

Plant Science

College of Agricultural
Sciences and Technology

Department of Plant Science

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B.S. in Plant Science

Options:

- Crop Production Management
- Plant Health

M.S. in Plant Science

Minor in Plant Science

Plant Science

Join the leader in science, technology, and agricultural management. The Department of Plant Science offers plant science programs focused on agricultural production with emphasis on science and technology and/or business management. Students select an option in crop production management or plant health.

Courses offered by the department integrate physiology, soils and nutrition, agronomic practices, plant health management, protection against plant pests, ag marketing, and mechanization to provide students with a well-balanced background for positions in plant/soil sciences, and crop production. In addition, courses in areas such as micropropagation and plant improvement provide students with a background for further studies in plant biotechnology.

Each degree option integrates departmental curricula with the basic sciences (e.g., biology, chemistry, mathematics, physics) and management skills to build a well-balanced foundation.



Randy Vaughn-Dotta, TLT Photographer

The irrigation program is augmented by the Center for Irrigation Technology and the newly created International Center for Water Technology.

For information about laboratory units and supervised projects, contact the department office.

Career Opportunities

The courses offered within each of the disciplinary areas in the department provide the required background and experience to qualify graduates of these programs for many exciting, well-paying careers. For a list of career opportunities, contact the department office.

Mandatory Advising

It is the policy of the department that every student see his/her assigned adviser at least once during the academic year.

Faculty

The faculty members hold advanced degrees in their fields of specialization from leading agricultural institutions and universities in the United States. They are well-qualified teachers who, through extensive research and interaction with major agricultural industries, bring a wealth of basic and practical information into the classroom. A faculty academic adviser is assigned to work with each student to plan and design an individualized program of study to meet the student's educational and career objectives.

Many of the faculty members are involved in one or more of the Centers of the California Agricultural Technology Institute (Center for Irrigation Technology and the Viticulture and Enology Research Center) and the San Joaquin Experimental Range. These centers offer excellent opportunities to undergraduate and graduate students to participate in applied research projects that address and help solve problems faced by California's agricultural industry.

James J. Farrar, *Chair*
 Bruce A. Roberts,
J.G. Boswell Chair of Agronomy
 Sharon E. Benes, *Co-Graduate Coordinator*
 John T. Bushoven, *Co-Graduate Coordinator*

Athanasios Alexandrou
 Charles Boyer
 Dave Goorahoo
 Ken Heupel
 Charles F. Krauter
 Andrew B. Lawson
 Florence Cassel Sharma
 Anil Shrestha

Adjunct faculty

Carlos Crisosto
 Kent M. Daane
 Joel Mahill
 David Zoldoske

Bachelor of Science Degree Requirements

Plant Science Major

Crop Production Management Option: Recommended curriculum for students interested in a foundation of agronomic, vegetable, tree fruit/nut, or ornamental horticulture crop production combined with a foundation in agricultural business; recommended curriculum for students interested in combining foundations in agricultural equipment, crop production, and agricultural business.

Units

Major requirements 45

- PLANT 99, 100; SW 2, 100, 100L
- Choose one from MEAG 3 or 20
 - Choose two from PLTH 103, 105, 106
 - Choose 2 units from PLANT 180, 190, 194, 196, or VIT 196
- After consultation with your adviser, choose courses below that best serve your career objectives. Courses from above cannot be double-counted below. 15 units must be from no more than two prefixes. Select 21 units (minimum 15 upper-division units) from CRSC, HORT, MEAG, OH, PLTH, SW, VIT; PLANT 1, 107, 108, 134, 150.

Additional requirements 22-24*

CHEM 3A, BIOL 11, AGECE 1 (or ECON 40), DS 71 (or MATH 75)

- Select one course from CHEM 3B, CHEM 8, PHYS 2A
- Select 18 units (15 upper-division) from the following:**
 AGECE 28, 31, 100, 110, 117, 120, 130, 150, 160, 163, 164

General Education requirements..... 51

(Includes 12 upper-division units, to be taken no sooner than the term in which 60 units of coursework are completed.)

Note: Consult your departmental adviser for other G.E. courses that are recommended for the plant science major. No General Education Integration or Multicultural/International course offered by the Plant Science Department may be used to satisfy the G.E. requirements for majors in the department.

Electives 0-2

Total units 120

* This total assumes that CHEM 3A, BIOL 11, AGECE 1 (or ECON 40), and DS 71 (or MATH 75) are being used to satisfy 12 units of the G.E. requirement.

