univ. di PALERMO
CREDITS	12		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	2° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	MANCUSO FRANCESCO PAOLO Tuesday 12:00 14:00 Dipartimento di Scienze della Terra e del Mare, Università degli Studi di Palermo. Viale delle Scienze Ed. 16, stanza T-3 piano interrato - 90128 Palermo Thursday 12:00 14:00 Dipartimento di Scienze della Terra e del Mare, Università degli Studi di Palermo. Viale delle Scienze Ed. 16, stanza T-3 piano interrato - 90128 Palermo TOMASELLO AGOSTINO Monday 15:00 17:00 Per gli studenti del CdS in Biotecnologie e Innovazione Tecnologica, presso le strutture del polo didattico di Trapani O della struttura "Principe di Napoli". I ricevimenti, su richiesta, possono essere svolti anche su piattaforma teams. Ulteriori o differenti incontri possono essere concordati con il docente) Wednesday 14:30 15:30 Dipartimento di Scienze della Terra e del Mare, edificio 16 viale delle Scienze, piano seminterrato		

DOCENTE: Prof. AGOSTINO TOMASELLO

PREREQUISITES	None
LEARNING OUTCOMES	Knowledge and ability to understand Acquisition of basic knowledge on Plant Morphology and Physiology e on Systematic Botany. Ability to use specific language of the basic discipline, but also of the more specialized ones. Capacity of approach the courses provided by the course of study they will employ as a knowledge base the Plant Biology. Ability to apply knowledge and understanding The student will be able to recognize and make observations on aspects cytological, histological, anatomical and physiological properties of plants; will also be able to to perform morphological classifications relative to the Systematic Botany. Autonomy of judgment The methodological knowledge and skills provided by the course will be useful for the interpretation of scientific texts and reports, with the possibility to transfer i results in professional activity (forest sectors, environmental rehabilitation, conservation of nature, etc.). Communication skills The course aims to provide the basis for a correct exposure of the concepts of the General Botany and Systematic Botany also to non-public expert in the field or with practical experience but with reduced base scientific. Learning skills The student will be able to follow related disciplines, as well as courses in-depth study and specialized seminars related to the General Botany and to the Systematic Botany. He will also be able to understand the disciplines of the study plan that will use the concepts of the Plant Biology.
ASSESSMENT METHODS	Oral exam is aimed at assessing knowledge acquired, the processing and connection skills between the topics of the two modules, as well as the possession of an adequate exposition capacity. The student will have to demonstrate the acquisition of basic knowledge on the Plant Morphology and Physiology and Systematic Botany, using the specific terminology. The final evaluation will be formulated out of thirty, based on the following criteria evaluation: a) thorough and widespread knowledge of the proposed topics, excellent ability to apply the concepts promptly and correctly, very good analytical and exhibition capacity (score 30-29, with the "praise" that will be attributed to the students who will show complete mastery of the subject); b) in-depth knowledge of the topics covered and ability to apply it to biological phenomena, good synthesis and exposure of procedures followed (score 28-26); c) good knowledge of the topics covered and ability to connection and application of the contents, discrete analysis and exhibition (score 25-22); d) basic knowledge of the main topics dealt with, limited ability to apply the concepts to the proposed and sufficient questions exposure of the procedures followed (score 21-18). There will also be an in itinere test using multiple-choice tests on the first part of the program that will be averaged with the grade obtained from the oral test on the second part
TEACHING METHODS	Frontal lessons

MODULE GENERAL BOTANY

Prof. AGOSTINO TOMASELLO

SUGGESTED BIBLIOGRAPHY

Evert R.F. & Eichhorn S.E, 2013 – Biologia delle piante di Raven. – Zanichelli, Bologna.
Dispense fornite dal docente

AMBIT	10703-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48

EDUCATIONAL OBJECTIVES OF THE MODULE

The module aims to provide basic knowledge on the concepts of Morphology and Plant Physiology and a vision of the ultrastructure, anatomy and functional aspects of Cormophytes. In detail, various related aspects will be investigated to Cytology (the plant cell, the nucleus, the cytoplasm, the plastids, the cell wall, the vacuole), the histology (tissues meristematic, parenchymal, tegumental, mechanical, conductive), the Organography (root, stem, leaf, flower and fruit) and Plant physiology (the transport of water and other substances in the plant, hormones, energy and vital processes, the role of plants in the biosphere; photosynthesis).

