

Plant Science

College of Agricultural
Sciences and Technology

Department of Plant Science
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B.S. in Plant Science

Options:

- Agronomy
- Horticulture
- Plant Health

Emphases:

- Production Management
- Science and Technology

M.S. in Plant Science

Minor in Plant Science

Plant Science

Join the leader in science, technology, and management. The Department of Plant Science offers programs in production with classes in science and technology and in business management. Within the production or science emphasis, students select an option in agronomy (CR SC and SW courses), horticulture (OH, VTF and some CR SC courses), or plant health (PLT H, CR SC, OH, and VTF courses).

Courses offered by the department integrate physiology, soils and nutrition, cultural practice, protection against plant pests, marketing, storage and handling practices, 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, plant improvement, and seed technology 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.



The irrigation and viticulture programs have received the Western Region and National Awards for Excellence in Agricultural Technology Instruction respectively. These prestigious awards are sponsored by the National Association of State Departments of Agriculture and R. J. Reynolds Industries Inc.

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.

Faculty

Mahlon M. S. Hile, *Chair*
Arthur J. Olney, *Graduate Coordinator*
Daniel P. Bartell
Sharon E. Benes
Earl H. Bowerman
Philip H. Jost
Charles F. Krauter
Mark A. Mayse
Michael Spiess, *Lecturer*

The faculty 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.

Most of the faculty are involved in one or more of the California Agricultural Technology Institute Centers — the Center for Irrigation Technology and the Viticulture and Enology Research Center — and the San Joaquin Experimental Range. The centers offer excellent opportunities to undergraduate and graduate students who gain experience by participating in applied research projects that address and help solve problems faced by California's agricultural industry.

Bachelor of Science Degree Requirements

**Plant Science Major
Production Management Emphasis**

Options: Agronomy, Horticulture,
Plant Health

Recommended curriculum for students interested in agronomy (crop science and soil and water courses), horticulture (ornamental horticulture, viticulture/tree fruit and some crop science courses), and plant health.

	<i>Units</i>
General Education	51
(Includes 12 upper-division units, to be taken no sooner than the term in which 60 units of coursework are completed.)	
<i>Note:</i> Consult your departmental adviser for other G.E. courses that are recommended for the plant science major.	
Major	51-52
(including 20 upper-division units)	
Plant Science Core	(25)
PLT H 103, 105, 106; PLANT 107, 150; SW 2, 100, 100L; ME AG 3	
Option	(26-27)
Minimum of 15 units, including 12 upper-division units, from one of the following option categories	
Agronomy	(15)
All from CR SC and/or SW courses	
Horticulture	
All from OH, VTF and/or CR SC 111, 112 courses	
Plant Health	
9 units from PLT H courses and 6 units from a production area (CR SC, OH, VTF, not to include VTF 110)	
Complement the option by choosing one course from three of the following four sets. No double counting of courses is permitted within the major	
	(9-10)
Set A: SW 101, 104, 111	
Set B: PLT H 107, 108, 109	
Set C: CR SC 104, OH 101, PLANT 102, VTF 114	
Set D: ME AG 20, 114, 120	
Select 2 units of research or crop project courses from PLANT 180, 190, or 196	
	(2)

Additional requirements	16-26
CHEM 3A*, 3B; BOT 10*, 130	
Management courses	
AG EC 31; select two from: AG EC 110N, 117, 120, 130, 160, 164	
Electives	0-9
Courses supplementary to the major, selected in consultation with your department faculty adviser, are strongly recommended.	
Total requirements	128
(including 40 upper-division units)	

*These 7 units — CHEM 3A and BOT 10 — are requirements for the major that also satisfy part of the General Education requirements.

Advising Notes

1. During the Add/Drop period of their first semester, students are required to attend a department undergraduate orientation session. Alternatively, they are required to meet with the department chair. In either case, they will be assisted in selecting an appropriate faculty adviser and be given the curriculum checksheet(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 taking 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.