** Additional prerequisites may be required for some upper-division AGECE courses

Plant Health Option: Recommended curriculum for students interested in obtaining a Pest Control Adviser's license, or who are interested in plant biotechnology or in pursuing a post-graduate degree in plant science.

Units

Major requirements 57-58

- PLANT 99, 100, 150; PLTH 102, 103, 105, 106, 108; SW 2, 100, 100L; MEAG 20
- Choose one from SW 101, PLTH 104
 - Choose 3 additional units from PLTH courses
 - Select 15 units (minimum 9 upper division) from CRSC, HORT, OH, SW, VIT; PLANT 1, 107, 108, 134
 - Choose 2 units from PLANT 180, 190, 194, 196, or VIT 196

Additional requirements 7*

CHEM 3A, BIOL 11, CHEM 8 and 150

General Education requirements..... 51

(Includes 12 upper-division units, to be taken no sooner than the term in which 60 units of coursework are completed.)

Note: Consult your departmental adviser for other G.E. courses that are recommended for the plant science major. No General Education Integration or Multicultural/International course offered by the Plant Science Department may be used to satisfy the G.E. requirements for majors in the department.

Electives 4-5

Total units 120*

* This total assumes that CHEM 3A and BIOL 11 are being used to satisfy 6 units of the G.E. requirement..

Advising Notes

1. Students will be assisted in selecting an appropriate faculty adviser and be given the curriculum checklist(s) from which to select a catalog year.
2. Meet with your academic adviser prior to registration each semester.
3. General Education courses designated as required by the department are prerequisites to many courses in the program of study. The General Education requirement of 51 units may be exceeded depending upon your selection of courses.
4. *CR/NC* grading is not permitted for courses included in the major.
5. Upper-division G.E. courses (i.e., 100-level courses) should not be attempted prior to the semester in which 60 lower-division units toward the degree have been completed.
6. The upper-division writing skills requirement can be met by passing the university Upper-Division Writing Examination (UDWE) or by passing an approved upper-division writing skills course. One unit of credit (i.e., ENGL 100W) may be earned for passing the exam; 3 units of credit is earned by obtaining a letter grade of *C* or higher in an approved course, i.e., PLANT 110W. In either case, the requirement will have been met.

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- One semester prior to graduation, contact your academic adviser to prepare and file any necessary course substitutions with the Evaluations Office.
- Students interested in becoming Certified Professional Agronomists, Crop Scientists/Specialists or Soil Scientists/Specialists should consult with their department faculty adviser for additional requirements for certification.

Plant Science Minor

The 21 units of courses will constitute a basic background in plant science. The program is similar to the major core and provides students with an introduction to the broad spectrum of plant science. Other majors in the College of Agricultural Sciences and Technology, particularly the Agricultural Business and Education majors, require students to be knowledgeable of plant science in order to pursue their careers or teach the subjects of agricultural production. This minor would be a way in which students could acquire those courses they need and get credit for completing a program of study rather than only a series of courses.

Units

Select from the following..... 3

- PLANT 107: Plant Propagation
- PLANT 196: Crop Project* (MEAG 3 and permission of instructor and appropriate production course)
- PLANT 150: Crop Improvement* (BIOL 10 or 11)

Select from the following..... 6

- PLTH 103: Economic Entomology* (BIOL 10 or 11 or 12)
- PLTH 105: Weeds* (BIOL 10 or 11 and CHEM 3A)
- PLTH 106: Plant Pathology* (BIOL 10 or 11)

Select from the following..... 3

- SW 2: Agricultural Water
- SW 100: Soils* (CHEM 3A)

Select from one of the option areas

in Plant Science (at least 6 units must be upper division)..... 9

Total units..... 21

*Course requires a prerequisite.

Note: The Plant Science Minor also requires a 2.0 GPA and 6 upper-division units in residence.

Master of Science Degree Requirements

The Master of Science (M.S.) in Plant Science is a 30-unit program designed to provide advanced studies and in-depth knowledge in the fundamentals of plant science, as well as experimental design, technical writing, and formal presentation of research. Coursework provides a broad understanding of crop production and physiology, and thesis research allows for specialization. Areas of specialization include agronomy, pomology, horticulture, weed science, entomology, plant pathology, soils and irrigation, and mechanized agriculture. Graduate courses are offered in the late afternoon or evening permitting students to earn a degree within two or three years when working closely with an adviser.