SYLLABUS

Hrs	Frontal teaching
2	Introduction to the General Botany. Structural organization of plants. Autotrophic ed heterotrophic. Prokaryotes and eukaryotes.
2	Cytology - The plant cell. Protoplasm. Endoplasmic reticulum
2	The nucleus. Mitosis. Golgi apparatus. Mitochondria.
2	Plastids (classification, ultrastructure and function). Chloroplasts: origin, role, structure and chemical composition. Proplastids and etioplasts. Amyloplasts. The chromoplasts.
2	Vacuoles (origin, development and function). Tonoplast. The juice vacuolar. Osmotic phenomena.
2	Cell wall (role, biogenesis and chemical composition). Central lamella. Primary wall e secondary wall. Wall modifications. Punctuation and plasmodesm.
2	Histology - Cell aggregates. Classification of tissues.
2	Meristematic tissues - apical meristems, lateral meristems (cribrovascular exchange and fellogenic).
2	Tegumental (or protective) tissues: epidermal tissue; stomata; hairy coatings.
2	Mechanical tissues (collenchive and sclerenchymal). Secretory tissues.
2	Root anatomy - Function and organization of the root system. Comparison between Monocotyledonous, Dicotyledons and Gymnosperms.
2	Root anatomy - From the apex to the primary structure. Meristematic zone (cap, meristems apical; theories on the organization of meristems). Relaxation area. Pilifera area.
2	Stem Anatomy - Changes and adaptation of the stem to the environment. Structure of the apex of the Bud. Primary structure.
2	Stem Anatomy - Primary structure zone (epidermis, cortex, collenchyme, sclerenchyma, central cylinder).
2	Stem Anatomy - Secondary structure area (cribro-vascular and fellogenic exchange). Xilema e secondary phloem.
2	Stem Anatomy - Secondary Structure Zone: Comparisons between Monocotyledons, Dicotyledons and Gimnosperme. Sapwood and duramen.
2	The leaf - Morphology and adaptations to the environment. Anatomy of the leaf (dorsoventral ed isolaterale). Lamina (epidermis, mesophyll, conductive system).
2	Water absorption (imbibition, diffusion, osmosis, plasmolysis). Movement of water from plant to the atmosphere through the stomata. Physiology of the stomata. Transpiration. Transportation of processed substances.
2	Embryo formation. Seed development, maturation and accumulation of reserves. Seed germination mechanism. Plant growth. Annual, biennial and perennial plants.
2	Growth and development of the plant. Hormonal regulation: Auxin, Gibberellic acid, Cytokinins. Ethylene and abscisic acid. Physiology of flowering: photoperiodism and vernalization.
2	Chlorophyll Photosynthesis (definition and meaning). Photosynthetic requirements: chloroplasts and pigments, absorption of light energy, excitation of atoms or molecules. Plants C3, C4 and CAM. Translocation of organic solutes.
2	Adaptations of plants to particular environments: Aquatic ecosystems

2	Seagrasses
2	Seagrasses of Mediterranean Sea. Posidonia oceanica ecosystem

MODULE SYSTEMATIC BOTANY

Prof. FRANCESCO PAOLO MANCUSO

SUGGESTED BIBLIOGRAPHY

- EVERT R.F. & EICHORN S.E. – "La biologia delle piante di Raven" – 7a Edizione Zanichelli, Bologna.
 - MAUSETH J. (2019). Botanica. Fondamenti di Biologia delle piante. 4a Edizione, Idelson-Gnocchi. ISBN: 887947698X (utilizzabile anche 3a edizione 2014 ISBN: 9788879475822)
 - JUDD S.W., CAMPBELL C.S., KELLOGG E.A., STEVENS P.F. – Botanica sistematica (un approccio filogenetico). Piccin, Padova. (solo x Tracheofite)

AMBIT	50170-Discipline biologiche
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

The systematic botany module seeks to teach students the fundamentals of plant organism diversity and evolution, from the simplest to the most complex living forms, as well as their distribution and the factors that influence it (biogeography). The module also aims to provide the practical knowledge required to identify the main plants and algae of the Italian flora, specifically the flora of Sicily. Finally, students will be introduced to issues concerning the human-plant relationship, the notion of biodiversity, issues concerning the management and conservation of plant resources, "traditional taxonomies," traditional uses of plants, and so on. The classification, identification, and nomenclature systems of the major plant systematic groups will be clarified, as will the primary morphological and structural traits, biological and ecological needs, adaptation and reproductive strategies. The structural and functional characteristics will be highlighted, beginning with prokaryotic algal forms and progressing to more specialized terrestrial plants, following an evolutionary thread from water to the emerged earth, recognizing the fundamental stages of biological evolution in the vegetable field while also allowing recognition and differentiation of different taxonomic categories. Educational tours and seminars will try to identify the major plant and algae groupings in their natural environment. The laboratory's goal is to view algae and plant samples under a microscope and become acquainted with the usage of dichotomous keys for species identification.