7. One semester prior to graduation, contact your academic adviser to prepare and file an official Certification of Major Requirements form. Your Application for Graduation cannot be processed by the Evaluations Office until this form has been submitted.
8. 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 Major
Science and Technology Emphasis**

Options: Agronomy, Horticulture, Plant Health

Recommended curriculum for students interested in agronomy (crop science and soil and water courses), horticulture (ornamental horticulture, viticulture/tree fruit and some crop science courses), and plant health. Also recommended for students planning to pursue graduate study in plant science and for those who wish to become certified professional agronomists, crop scientists/specialists, horticulturists, or soil scientists/specialists.

Units

General Education	51
(Includes 12 upper-division units, to be taken no sooner than the term in which 60 units of coursework are completed.)	
<i>Note:</i> Consult your departmental adviser for other G.E. courses that are recommended for the plant science major.	
Major	51-52
(including 20 upper-division units)	
Plant Science Core	(22)
PLT H 103, 105, 106; SW 2, 100, 100L, ME AG 3	
Select one: PLANT 102 or 107	
Option	(29-30)
Minimum of 15 units, including 12 upper-division units, from one of the following option categories	
	(15)

Plant Science

Agronomy

All from CR SC and/or SW courses

Horticulture

All from OH, VTF and/or CR SC 111, 112 courses

Plant Health

9 units from PLT H courses and 6 units from a production area (CR SC, OH, VTF, not to include VTF 110)

Complement the option by choosing one course from each of the following four sets. No double counting of courses is permitted

within the major (12-13)

Set A: SW 101, 104, 111

Set B: PLT H 107, 108, 109

Set C: CR SC 104, OH 101, PLANT 102, VTF 114

Set D: ME AG 20, 114, 120

Select 2 units of research or crop project courses from PLANT 180, 190, or 196 (2)

Additional requirements 16-33

Science courses

BOT 10*, 130; CHEM 3A*, 8; and either CHEM 150 or both CHEM 4 and 105; GENET 120; PLANT 99; MICRO 20 or equivalent

Electives 0-9

Courses supplementary to the major, selected in consultation with department faculty adviser, are strongly recommended. ZOOL 10 recommended for Plant Health Option.

Total requirements 128 (including 40 upper-division units)

*These 7 units — CHEM 3A and BOT 10 — are requirements for the major that also satisfy part of the General Education requirements.

Advising Notes

See *Advising Notes*, Plant Science Major, Production Management Emphasis.

Plant Science Minor

Options: Agronomy, Horticulture, Plant Health

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* (ME AG 3 and permission of instructor and appropriate production course)
PLANT 150: Crop Improvement* (BOT 10 or BIOL 10)

Select from the following 6

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

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 21

*Course requires a prerequisite.

Master of Science Degree Requirements

The Master of Science degree in Plant Science is a 30-unit program designed to provide advanced studies and in-depth knowledge in the fundamentals of plant physiology and experimental design, as well as technical writing and formal presentation of research reports.

This degree is for individuals seeking career advancement in agronomy, agricultural research and development, plant physiology, pest management, plant pathology, and soils and irrigation. Graduate courses are offered in the late afternoon or evening permitting students to earn their degree

within two years when working closely with an adviser.

Admission Requirements. The Master of Science degree in Plant Science assumes preparation equivalent to a Bachelor of Science in Plant Science. The following courses or equivalents are expected to be completed prior to enrollment in courses to be applied to the master's program: BOT 10, 130; CHEM 3A, 8; GENET 120; PLT H 103, 105, 106; PLANT 99; SW 2, 100, 100L.

Students are required to submit in one complete packet the following materials to the Department of Plant Science, Ag Building, Room 222:

- one complete set of transcripts of all prior college or university work
- school application to the master's degree program
- 500-word statement of purpose by the candidate
- three letters of recommendation from persons in a position to make an evaluation in support of program entry, and
- one copy of the Institutional Score Report of GRE scores

All graduate applicants whose native language is not English, regardless of citizenship, must demonstrate English language proficiency through an official TOEFL report showing a minimum score of 550, unless they have a baccalaureate degree from an institution of higher education in which English is the language of instruction.

The packet of materials must be delivered to the Department of Plant Science by the following deadlines:

Desired Semester of Enrollment	Submit Packet by
Spring	October 25
Fall	March 15

Incomplete packets of materials will be returned to students for resubmission the following semester. Required application materials are available in the Department of Plant Science, Ag 222, (559) 278-2861.