Admission Requirements. The master's degree in Plant Science assumes preparation equivalent to a Bachelor of Science in Plant Science. Students having undergraduate majors in fields other than plant science may enter the program, but may reasonably expect additional requirements to produce equivalent preparation. The following courses or equivalents are expected to be completed prior to admission to the master's program:

Units Subject Area

- 3 Plant Physiology
- 3 Statistics
- 3 Soils
- 3 Plant Health (entomology, pathology, nematology, integrated pest management, biological control, etc.)
- 6 Physical Science (chemistry, physics, etc.) of which a minimum of 3 units must be in chemistry
- 9 Life Science (biology, ecology, genetics, agricultural sciences, etc.)

Students who do not have all the prerequisite courses may be admitted to the program with conditionally classified standing and would be expected to complete the prerequisites before being granted classified standing.

To apply, students must complete the online application required for university admission at www.csufresno.edu/gradstudies/admission. The following materials are required to complete the application:

- college application to the master's degree program
- statement of research interest (minimum of 500 words)
- three letters of recommendation from individuals in a position to make an evaluation in support of graduate study
- Institutional Score Report of the Graduate Record Exam (GRE)
- Institutional Score Report of the Teaching of English as a Foreign Language (TOEFL) exam — *for applicants whose native language is not English (unless the baccalaureate degree is from an institution using English as their language of instruction)*

The packet of application materials must be submitted by the following deadlines:

Spring Semester: September 30 (Aug. 30, International students)*

Fall Semester: March 1 (February 1, International students)*

*or as reported at www.csufresno.edu/gradstudies/mission/index.shtml

Admission will be based on all of the following criteria:

- Official GRE scores (suggested minimum of 480 verbal, 580 quantitative and 4.0 analytical writing) sent to the university by ETS
- Grade point average (GPA) for the last 60 units (minimum 2.75)
- TOEFL score: for those required to take this exam, scores of 213 (computer-based), 550 (paper-based), or 80 (Internet-based)
- Official college transcript verifying completion of prerequisite courses and conferral of the bachelor's degree
- Three letters of reference
- Statement of research interest

Classified standing may be granted to students who meet all of the admission criteria.

Conditional classified standing may be granted to applicants meeting most, but not all, of the admission requirements. In this case, students must fulfill the criteria for "classified standing" and submit the required paperwork by the semester in which a minimum of 10 units to be used toward the degree are completed. Prerequisite

site courses are not included in the 30-unit master's program and students must achieve a 3.0 GPA for all coursework (prerequisite and graduate)

Program Requirements

All students must complete a 15-unit common core consisting of four 3-unit courses and three 1-unit topic seminars. Students must also complete 9 additional units of elective courses. Each student is also expected to complete 6 units of thesis research (PLANT 299) in consultation with a thesis committee.

Units

Core	15
AGRI 200, 201, 220; PLANT 257, 270 (3 units required)	
Electives	9
Three courses from the list below. With prior approval, one course from the list of approved, non-departmental electives can substitute. PLANT 253, 261, 252, 255, PLANT 250T (Topics in Plant Science)	
Thesis Research	6
PLANT 299 (3 units in each of two semesters)	
Total minimum requirements	30*

*Under certain circumstances students may need to take additional units at the discretion of the thesis adviser.

Graduate Advising Notes

1. Non-departmental elective courses may have prerequisites other than those listed as admission requirements.
2. Upon acceptance to the M.S. program in Plant Science, students should obtain the Graduate Student Handbook from the department office (559. 278.2861). Students will be assigned an initial faculty adviser by the graduate coordinators. Soon after, students should identify a research interest and find a faculty member willing to serve as their thesis adviser, notifying the graduate coordinators once finalized.
3. To progress through the graduate program, the student must (a) complete all prerequisite coursework, (b) attain classified standing, (c) maintain a minimum GPA of 3.0, (d) meet the university graduate writing requirement, (e) successfully present and defend the thesis proposal, (f) file for advancement to candidacy, (g) file a thesis committee assignment form,

- (h) complete all program requirements, and (i) satisfactorily present and defend the thesis research results.
4. Advancement to candidacy requires the completion of 9 program units in residence with a 3.0 or higher GPA, meeting the university graduate writing requirement, and filing a Petition for Advancement to Candidacy a minimum of one semester prior to enrollment in thesis units (PLANT 299) and within the deadline.
5. To meet the university graduate writing competency requirement, students must either pass the writing component of AGRI 220, or be approved for writing competency by the graduate coordinators based on their review of the thesis proposal. See the Plant Science Department "Graduate Student Handbook" or the graduate coordinators for details.
6. All students must successfully present and defend their thesis research proposal. The defense must be completed by the end of their second semester in the M.S. program. Information on writing and defending the thesis can be obtained from the graduate coordinators.
7. See the Division of Graduate Studies section in this catalog for university requirements or visit www.csufresno.edu/gradstudies/.

