

HORTICULTURE

Horticulture involves the production, genetic improvement, storage, and marketing of fruits, nuts, vegetables, flowers, and vegetable crops; and the design, construction, and management of landscape plantings such as parks, gardens, golf courses, restoration projects, and sports fields. It is a science, an art, an avocation, and a business.

Horticultural and other high-value specialty crops are the largest components of Oregon's agricultural industry. Landscape horticulture is a rapidly expanding service industry in the urban areas of the Pacific Northwest and throughout the nation. Excellent and varied career opportunities exist for college graduates in both crop and landscape horticulture.

The undergraduate program provides students with a solid background in the fundamental life and physical sciences, as well as an understanding of the technologies and management systems used in the horticultural industry. Problem-solving and decision-making skills are stressed, as is student involvement. Field trips are an important component of many of the courses.

The program has seven options:

1. *Ecological Management of Turf, Landscape & Urban Horticulture*
2. *General Horticulture (Online)*
3. *Horticultural Research*
4. *Plant Breeding and Genetics*
5. *Sustainable Horticultural Production*
6. *Therapeutic Horticulture*
7. *Viticulture and Enology*

The **Ecological and Sustainable Horticultural Production** option prepares students for careers dealing directly or indirectly with the production, breeding, post-harvest handling, marketing, and scientific study of horticultural crops.

The **General Horticulture** is an online option and is especially recommended for students already working in the horticultural industry, whose careers will benefit from post-secondary education in the horticultural sciences.

The **Horticultural Research** option prepares students to assist in research or to pursue graduate studies.

The **Plant Breeding and Genetics** option provides an interdisciplinary approach to applied plant breeding and practical experience in breeding and genetic analysis working in the greenhouse, field, and laboratory.

The **Sustainable Horticultural Production** option prepares students for careers dealing directly or indirectly with the production, breeding, post-harvest handling, marketing, and scientific study of horticultural crops.

The **Therapeutic Horticulture** option prepares students to design healing and adapted gardens and to provide therapy programs used to improve the quality of people's lives.

The **Viticulture and Enology** option prepares students for careers in Oregon's growing vineyard and winery industry.

All options allow the student considerable flexibility to pursue a minor or to tailor course work to meet individual goals. Qualified students interested in the business aspects of horticulture are encouraged to

pursue a minor in business. All undergraduates are required to complete either an approved internship or an undergraduate research project.

A high school student preparing for the program should follow a well-balanced college preparatory curriculum. Course work in biology, chemistry, and mathematics is strongly recommended. Course work in the social sciences, humanities, arts, and foreign languages is also encouraged, and the student should develop public speaking and writing abilities.

The program was designed to facilitate timely completion of degree requirements by transfer and postbaccalaureate students. Students intending to transfer into the program from a two- or four-year institution should complete as many of the lower-division requirements as possible. Some professional-technical courses from community colleges may be equivalent to lower-division horticulture courses. Equivalent credit can be given for such courses. Contact a departmental advisor for further information.

For additional information about the program, contact one of the undergraduate advisors: Kelly Donegan (head advisor, all options) and Sarah McDonald (advisor for the General Horticulture option).

Undergraduate Program

Major

- Horticulture (BS, HBS) (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/horticulture-bs-hbs>)

Options

- *Ecological Management Turf, Landscape & Urban Horticulture* (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/horticulture-bs-hbs/eco-management-turf-landscape-urban-hort/#requirementstext>)
- *General Horticulture* (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/horticulture-bs-hbs/general-horticulture-option>) (*Online*)
- *Horticultural Research* (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/horticulture-bs-hbs/horticultural-research-option>)
- *Plant Breeding and Genetics* (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/horticulture-bs-hbs/plant-breeding-genetics-option>)
- *Sustainable Horticultural Production* (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/horticulture-bs-hbs/sustainable-hort-prod>)
- *Therapeutic Horticulture* (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/horticulture-bs-hbs/therapeutic-horticulture-option>)
- *Viticulture and Enology* (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/horticulture-bs-hbs/viticulture-enology-option>)

Minors

- Entomology (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/entomology/entomology-minor>) (Administered by the Department of Horticulture in the College of Agricultural Sciences.)
- Horticulture (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/horticulture-minor>)