A committee of department faculty will review all complete applications which were received by the stated deadline. Written notification will be sent, no later than the 15th day of the next succeeding month, regarding whether or not admission has been granted. Admission to the M.S. in Plant Science degree program is contingent upon admission to California State

University, Fresno. Students who have been denied admission to the graduate program in plant science must appeal the decision in writing to the department's graduate coordinator no later than two weeks following the date of the letter of denial in order to be reconsidered by the faculty for admission during the semester for which the application was originally submitted.

Admission as a classified student will be based on consideration of a combination of all the following criteria:

1. GRE scores, which must be submitted with application (suggested minimum scores of 480 verbal and 580 quantitative)
2. grade point average for the last 60 units (minimum 2.75 GPA)
3. college transcript verifying completion of prerequisite courses and that bachelor's degree was conferred
4. completed College of Agricultural Sciences and Technology "Graduate Programs Admission Application"
5. three letters of reference, and
6. a typewritten statement of 500 words explaining the applicant's professional goals.

Conditional classified standing may be granted by the department to applicants who have a minimum GPA of 2.5 (last 60 semester units) and who have 9 or fewer units of prerequisite courses to complete. Students must achieve a 3.0 GPA on prerequisite coursework.

Students must achieve classified standing in the program by the semester in which a maximum of 10 units to be used toward the master's degree are completed.

Students are not normally accepted into the Master of Science in Plant Science degree program if they have more than 10 units of prerequisite courses to complete. Prerequisite coursework cannot be used to fulfill the 30 unit master's program requirements. Potential graduate students who have 10 or more units of prerequisite courses to complete are encouraged to enroll as unclassified postbaccalaureate students in plant science at California State University, Fresno and apply to the master's program when they have 9 or fewer units of prerequisite courses to complete. Students must achieve a 3.0 GPA on prerequisite coursework.

Students completing prerequisite coursework, following admission as unclassified postbaccalaureate students in plant science, must achieve a grade of *C* or better in required prerequisite coursework to qualify for admission to the master's degree program.

Program Requirements

All students must complete a 13-unit common core. Students must also complete 9 units of additional requirements, including one course from each of three sets of courses, as well as 5 units of approved electives. Each student is also expected to complete a 3-unit thesis in consultation with a thesis committee.

	<i>Units</i>
Core	13
AGRI 200, 201, 220; PLANT 257, 270	
Additional requirements	9
Three courses, one from each of three sets:	
Set A: PLANT 252, 254, 255	
Set B: PLANT 258, 261	
Set C: PLANT 253, 256	
Electives	5
In consultation with their advisers, students select additional courses from the three sets listed above, and/or from the department's approved electives list.	
Culminating experience	3
PLANT 299	
Total minimum requirements	30

Graduate Advising Notes

1. Several of the approved elective courses have prerequisites other than courses listed as admission requirements.
2. To obtain the required school application form and more specific information concerning the Master of Science in Plant Science degree, interested students should call or write the department office. Upon acceptance in the Master of Science in Plant Science program, students should obtain the *Graduate Student Handbook* from the department office.
3. Upon acceptance into the M.S. in Plant Science program, students will be assigned an initial faculty adviser by the department chair. Students may subsequently select a faculty adviser upon obtaining his/her approval and notifying the department office of that selection.
4. Elective courses are selected in consultation with the student's faculty adviser from the three sets of courses listed under additional requirements. They may also be selected from the department's list of approved electives, consisting of chemistry, biology and plant science courses.
5. To progress through the graduate program, the student must:

- a. Maintain a minimum GPA of 3.0
 - b. Complete all prerequisite coursework
 - c. Attain classified standing
 - d. Meet the university graduate writing requirement
 - e. File for advancement to candidacy
 - f. Pass the department qualifying examination
 - g. Complete the program requirements
 - h. File a master's thesis committee assignment form
 - i. Satisfactorily present and defend the thesis research results
6. Advancement to candidacy requires the completion of 9 program units in residence, meeting the university graduate writing requirement, and filing a Petition for Advancement to Candidacy a minimum of one semester prior to enrollment in thesis and within the deadline.
 7. Graduate writing proficiency must be demonstrated by taking and passing AGRI 220 with a grade of *B* or better.
 8. All students must successfully complete the department qualifying examination, which is taken as soon as possible after completing AGRI 200, 201 and PLANT 257. Information on the department qualifying examination is included in the *Graduate Student Handbook*.
 9. See *Division of Graduate Studies* section in this catalog for university requirements.