COURSES

Note: Active immunization against tetanus (available through Student Health Services) is a prerequisite for registration in any laboratory course in agriculture and for any student employment within the University Agricultural Laboratory.

Note: Cost to the student of extended field trips varies each semester depending upon itinerary. The student should ask the course instructor.

Crop Science — Agronomy and Vegetable Crops (CRSC)

CRSC 1. Introduction to Crop Science (3)
Not open to students with credit in upper-division CRSC courses. Principles of production for cereal, row, forage and vegetable crops. Culture, insect and disease control, harvesting, storage, and marketing. S

CRSC 101. Row Crops (3)
Prerequisites: BIOL 10 or 11, CRSC 1. The culture of beans, cotton, sugar beets, and oil crops; varieties, nutrition, insect, disease,

and weed control; harvest, storage, uses, and marketing. (2 lecture, 3 lab hours) F

CRSC 102. Cereal and Forage Crops (3)
Prerequisites: BIOL 10 or 11, CRSC 1. The culture of alfalfa, barley, corn, sorghum, oats, rice, rye and wheat; varieties, nutrition, insect disease, and weed control; harvest, storage, uses, and marketing. (2 lecture, 3 lab hours) S

CRSC 105. Range Ecology and Management (3)
Prerequisites: BIOL 10 or 11, CRSC 1. Identification of range and pasture plants; carrying capacity; methods of range and pasture improvement, grazing management, water development, rodents, fertilization, reseeding, brush removal; mountain range resources. (2 lecture, 3 lab hours) S

CRSC 111. Warm Season Vegetables (3)
Prerequisites: BIOL 10 or 11, CRSC 1. Cultural practices, harvesting, processing, and marketing of warm season vegetables of economic importance to California and the San Joaquin Valley. (2 lecture, 3 lab hours) (2-3 day field trip fee, \$65) F even

CRSC 112. Cool Season Vegetables (3)
Prerequisites: BIOL 10 or 11, CRSC 1. Cultural practices, harvesting, processing, and marketing of cool season vegetables of economic importance to California and the San Joaquin Valley. (2 lecture, 3 lab hours) (2-3 day field trip fee, \$65) F odd

Horticulture (HORT)

HORT 1. Introduction to Fruit Science (3)
Not open to students with credit in upper-division HORT courses. Origin and distribution of grape and tree fruit crops. Botanical and commercial classification of grapes and tree fruits and their culture in California. F (Formerly VTF 1)

HORT 110. Fruit Species of California (3)
Prerequisite: BIOL 10 or 11 or HORT 1 or OH 1. Fruit and nut species common to California, their adaptation and uses. S (Formerly VTF 110)

HORT 112. Principles of Pomology II (3)
Prerequisite: BIOL 10 or 11 or HORT 1. Pruning, fruit and vegetative development, pollination, rootstocks, propagation, and nutrition. Crop fundamentals of spring cultural practices. (2 lecture, 3 lab hours) F (Formerly VTF 112)

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HORT 113. Citrus and Subtropical Fruits (3)

Prerequisite: BIOL 10 or 11 or HORT 1. Geographic distribution, climatic and soil adaptation of subtropical fruit crops. Fruit and vegetative development and cultural practices for globally important fruit crops. Emphasis on citrus and olive. (2 lecture, 3 lab hours) **F odd** (Formerly VTF 113)

Mechanized Agriculture (MEAG)

Note: Suitable eye protection is required in many MEAG laboratory classes.