- Turf and Landscape Management (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/turf-landscape-management-minor>)

Graduate Programs

Major

- Horticulture (MS, PhD, MAIS) (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/horticulture-ms-phd-mais>)

Options

- Entomology
- Plant Breeding and Genetics

Minor

- Horticulture (<http://catalog.oregonstate.edu/college-departments/agricultural-sciences/horticulture/horticulture-graduate-minor>)

Bill Braunworth, Department Head

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Faculty

Professors Bell, Long, Mehlenbacher, Myers, Strik

Associate Professors Andrews, Braunworth, Bubl, Castagnoli, Contreras, Deluc, Detweiler, Kaiser, Lambrinos, Langelotto, W. Miller, Nonogaki, Peachey, Renquist, Rosetta, Skinkis, Stone, Walton, Yang
Assistant Professors Albert, Bouska, Choate, Coop, Edmunds, Formiga, Garrett, Hooven, Kowalewski, Levin, Lukas, Melathopoulos, Moretti, Nackley, Powell, Sagili, Sanchez, Stoven, Vining, Wang, Wiman
Instructors Bonady, Danler, Dixon, Donegan, Lemein, B. Miller, Millison, Shay, Stephan

Courtesy Faculty

Bassil, Bryla, Chernoh, Choi, Einhorn, Finn, Golembiewski, Griesbach, Hedstrom, Hummer, Jeknic, Jana Lee, Jung-Min Lee, Martin, Owen Jr., Peters, Reed, Scagel, Schreiner, Seiter, Tarara

Adjunct Faculty

Bondi, Kennedy, Landgren, Stephenson

Crop Science

CROP 101. INTRODUCTION TO CROP, SOIL, AND INSECT SCIENCE. (1 Credit)

Introduces students with interests in crop, soil, and insect sciences to educational and professional opportunities in these disciplines. Speakers will discuss opportunities in research and academia as well as in the applied professional job market. Open to all students. CROSSLISTED as ENT 101, SOIL 101.

CROP 199. SPECIAL STUDIES: ISSUES IN SUSTAINABLE AGRICULTURE. (1-16 Credits)

Invited speakers present seminars on specific aspects of agriculture relating to sustainability. Topics vary from term to term and year to year. May be repeated for credit when topics differ.
This course is repeatable for 16 credits.

CROP 200. CROP ECOLOGY AND MORPHOLOGY. (3 Credits)

An introduction to the concepts and principles of crop ecology and morphology and a foundation for other crop science courses. Examines the dynamics and function of crop communities, and the biotic and environmental interactions that influence productivity. Fundamentals of the developmental morphology of crop seeds, seedlings, and plants. Morphological features of seeds and plants in relation to the identification of crop families and species of economic importance.

CROP 280. INTRODUCTION TO THE COMPLEXITY OF OREGON CROPPING SYSTEMS. (4 Credits)

An introduction to field cropping systems of western Oregon. Provides students with a broad overview of the complexity of cropping systems and the knowledge required to grow and produce a crop—plant physiology, seed biology, plant pathology, soil fertility, entomology, and weed science. Students will observe a crop under different management strategies to enhance understanding of management approaches.

CROP 300. CROP PRODUCTION IN PACIFIC NORTHWEST AGROECOSYSTEMS. (4 Credits)

Relation of crop production to human culture and the natural environment. Origins of agriculture and the processes of agricultural change, and productivity and sustainability of specific crop production systems in the Pacific Northwest. History, geography, resource requirements, and key challenges faced are presented. Fundamental crop production practices in relation to productivity and sustainability. Lec/lab/rec. CROSSLISTED as HORT 300.

Recommended: One year of general biology

CROP 310. FORAGE PRODUCTION. (4 Credits)

Importance of, and current production practices for, forage crops. Lec/lab.

Recommended: (CSS 300 or CROP 300 or HORT 300) and (CSS 305 or CSS 205 or SOIL 205)

CROP 319. PRINCIPLES OF FIELD CROP PRODUCTION. (3 Credits)

Provides students with an understanding of the basic principles of field crop production—tillage, soil testing, fertilization, variety selection, planting, and in-season crop management. Management practices for wheat, corn and soybean as .