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 on the University Farm.

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

Plant Science (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.

80. Undergraduate Research (1-4; max total 4)
Open to freshmen and sophomores with permission of instructor. Exploratory work on a suitable agricultural problem in plant science. Approved for *SP* grading.

Plant Science

99. Introduction to Biometrics (3)

Prerequisite: satisfactory completion of an intermediate algebra course or ELM. Introduction to experimental methods and statistical procedures with particular emphasis on applied biological systems. Design of experiments; statistical analysis and interpretation. (2 lecture, 3 lab hours)

102. Micropropagation (3)

Prerequisites: BOT 10 or BIOL 10; and BOT 130 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)

105. Food, Society, and Environment (3)

Prerequisites: General Education Areas B1, B2, and D completed (or concurrent enrollment). 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.

107. Plant Propagation (3)

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

110W. Dimensions in Agriculture (3)

Prerequisites: satisfactory completion (C or better) of the ENGL 1 graduation requirement, to be taken no sooner than the term in which 60 units of coursework are completed. 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.

115. Computer Applications in Plant Science (4)

Overview of computer hardware. Basics of PC operating systems. Software applications for plant science. Word processing, spreadsheet analysis and modeling, database management, geographic information systems, remote sensing, surveying, and scientific data visualization technologies related to plant science. Hands-on instruction. (3 lecture, 3 lab hours) (Course fee, \$15) (Formerly PLANT 12)

134. Microclimatology (3)

(See GEOG 114.)

150. Crop Improvement (3)

Prerequisite: BOT 10 or BIOL 10. 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.

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.

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 *SP* grading.

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

See *Academic Placement — Independent Study*. Approved for *SP* grading.

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.

196. Crop Projects (1; max total 4)

Prerequisite: ME AG 3 or equivalent, appropriate production course and permission of instructor. Knowledge gained from classroom instruction applied to field conditions. Students will participate in cultural practices using the University Farm Laboratory in growing and marketing a crop.

Crop Science — Agronomy and Vegetable Crops (CR SC)

1. Introduction to Crop Science (3)

Not open to students with credit in upper-division CR SC courses. Principles of production for cereal, row, forage and vegetable crops. Culture, insect and disease control, harvesting, storage, and marketing.

101. Row Crops (3)

Prerequisites: BOT 10 or BIOL 10, CR SC 1. The culture of beans, cotton, sugar beets, and other fiber and oil crops; varieties, nutrition, insect, disease, and weed control; harvest, storage, uses, and marketing. (2 lecture, 3 lab hours)

102. Cereal Crops (3)

Prerequisites: BOT 10 or BIOL 10, CR SC 1. The culture of barley, corn, grain sorghum, oats, rice, rye and wheat; varieties, nutrition, insect disease, and weed control; harvest, storage, uses, and marketing. (2 lecture, 3 lab hours) (Two 1-day field trips)

103. Forage Crops (3)

Prerequisites: BOT 10 or BIOL 10, CR SC 1. The culture of alfalfa, silage, irrigated pasture and range related to livestock feed enterprises; varieties, nutrition, insect, disease and weed control; harvesting, uses, and marketing. (2 lecture, 3 lab hours)

104. Seed Production and Technology (3)

Prerequisites: BOT 10 or BIOL 10, CR SC 1. The principles of specialized agronomic seed production; harvesting, mechanical conditioning, storage, treatment and viability testing. (2 lecture, 3 lab hours) (2-3 day field trip fee, \$65)

105. Range Management (3)

Prerequisites: BOT 10 or BIOL 10, CR SC 1. Identification of range plants; carrying capacity; methods of range improvement, grazing management, water development, rodents, fertilization, reseeding, brush removal; mountain range resources. (2 lecture, 3 lab hours)

111. Warm Season Vegetables (3)

Prerequisites: BOT 10 or BIOL 10, CR SC 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)

112. Cool Season Vegetables (3)

Prerequisites: BOT 10 or BIOL 10, CR SC 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)