MEAG 1S. Introduction to Agricultural Mechanics (3)

Selection, care, and use of common tools, projects of wood and metal; mechanical skills in the field of agriculture. (2 lecture, 3 lab hours) (Course fee, \$25) **FS**

MEAG 3. Agricultural Tractors (3)

Study of functions, physical capabilities, applications, economics, and improvement of tractors. Testing and analysis of tractors in laboratory and field conditions to maximize efficiencies. (2 lecture, 3 lab hours; 5 hours field operation) **F**

MEAG 5. Power Equipment Safety (1)

Safety training for operation of power equipment. Meets requirements of Senate Bill 198 and University Agricultural Laboratory (UAL) for classroom safety instruction on using tractors and similar power equipment. Satisfactory completion meets safety training portion requirement of the UAL Tractor License. (16 hours, meets four consecutive times) **CR/NC** grading only. **FS**

MEAG 20. Agricultural Machinery and Equipment (3)

The study of functions and applications of machinery and equipment. Setup, calibration, analysis, and adjustment of agricultural machinery common to the San Joaquin Valley under field conditions will be emphasized. Equipment will be evaluated for efficiency and effective performance. (2 lecture, 3 lab hours) **S**

MEAG 50. Metallurgical Processes (3)

(Same as IT 71.) Fundamentals of metallurgy; properties and characteristics of metals; survey of metal welding processes,

equipment, and procedures; theory-discussion and laboratory experience in oxygen-fuel welding, cutting, brazing, and shielded metallic arc welding. (2 lecture, 3 lab hours) (Course fee, \$20) **FS**

MEAG 53. Electricity and Electronics (3)

(See IT 52.) **F**

MEAG 103. Electro-Hydraulics (3)

Prerequisite: MEAG 3. Theory and practice in the operation, service, adjustment, and function of the component parts of fluid power systems. Design application of systems to agricultural equipment. Major emphasis is on computerized electronic controls of hydraulic systems. (2 lecture, 3 lab hours) **S odd**

MEAG 112. Power Systems Technology (3)

Prerequisite: MEAG 3. Principles of the internal combustion engine; overhauling, repairing, and adjusting of gasoline, diesel, and LPG farm engines. Practices in repair technology and engine replacement as well as cost analysis decisions. (2 lecture, 3 lab hours) **S even**

MEAG 113. Power Transmissions (3)

Prerequisite: MEAG 3. Theory and operation of electro-hydraulic assist transmissions, synchronized transmissions; gear transmissions; clutches; brakes; final drives, selecting devices, mechanical front wheel drives, four wheel drive, and rubber/steel track drives. (2 lecture, 3 lab hours) **F even**

MEAG 114. Small Gasoline and Compact Diesel Engines (3)

Prerequisite: MEAG 1S. Theory of operation, maintenance, and repair of small gasoline and compact diesel internal combustion engines. Emphasizes use of small engines in agricultural education. (2 lecture, 3 lab hours) **FS**

MEAG 120. Advanced Farm Machinery (3)

Prerequisite: MEAG 3. Theory, operation, and management economics of planters, tillage tools, harvesting, spraying equipment, and precision farming equipment. Managerial responsibilities under state and federal mandates will be emphasized. (2 lecture, 3 lab hours) **F odd**

MEAG 130. Precision Agriculture (3)

Survey of current geo-spatial technologies (GIS) and their application to agriculture. Theory and application of precision

agriculture technologies such as remote sensing, parallel swathing, yield monitoring, precision navigation, and variable rate application to California crops. (2 lecture, 3 lab hours)

Ornamental Horticulture (OH)

OH 1. Introduction to Ornamental Horticulture (3)

Not open to students with credit in upper-division OH courses. Planting and maintenance of the home landscape; selection, planting, fertilization, and pruning of plants; lawn planting and care. (2 lecture, 3 lab hours) **FS**

OH 4. Floral Design (3)

Principles and rules of design and color using plants as a media; European and Japanese influences; emphasis on American line-mass and contemporary designs. An assortment of arrangements are made in lab. (2 lecture, 3 lab hours) (Course fee, \$50) **S**

OH 104. Greenhouse and Nursery Crop Production (4)

Prerequisites: BIOL 10 or 11, OH 1. Fundamentals of greenhouse and nursery crop production. Emphasis on sustainable and economically viable production and management systems for significant flower, foliage, and nursery crops. (3 lecture, 3 lab hours; field trips)

OH 107. Landscape Design (4)

Prerequisites: OH 1, 109. History and development of landscape design. Landscapes for the modern home, with consideration of effect on microenvironment. Graphic techniques used in developing landscape designs. Analysis and solution of landscape design problems of residential and commercial structures. (3 lecture, 3 lab hours; field trips)