SYLLABUS

Hrs	Frontal teaching
2	Presentation of the module's objectives, contents, and methods of implementation. Textbooks and other instructional materials are suggested. The goals of systematic botany. Plant classification methods (artificial and natural systems). Concepts pertaining to various taxa (species, genus and higher systematic categories). Norms of nomenclature
4	The principles of cladistics. Eukaryotic origin: eukaryotic plant cell features Theories about its genesis include the endosymbiosis theory (primary, secondary and tertiary). An overview of the mitosis and meiosis processes. Plant reproduction. An explanation of mitosis and meiosis. Plants vegetative reproduction (splitting, budding, fragmentation and viviparous). The notion of generation. Cycles of ontogeny and metageny (aplonti, diplonti and haplodiplonti organisms). Sexual reproduction as well as sporogony (amphimissia, self-abasement, pseudomissia). Apomixis (parthenogenesis, diplosporia, apogametia, aposporia). Agamospermia is a spermatophyte with apomictic structures. The significance of apomixis Parthenocarp. Plants have sexuality.
4	The theory of evolution. The species (definition of taxonomic, biological and agronomic species). Natural and induced selection Idea for a gene pool. Fitness. Causes of gene pool changes. Mutations, hybridizations, and genetic recombinations processes. Species selection processes. Cline and ecotype. Concept of biological, morphological and phylogenetic species. Allopatric, sympatric and parapatric speciation.
4	Prokaryotes: generalities, biology and hints of ecology with particular reference to Cyanobacteria (blue algae). Bacteria (bacteria) and Archaea (archaea): morphology and biology Prokaryotic algae: phylum Cyanophyta, phylum Prochlorophyta.
4	Kingdom Funghi (mushrooms): General characteristics. Morphology, biology and ontogenetic cycles of the following taxa: Phylum Microsporidia, Chitridiomycetes. Zygomycetes, phylum Ascomycota (subphyla Taphrinomycotina, Saccharomycotina, Pezizomycotina). Deuteromycetes: phylum Basidiomycota, subphylum Agaricomycotina. Hymenomycetes. Gasteromycetes: subphylum Pucciniomycotina, subphylum Ustilaginomycotina. Symbiotic relationships between fungi (Lichens and mycorrhizae).
4	Algae: general characteristics, types of organizations; ecological and economic importance; and reproductive cycles of the following groups: Euglenoids, Bacillariophyceae class (Diatoms), Phylum Phaeophyta (brown algae), Phylum Rhodophyta (red algae), Phylum Chlorophyta (green algae), Class Chlorophyceae, Class Charophyceae (carophyte or streptofite).
4	Bryofite - General. Gametophyte and sporophyte morphology. Ontogenetic cycle. Systematics and main characteristics of the following phyla: Marchantiophyta (liverworts), Bryophyta (mosses) and Anthocerotophyta (antocerate).
4	Vascular Cryptogams - General. Gametophyte and sporophyte morphology. Ontogenetic cycle. Systematics and main characteristics of the following phyla: Lycophyta (Lycopodiales, Selaginellales and Isoetales). Phylum Monilophyta (ferns and horsetails).

4	Gymnosperms: general characteristics of the vegetative (root, stem, leaves) and reproductive systems. Fertilization processes. The seed. Systematics: Cycadophyta, Ginkgophyta, Coniferophyta and Gnetophyta.
6	Angiosperms - Main characteristics of the vegetative and reproductive systems. The flower and the inflorescences (typologies). Pollinative strategies (typologies). Fertilization. The seed. Carpology (types of fruit). Biological forms. Primitive and evolved characters of Angiosperms. Systematics of Dicotyledons and Monocotyledons. Main taxa of Dicotyledons: Ranunculaceae, Fagaceae, Malvaceae, Brassicaceae, Rosaceae, Fabaceae, Euphorbiaceae, Apiaceae, Solanaceae, Lamiaceae, Asteraceae and Cichoriaceae. Main taxa of Monocotyledons: Poaceae, Liliales, Orchidales.
Hrs	Practice
12	• Educational visits to the botanical garden and along the rocky coasts of the AMP of Capo Gallo - Isola delle Femmine. • Observation and recognition of samples of marine and / or terrestrial origin. • Use of dichotomous keys to identify plant flora • Prepare and store herbarium and algarium samples (work may be exhibited during the examination. Optional).