Ornamental Horticulture (OH)

1. Introduction to Ornamental Horticulture (3)

Planting and maintenance of the home landscape; selection, planting, fertilization, and pruning of plants; lawn planting and care. (2 lecture, 3 lab hours)

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, \$25)

101. Greenhouse Management (3)

Prerequisites: BOT 10 or BIOL 10, OH 1. The construction, operation and management of greenhouses; cultural and environmental techniques used in the production of greenhouse crops. Foliage plant identification. (2 lecture, 3 lab hours; field trips)

105. Nursery Management (4)

Prerequisite: OH 1. Practices and principles in planning and managing a retail nursery, flower shop, or garden center; includes some aspects of production and construction of occasional floral designs. (3 lecture, 3 lab hours; field trips)

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)

108. Ornamental Trees (3)

Prerequisites: BOT 10 or BIOL 10, OH 1. Trees grown in California for landscaping, shade and ornamentation; identification, habits of growth, cultural requirements, landscape use. (2 lecture, 3 lab hours; field trip)

109. Plant Identification and Botanical Gardens (3)

Prerequisites: BOT 10 or BIOL 10, OH 1. Identification, growth habits, culture and landscape use of shrubs, vines and ground covers. Botanical gardens of the U.S. and California with particular emphasis on their history and design. (2 lecture, 3 lab hours; 2 Saturday field trips)

110. Turfgrass Production and Management (3)

Prerequisites: BOT 10 or BIOL 10, 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)

Plant Health (PLT H)**1. Introduction to Plant Health (3)**

Not open to students with previous credit in upper-division PLT H 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. (Formerly PL PR 1)

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) (Formerly PL PR 102)

103. Economic Entomology (3)

(Same as ZOOL 122). Prerequisite: BOT 10 or ZOOL 10. Biology, ecology, management and taxonomy of economically important arthropods, with special emphasis on agricultural ecosystems in California. (2 lecture, 3 lab hours) (Formerly PL PR 103)

105. Weeds (3)

Prerequisites: BOT 10 or BIOL 10, CHEM 3A. Vegetation management in California. Identification of common weeds. Fundamentals of preventive, cultural, biological, physical, and chemical weed control methods. (2 lecture, 3 lab hours) (Formerly PL PR 105)

106. Plant Pathology (3)

Prerequisite: BOT 10 or BIOL 10. Study of the causal agents, disease cycles, and control of plant diseases. (2 lecture, 3 lab hours) (Formerly PL PR 106)

107. Biological Control (3)

Prerequisite: PLT H 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) (Formerly PL PR 107)

108. Integrated Pest Management (3)

Prerequisite: PLT H 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) (Formerly PL PR 108)

109. Diagnosis of Plant Diseases (3)

Prerequisite: PLT H 106 or concurrently. Techniques for the diagnosis of specific diseases in field, greenhouse, and laboratory settings. Students will practice diagnostic techniques for the major plant diseases occurring in California. (2 lecture, 3 lab hours) (Formerly PL PR 109)

Soil and Water (SW)**1. Introduction to Irrigated Soils (3)**

Prerequisites: introductory chemistry and/

or physics. 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. (2 lecture, 3 lab hours) (Formerly SI 1)

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) (Formerly SI 2)

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. (Formerly SI 100)

100L. Soils Lab (1)

Prerequisite: SW 100 or concurrently. Physical, chemical, and biological analysis. Interpretation of field and laboratory data. (3 lab hours) (Saturday field trip) (Formerly SI 100L)

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) (Formerly SI 101)

102. Soil Classification and Conservation (3)

Prerequisite: SW 100. Influence of environmental factors on soil development; description of soil profiles; interpretation of soil maps; conservation practices relating to irrigation, drainage and erosion control. Saturday field trips required. (2 lecture, 3 lab hours) (Formerly SI 102)

104. Soil and Water Management (4)

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. (3 lecture, 3 lab hours) (Formerly SI 104)

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. This course may be supplemented with optional labs in agricultural systems (SW 111AG) or landscape systems (SW 111OH). (Formerly SI 111)

111AG. Agricultural Irrigation Lab (1)
Prerequisite: SW 111 or concurrently. Field experience in planning, installing, and evaluating irrigation systems for agricultural applications. (3 lab hours) (Formerly SI 111AG)