OH 108. Woody Plant Materials (3)

Prerequisites: BIOL 10 or 11, OH 1. Survey of woody plant materials, including identification, growth habits, and cultural requirements. Emphasis on plants used in the California landscape. (2 lecture, 3 lab hours; field trips)

OH 109. Herbaceous Plant Identification Materials (3)

Prerequisites: BIOL 10 or 11, OH 1. Survey of herbaceous plant materials, including identification, growth habits, and cultural requirements. Emphasis on plants used in

California landscapes, botanical gardens, and arboreta. (2 lecture, 3 lab hours; 2 Saturday field trips)

OH 110. Turfgrass Production and Management (3)

Prerequisites: BIOL 10 or 11, OH 1. Production and maintenance of grass for lawns, public parks, public institutions, playgrounds, playing fields, golf courses, bowling greens; identification of turfgrasses and turfgrass seed. (2 lecture, 3 lab hours; field trip) F odd

Plant Health (PLTH)

PLTH 1. Introduction to Plant Health (3)

Not open to students with credit in upper-division PLTH courses. Origin, history, and evaluation of protective measures (chemical, biological, and cultural) for management of insects, diseases, weeds, and rodents in the field and around the home.

PLTH 102. Pesticides (3)

Prerequisite: CHEM 3B or 8. Modes of action and effective application of insecticides, herbicides, fungicides, rodenticides, nematocides and plant growth regulators. Emphasis on effective and safe use of agricultural chemicals by reading labels and following laws/regulations. (2 lecture, 3 lab hours) F

PLTH 103. Economic Entomology (3)

Prerequisite: BIOL 10 or 12. Biology, ecology, management and taxonomy of economically important arthropods, with special emphasis on agricultural ecosystems in California. (2 lecture, 3 lab hours) F

PLTH 104. Plant Nematology (3)

Prerequisites: PLTH 1 and either or BIOL 10 or 12. Biology, taxonomy, host-parasite relationships, soil ecology, conventional and innovative controls, plant diagnosis and laboratory techniques with emphasis on plant-parasitic species. (2 lecture, 3 lab hours) (Formerly PLPR 104) F

PLTH 105. Weeds (3)

Prerequisites: BIOL 10 or 11; CHEM 3A, 3B, or 8. Vegetation management in California. Identification of common weeds. Fundamentals of preventive, cultural, biological, physical, and chemical weed control methods. (2 lecture, 3 lab hours) S

PLTH 106. Plant Pathology (3)

Prerequisite: BIOL 10 or 11. Study of the causal agents, disease cycles, and control of plant diseases. (2 lecture, 3 lab hours) S

PLTH 107. Biological Control (3)

Prerequisite: PLTH 103. Study of the action of parasites, predators, and pathogens on the population dynamics of their host/prey organisms; focus on arthropods, with additional emphasis on microorganisms, weeds, nematodes, and vertebrates. (2 lecture, 3 lab hours) S

PLTH 108. Integrated Pest Management (3)

Prerequisite: PLTH 103. Concepts and principles of integrated pest management. Insect and mite pest problems; sampling techniques; biology and ecology of major agricultural crop pests; integration of control measures for management of economic pests. (2 lecture, 3 lab hours) S

PLTH 109. Diagnosis and Control of Plant Diseases (3)

Prerequisite: PLTH 106. Techniques for diagnosis of specific diseases in California and selection criteria for control strategies. Students will practice diagnostic techniques and select preventative, cultural, biological, physical, and chemical disease control strategies for major plant diseases. (2 lecture, 3 lab hours) F

Plant Science (PLANT)

PLANT 1. Introduction to Plant Science (3)

Principles of plant structure, heredity, physiology and climate in relation to growth, adaptation and management of crops. Emphasis is placed on food and fiber crops.