Recommended: CROP 280 and SOIL 205

CROP 330. *WORLD FOOD CROPS. (3 Credits)

Origin, production, utilization, and improvement of the world's major food crops. The role of crop production in global economic and social development; food security and worldwide nutritional requirements. (Bacc Core Course)

Attributes: CSGI – Core, Synth, Global Issues

Recommended: CSS 200 or CROP 200

CROP 340. *PENS AND PLOWS: WRITINGS OF WORKING THE LAND. (3 Credits)

A survey of literature from ancient Greece to the twentieth century focusing on the significance of agricultural life and/or the natural world. Students read and discuss writings considered critical in the development of Western culture and receive input on the literary significance and the accuracy of agriculture presented within the readings. (Bacc Core Course) Taught via Ecampus only.

Attributes: CPWC – Core, Pers, West Culture

CROP 355. ORGANIC CERTIFICATION. (3 Credits)

Learn about the USDA National Organic Program (NOP) standards relating to certified operations, inspection, certification processes, and labeling. Focus on the crops, processing, and livestock aspects of organic certification for farms and food manufacturing operations.

CROP 401. RESEARCH. (1-16 Credits)

This course is repeatable for 16 credits.

CROP 403. THESIS. (1-16 Credits)

Independent, original study and preparation of a senior thesis.

This course is repeatable for 16 credits.

CROP 405. READING AND CONFERENCE. (1-16 Credits)

Equivalent to: CROP 405H, CSS 405

This course is repeatable for 16 credits.

CROP 405H. READING AND CONFERENCE. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: CROP 405, CSS 405H

This course is repeatable for 16 credits.

CROP 407. SEMINAR. (1 Credit)

Senior seminar intended to instruct students on proper techniques for presentation of scientific material. Each student is expected to prepare and present a scientific seminar and to submit written documentation supporting that seminar.

CROP 410. INTERNSHIP. (1-6 Credits)

Professional work experience previously approved and supervised by the department, written report required.

This course is repeatable for 12 credits.

CROP 414. PRECISION AGRICULTURE. (4 Credits)

Provides insight into the technology available to support precision agriculture and data management planning applications. Examines the concepts and applications of precision agriculture to teach practical use of hardware, equipment and software. An overview of current technology including autonomous vehicles, GPS, soil and crop proximal sensors, imagery and mapping, variable rate control systems, and yield monitors. Lec/lab. CROSSLISTED as HORT 414.

Equivalent to: HORT 414

CROP 418. TOXIC PLANTS IN PNW PASTURES. (1 Credit)

Identifying and understanding ecology and biology of harmful weeds and poisonous plants found in Pacific Northwest pastures and rangelands and determining best management and control options. Taught via Ecampus only.

Recommended: College-level plant biology and/or taxonomy courses.

CROP 420. SEED SCIENCE AND TECHNOLOGY. (3 Credits)

Seed formation and factors affecting their development and maturation. Seed structure and chemical composition. Physiological and biochemical aspects of seed germination, dormancy, deterioration and storability. The concept of seed quality, its importance in agriculture, its attributes and impact on field performance. Methods of measuring seed quality of conventional and genetically modified seeds. Taught via Ecampus only.

Recommended: Biology, plant anatomy and/or physiology courses

CROP 433. SYSTEMATICS AND ADAPTATION OF VEGETABLE CROPS. (4 Credits)

Covers the botanical and taxonomic relationships, breeding systems and adaptation of vegetable crops. Fresh material is used to illustrate varietal differences and traits of importance. Lec/lab. Offered even years. CROSSLISTED as HORT 433/HORT 533.

Prerequisites: BI 102 with D- or better or BI 213 with D- or better or BI 311 with D- or better or HORT 430 with D- or better or CSS 430 with D- or better or PBG 430 with D- or better or HORT 450 with D- or better or CSS 450 with D- or better or PBG 450 with D- or better

CROP 440. WEED MANAGEMENT. (4 Credits)

Principles of weed control by cultural, biological, and chemical means; weed identification; introduction to herbicides and factors influencing their use. Lec/lab/rec.

Recommended: One year biological science and one course in organic chemistry.

CROP 460. SEED PRODUCTION. (3 Credits)

An introduction to principles and practices of seed-based genetic delivery systems. Fundamentals of seed crop biology, cultivar maintenance and production methods are stressed. Concepts are illustrated using Pacific Northwest seed crops.