111OH. Ornamental Horticulture Irrigation Lab (1)
Prerequisite: SW 111 or concurrently. Field experience in planning, installing, and evaluating irrigation systems for landscape and other ornamental horticultural applications. (3 lab hours) (Formerly SI 111OH)

114. Pumps and Motors (3)
Operation and study of centrifugal and deep well turbines; testing of pumps and motors under operating conditions to determine efficiency; installation, protective devices, maintenance, and proper selection of single- and three-phase motors used on the farm. (2 lecture, 3 lab hours) (Formerly SI 114)

Viticulture/Tree Fruit (VTF)

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

101. Principles of Viticulture (4)
Prerequisite: BOT 10 or BIOL 10 or VTF 1. Current status and future of the grape industry. Characteristics and identification of leading raisin, table, wine and rootstock varieties. Growth and physiology of the grapevine. Climatic and soil requirements for grape growing. Principles and practices of vineyard fertilization, irrigation and pruning. (3 lecture, 3 lab hours)

102. Advanced Viticulture (3)
Prerequisite: VTF 101. Planning of new vineyards. Vine propagation, planting and training. Recent developments in viticultural practices, with emphasis on table and wine grape production. (2 lecture, 3 lab hours)

103. Raisin Production and Processing (2)
Prerequisite: BOT 10 or BIOL 10 or VTF 1. Principles and practices of raisin production; sun drying, mechanical dehydration, on-the-vine drying; new raisin processes to produce new products. (1 lecture, 3 lab hours)

105. Production and Marketing of Table Grapes (2)
Prerequisite: VTF 101. An overview of the table grape industry in California. Major table grape growing regions in the world, U.S., and California. Varietal adaptation to climate and soils. Cultural practices and vineyard management. Post-harvest technology and marketing strategies. Field trips. (1 lecture, 3 lab hours) (Formerly PLANT 170T)

106. Winegrape Production (2)
Prerequisite: VTF 101. Advanced viticulture course in the science of winegrape production. Covers the basics and advanced technology of winegrape growing for wine production. (1 lecture, 3 lab hours) (Formerly PLANT 170T)

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

112. Principles of Pomology (3)
Prerequisite: BOT 10 or BIOL 10 or VTF 1. Pruning, fruit and vegetative development, pollination, rootstocks; propagation, and nutrition. Crop cultural practices. (2 lecture, 3 lab hours)

113. Subtropical and Tropical Fruits (3)
Prerequisite: BOT 10 or BIOL 10 or VTF 1. Geographic distribution, climatic and soil adaptation of subtropical and tropical fruit crops. Fruit and vegetative development and cultural practices for globally important fruit crops. Emphasis on citrus, avocado, banana, mango, olive, and pineapple. (2 lecture, 3 lab hours)

114. Postharvest Handling of Perishable Crops (3)
Prerequisite: BOT 10 or BIOL 10. Physiological aspects of fruit maturation and ripening. Principles of postharvest handling of fruit and vegetables for the fresh market as they apply to harvesting, packaging, storage, and transportation. (2 lecture, 3 lab hours) (2-day field trip fee, \$75)

Mechanized Agriculture (ME AG)

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

1. Introduction to Agricultural Mechanics (3)
Selection, care, and use of common farm tools, projects of wood and metal; mechanical skills in the field of agriculture. (2 lecture, 3 lab hours) (Course fee, \$25) (Formerly AET 1)

3. Farm Tractors and Equipment (3)

Operation and maintenance of farm tractors; operation of farm tractors and equipment under field conditions; service, maintenance and minor repair of engines of wheel and crawler type. (2 lecture, 3 lab hours; 5 hours field operation) (Formerly AET 3)

5. Power Equipment Safety (1)
Safety training for operation of power equipment. Meets requirements of Senate Bill 198 and University Farm Laboratory (UFL) for classroom safety instruction on using tractors and similar power equipment. Satisfactory completion meets safety training portion requirement of the UFL Tractor License. (16 hours, meets four consecutive times) *CR/NC* grading only. (Formerly PLANT 170T)

20. Farm Machinery and Equipment (3)
The study of basic functions and applications of farm machinery and equipment. Operation, adjustment and maintenance of farm 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)