PLANT 99. Introduction to Biometrics (3)

Prerequisite: ELM requirement met. Introduction to experimental methods and statistical procedures with particular emphasis on applied biological systems. Design of experiments; statistical analysis and interpretation. S

PLANT 100. Aspects of Crop Productivity (3)

Prerequisite: BIOL 10 or 11. Study of the growth, development, and basic physiological processes of cultivated crops. Environmental influences on crop growth and development processes and management techniques to minimize stresses and maximize crop yield and quality. (Formerly PLANT 170T)

PLANT 105. Food, Society, and Environment (3)

Prerequisites: G.E. Foundation and Breadth Areas B. Linkages among food production systems, human social behavior, and

environmental quality. Basic principles of environmental and agricultural sciences as applied to interrelationships among social value systems, agricultural activities and environmental resources. G.E. Integration IB. FS

PLANT 107. Plant Propagation (3)

Prerequisite: BIOL 10 or 11; CHEM 3A. Principles and practices of propagating plants, sexual and asexual. Seeds, cuttings, layering, grafting, budding, and tissue culture. Propagation media and rooting aids. (2 lecture, 3 lab hours; field trips) S

PLANT 108. Micropropagation (3)

Prerequisites: BIOL 10 or 11; BIOL 161 or CHEM 150 or permission of instructor. Principles of plant propagation by aseptic cell and organ culture as a means of rapid cloning, elimination of systemic plant diseases, production of somatic hybrids, ploidy change, and other genetic variants for use in plant breeding. (2 lecture, 3 lab hours) F

PLANT 110W. Dimensions in Agriculture (3)

Prerequisite: satisfactory completion of the ENGL 5B or 10 graduation requirement. Current agricultural problems and developments; nature of agricultural industries in a changing world. Interrelationships among agriculture, government, labor, and the public. Meets the upper-division writing skills requirement for graduation. FS

PLANT 134. Microclimatology (3)

(See GEOG 114.)

PLANT 150. Crop Improvement (3)

Prerequisite: BIOL 10 or 11. Application of genetic, cytological and environmental principles to improvement of plants; heredity and variation in plants, effects of environmental factors, biotechnology, self- and cross-fertilization, principles and results of selection and hybridization in plant improvement. F

PLANT 170T. Topics in Plant Science (1-4; max total 6 per discipline if no topic repeated)

Prerequisite: junior standing. Selected topics in plant science, agronomy, horticulture, and other associated areas. Topics may require lab hours. FS

PLANT 180. Undergraduate Research (1-4; max total 4)

Open to juniors and seniors. Exploratory work on a suitable agricultural problem in plant science. Approved for *RP* grading. FS

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PLANT 190. Independent Study (1-3; max total 6)

See *Academic Placement — Independent Study*. Approved for *RP* grading. FS

PLANT 194. Agricultural Internship (1-8; max total 8)

Prerequisite: junior standing; approval of faculty adviser and department chair. Field experience in your career specialty that integrates with classroom instruction. Written reports of knowledge and experience gained are required. *CR/NC* grading only. FS

PLANT 196. Crop Projects (1; max total 4)

Prerequisite: MEAG 3, appropriate production course, UAL Tractor License, and permission of instructor. Knowledge gained from classroom instruction applied to field conditions. Students will participate in growing and marketing a crop using the University Agricultural Laboratory. Approved for *RP* grading. FS

Soil and Water (SW)

SW 1. Introduction to Irrigated Soils (3)

Interpretation of physical and chemical properties of biological and mineral matter for the management of soils in irrigated agriculture. Emphasis on soil/plant and plant/water relationships. F

SW 2. Agricultural Water (3)

Water resources and problems in California; water requirements for agricultural and ornamental crops; irrigation scheduling and application methods. (2 lecture, 3 lab hours) S

SW 100. Soils (3)

Prerequisites: CHEM 3A, intermediate algebra. Physical, chemical, and biologic properties of soils as a medium for plant growth and as a natural body, factors that influence soil formation; food and fiber production; fertilizer and soil amendment use and environmental impact; soil's role in the biosphere. F

SW 100L. Soils Lab (1)

Prerequisite: SW 100 (may be taken concurrently). Physical, chemical, and biological analysis. Interpretation of field and laboratory data. (3 lab hours) (Saturday field trip) F

SW 100N. Soils in Environment (3)

Prerequisites: CHEM 3A. Physical, chemical, and biological properties of soils as the interconnecting link in the biosphere; factors that influence soil formation; role of soil in food and fiber production. Not open to plant science and viticulture and enology majors. No credit if taken after SW 100. (2 lecture, 3 lab hours) (Formerly PLANT 170T)

SW 101. Crop Nutrition (4)

Prerequisite: SW 100. Evaluation of nutrient elements in soils; application of fertilizers and organic waste to meet nutrient requirements; soil and plant tissue analysis and interpretation; fertilizer recommendations for different crops. (3 lecture, 3 lab hours) S

SW 104. Soil and Water Management (3)