Recommended: CROP 200 or CSS 200

CROP 463. SEED BIOLOGY. (3 Credits)

Information about reproductive development of plants such as pollination and fertilization, which is important for the initiation of seed formation, will be provided. Embryo and endosperm development as well as accumulation of seed storage materials, which are major events during seed development, will be covered, as well as the dormancy and germination mechanisms in mature seeds. Lectures and discussions (presentations required for graduate students). Offered even years.

CROSSLISTED as HORT 463/HORT 563. Lec/lab.

Equivalent to: HORT 463

CROP 470. OILSEEDS AND ESSENTIAL OIL CROPS. (3 Credits)

Provides students with an understanding of the principles and the latest research information of field crop production, chemistry, oil extraction and utilization of OEOC. Includes the importance of OEOC, their uses, current trends, production systems for major crops, harvesting, drying, processing, and other post-harvest operations, fixed (fatty acid) and essential oil extraction methods, and oil utilization. Relevant recent research and review papers will be also included and the information discussed and assessed.

Prerequisites: CROP 200 with D- or better

CROP 480. CASE STUDIES IN CROPPING SYSTEMS MANAGEMENT. (4 Credits)

Decision cases involving the production of field and horticultural crops; individual and group activities; discussion of the decision-making process. Multiple field trips required. A field trip fee will be charged.

CROSSLISTED as HORT 480/HORT 580.

Equivalent to: HORT 480

Recommended: CROP 300 or HORT 300

CROP 499. SPECIAL TOPICS IN CROP SCIENCE AND SOIL SCIENCE. (1-16 Credits)

Technical knowledge and skills development courses offered in a wide array of course formats. Topics vary from term to term and year to year. May be repeated for credit when topics differ.

Equivalent to: CROP 499H

This course is repeatable for 16 credits.

CROP 499H. SPECIAL TOPICS IN CROP SCIENCE AND SOIL SCIENCE. (1-16 Credits)

Technical knowledge and skills development courses offered in a wide array of course formats. Topics vary from term to term and year to year. May be repeated for credit when topics differ.

Attributes: HNRS – Honors Course Designator

Equivalent to: CROP 499

This course is repeatable for 16 credits.

CROP 501. RESEARCH. (1-16 Credits)

This course is repeatable for 16 credits.

CROP 503. THESIS. (1-16 Credits)

This course is repeatable for 999 credits.

CROP 505. READING AND CONFERENCE. (1-16 Credits)

This course is repeatable for 16 credits.

CROP 506. PROJECTS. (1-16 Credits)

This course is repeatable for 16 credits.

CROP 507. SEMINAR. (1 Credit)

Graded P/N.

This course is repeatable for 99 credits.

CROP 509. PRACTICUM IN TEACHING. (1-3 Credits)

Developing skills and competence in teaching under staff supervision; organization and presentation of instructional material by assisting in laboratory, recitation, and lectures. CROSSLISTED as ENT 509, PBG 509, SOIL 509.

Equivalent to: ENT 509, PBG 509, SOIL 509

This course is repeatable for 9 credits.

CROP 514. PRECISION AGRICULTURE. (4 Credits)

Provides insight into the technology available to support precision agriculture and data management planning applications. Examines the concepts and applications of precision agriculture to teach practical use of hardware, equipment and software. An overview of current technology including autonomous vehicles, GPS, soil and crop proximal sensors, imagery and mapping, variable rate control systems, and yield monitors. Lec/lab.

CROP 520. SEED SCIENCE AND TECHNOLOGY. (3 Credits)

Seed formation and factors affecting their development and maturation. Seed structure and chemical composition. Physiological and biochemical aspects of seed germination, dormancy, deterioration and storability. The concept of seed quality, its importance in agriculture, its attributes and impact on field performance. Methods of measuring seed quality of conventional and genetically modified seeds. Taught via Ecampus only.

Recommended: Biology, plant anatomy and/or physiology courses

CROP 530. ORGANIC SOIL AND CROP MANAGEMENT. (3 Credits)

Overview of organic soil and crop management, organic soil system management, soil microbiology under organic systems, cropping systems, organic cereal production systems, organic forage production system, organic horticultural systems management, organic field and horticulture cropping systems; recent research and case studies. CROSSLISTED AS SOIL 530.