50. Metallurgical Processes (3)
(Same as I T 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, \$7) (Formerly AET 50)

53. Basic Electricity (3)
(See I T 52.)

103. Electro-Hydraulics (3)
Prerequisites: ME AG 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) (Formerly AET 103)

112. Power Systems Technology (3)
Prerequisite: ME AG 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) (Formerly AET 112)

113. Power Transmissions (3)
Prerequisite: ME AG 3. Theory and operation of electro-hydraulic assist transmis-

sions, 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) (Formerly AET 113)

114. Small Gasoline and Diesel Engines (3)

Prerequisite: ME AG 1. Theory of operation, maintenance, and repair of small gasoline and diesel internal combustion engines. (2 lecture, 3 lab hours) (Formerly AET 114)

120. Advanced Farm Machinery (3)

Prerequisite: ME AG 3. Theory, operation, and management economics of planters, tillage tools, harvesting and spraying equipment. Managerial responsibilities under State and Federal mandates will be emphasized. (2 lecture, 3 lab hours)

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)

200. Biometrics in Agriculture (3)

Prerequisites: PLANT 99, AG EC 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.

201. Agricultural Laboratory Techniques (3)

Prerequisite: One of the following courses: BOT 130; CHEM 105, 109, 151; 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)

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 *SP* grading.

Plant Science (PLANT)

250T. Topics in Plant Science (3; max total 12)

Prerequisites: upper-division plant science appropriate to study topic; permission of instructor. Advanced studies in a given area: crop physiology, plant breeding, plant pathology, plant nutrition, or economics. Topics may require lab hours.

252. Plant Nutrition (3)

Prerequisite: BOT 130. Mineral requirements of plants; the acquisition and translocation of nutrients by higher plants and the role of nutrient elements in plant development. (2 lecture, 3 lab hours)

253. Soil-Water Relationships (3)

Prerequisite: SW 2. Effect of irrigation water quality on soil properties and plant growth. Management alternatives for salinity and toxicity problems. Suitability of using waste waters for irrigation. (2 lecture, 3 lab hours)

254. Plant Hormones and Regulators (3)

Prerequisites: BOT 130, CHEM 8. History of discovery, chemical nature, extraction, and identification of naturally occurring hormones. Physiological and biochemical effects of plant growth substances and hormones. Mechanism of action of auxins, gibberellins, cytokinins, inhibitors (A.B.A.), ethylene, and other hormones. Agricultural impacts of growth regulators. (2 lecture, 3 lab hours)

255. Advanced Plant Breeding (3)

Prerequisites: BIOSC 140A-B; GENET 120. Principles and techniques of plant improvement, breeding methods, combining ability, sterility systems, quantitative genetic analysis, heritability estimates, experimental designs for plant breeding.

256. Plant-Water Relationships (3)

Prerequisite: BOT 130. Physicochemical properties of water and solutions; movement of water, solutes, and growth regulators in plants; study of moisture-sensitive periods of various crops; factors affecting water absorption and retention.

257. Physiology of Cultivated Plants (3)

Prerequisite: BOT 130. 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.

258. Plant Disease Control (3)

Prerequisite: PLT H 106. Principles of plant disease control. Methods and theory used in application of chemicals, biological control and breeding for resistance. Insight into industrial research and development of control measures. (2 lecture, 3 lab hours)

261. Advanced Pest Management (3)

Prerequisite: PLT H 108 or permission of instructor. Comprehensive study of anthropol, disease, and weed pest problems in important California cropping systems. Examination of complex relationships among crop plants, herbivores, and other components of these agro-ecosystems leads to design of management programs that are both economically viable and ecologically sound.

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

Prerequisite: permission of instructor. Reviews of published and/or original research in the broad areas of crop science, soil and water relations, and plant health.

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

See *Academic Placement — Independent Study*. Approved for *SP* grading.

299. Thesis (3)

Prerequisite: prior advancement to candidacy. See *Criteria for Thesis and Project*. Preparation, completion, and submission of an acceptable thesis for the master's degree. Oral defense of thesis required. Approved for *SP* grading.

IN-SERVICE COURSE

(See *Course Numbering System*.)

Agriculture (AGRI)

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

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