Prerequisites: SW 2, 100 (may be taken concurrently). Management of irrigated soils with particular emphasis on crop water requirements, irrigation scheduling, salinity, and other physical and chemical soil problems of field crops, permanent crops and landscapes. F

SW 111. Irrigation Systems (3)

Prerequisite: SW 2. Principles of planning, installation and evaluation of irrigation systems for field crops, permanent crops and ornamental horticulture. Pressurized systems (sprinkler and drip irrigation) emphasized. S

GRADUATE COURSES

The following graduate courses are open to students who have been accepted into the graduate program. Final semester senior undergraduate students may petition the Division of Graduate Studies to enroll in graduate courses. The petition form, which is available in the department office, must be accompanied by GRE scores to be considered.

Agriculture (AGRI)

AGRI 200. Biometrics in Agriculture (3)

Prerequisites: PLANT 99, AGECE 71, or MATH 101, or permission of instructor. Advanced concepts in the design of agricultural experiments. Emphasis is placed on the selection of appropriate designs to meet the objectives of well-planned experiments. Relative merits of various designs and topics in analysis, interpretation, and regression are covered. F

AGRI 201. Agricultural Laboratory Techniques (3)

Prerequisite: One of the following courses: BIOL 161; CHEM 105, 109; FSC 115. Agricultural problem solving through the application of advances in laboratory technology, crop management, foods, nutrition, soil and water quality. Theory and practice operation of scientific instruments and techniques are taught. Student defined project and report required. (2 lecture, 3 lab hours) S

AGRI 220. Research Methodology and Communications (3)

Critical literature review, quantitative and qualitative research design, scientific writing, questionnaire design and use, and presentation of research results. Ethical research issues examined. Approved for *RP* grading. F

Plant Science (PLANT)**PLANT 250T. Topics in Plant Science (3; max total 6)**

Prerequisites: upper-division plant science course appropriate to study topic or permission of instructor. Advanced studies in a selected area of plant science which could include new or emerging issues and technologies. Topics may require lab hours.

PLANT 252. Plant Nutrition (3)

Prerequisite: BIOL 161 and SW 100, or permission of instructor. Soil factors influencing nutrient availability, mineral requirements of plants, and the acquisition and translocation of nutrients and their role in plant metabolism. Soil and tissue analysis for fertility management. (2 lecture, 3 lab hours) **S even**

PLANT 253. Soil-Water Relationships (3)

Prerequisite: SW 100. Soil and water relationships influencing agricultural production and environmental quality. Soil quality concept and the role of organic matter; management alternatives for salinity, drainage, and trace element problems; irrigation water quality and the use of wastewaters for irrigation. (2 lecture, 3 lab hours) **S odd**

PLANT 255. Advanced Plant Breeding (3)

Prerequisites: PLANT 150 or equivalent. Principles and techniques of plant improvement, breeding methods, combining ability, sterility systems, quantitative genetic analysis, heritability estimates, experimental designs for plant breeding.

PLANT 257. Physiology of Cultivated Plants (3)

Prerequisite: BIOL 161 or permission of instructor. Plant cell structure and function. Response of cultivated plants to the environment. Physiology and hormonal control of flower induction, fruit set, and development. Review of pertinent current publications. **S**

PLANT 261. Advanced Plant Health Management (3)

Prerequisite: PLTH 108 or permission of instructor. Comprehensive study of anthropolod, disease, and weed problems in California cropping systems. Examination of complex relationships among crop plants and other biological organisms in agro-ecosystems design crop management programs that are economically viable and ecologically sound.

PLANT 270. Seminar in Plant Science (1; max total 4)

(Three units required.) Reviews of published and/or original research in the broad areas of crop science, soil and water relations, and plant health. **FS**

PLANT 290. Independent Study (1-3; max total 6)

See *Academic Placement — Independent Study*. Approved for *RP* grading. **FS**

PLANT 299. Thesis (3; max total 6)

Prerequisite: prior advancement to candidacy. See *Criteria for Thesis and Project*. Thesis research work and preparation. Submission of an acceptable written thesis for the master's degree. Oral presentation of thesis research required. Must take 3 units in each of two semesters. Approved for *RP* grading. **FS**

IN-SERVICE COURSE

(See *Catalog Numbering System*.)

Agriculture (AGRI)**AGRI 300. Topics in Agriculture (1-3; max total 6)**

Topics may require lab hours. In-service professional training in selected areas of agriculture.