Equivalent to: SOIL 530

Recommended: SOIL 525, CROP 200, SOIL 205 or introductory biology.

Completion or concurrent enrollment in AGRI 520

CROP 533. SYSTEMATICS AND ADAPTATION OF VEGETABLE CROPS. (4 Credits)

Covers the botanical and taxonomic relationships, breeding systems and adaptation of vegetable crops. Fresh material is used to illustrate varietal differences and traits of importance. Lec/lab. CROSSLISTED as HORT 433/HORT 533.

Recommended: BI 102 or BI 213 or BI 311 or HORT 430 or CSS 430 or PBG 430 or HORT 450 or CSS 450 or PBG 450

CROP 540. WEED MANAGEMENT. (4 Credits)

Principles of weed control by cultural, biological, and chemical means; weed identification; introduction to herbicides and factors influencing their use. Lec/lab/rec.

Recommended: One year biological science and one course in organic chemistry.

CROP 560. SEED PRODUCTION. (3 Credits)

An introduction to principles and practices of seed-based genetic delivery systems. Fundamentals of seed crop biology, cultivar maintenance and production methods are stressed. Concepts are illustrated using Pacific Northwest seed crops.

Recommended: CROP 200 or CSS 200

CROP 563. SEED BIOLOGY. (3 Credits)

Information about reproductive development of plants such as pollination and fertilization, which is important for the initiation of seed formation, will be provided. Embryo and endosperm development as well as accumulation of seed storage materials, which are major events during seed development, will be covered, as well as the dormancy and germination mechanisms in mature seeds. Lectures and discussions (presentations required for graduate students). Offered even years. CROSSLISTED as HORT 463/HORT 563. Lec/lab.

Equivalent to: HORT 563

CROP 570. OILSEEDS AND ESSENTIAL OIL CROPS. (3 Credits)

Provides students with an understanding of the principles and the latest research information of field crop production, chemistry, oil extraction and utilization of OEOC. Includes the importance of OEOC, their uses, current trends, production systems for major crops, harvesting, drying, processing, and other post-harvest operations, fixed (fatty acid) and essential oil extraction methods, and oil utilization. Relevant recent research and review papers will be also included and the information discussed and assessed.

Prerequisites: CROP 200 with D- or better

Recommended: Horticulture, biology or chemistry course

CROP 580. CASE STUDIES IN CROPPING SYSTEMS MANAGEMENT. (4 Credits)

Decision cases involving the production of field and horticultural crops; individual and group activities; discussion of the decision-making process. Multiple field trips required. A field trip fee will be charged. CROSSLISTED as HORT 480/HORT 580.

Equivalent to: HORT 580

Recommended: CROP 300 or HORT 300

CROP 590. EXPERIMENTAL DESIGN IN AGRICULTURE. (4 Credits)

Field layout, analysis, and interpretation of basic experimental designs used in agronomy and plant breeding and including field plot techniques such as optimum plot size and shape, factorial arrangement, replication, sub-sampling, randomization, and blocking. Recitation provides practical experience with SAS. Lec/rec.

Recommended: ST 351

CROP 599. SPECIAL TOPICS IN CROP SCIENCE AND SOIL SCIENCE. (0-16 Credits)

Technical knowledge and skills development courses offered in a wide variety of course formats. Topics vary from term to term and year to year. May be repeated for credit when topics differ.

This course is repeatable for 16 credits.

CROP 601. RESEARCH. (1-16 Credits)

This course is repeatable for 16 credits.

CROP 603. THESIS. (1-16 Credits)

This course is repeatable for 999 credits.

CROP 605. READING AND CONFERENCE. (1-16 Credits)

This course is repeatable for 16 credits.

CROP 606. PROJECTS. (1-16 Credits)

This course is repeatable for 16 credits.

CROP 607. SEMINAR. (1 Credit)

Graded P/N.

This course is repeatable for 99 credits.

CROP 608. WORKSHOP. (1-16 Credits)

This course is repeatable for 16 credits.

CROP 609. PRACTICUM IN TEACHING. (1-3 Credits)

Developing skills and competence in teaching under staff supervision; organization and presentation of instructional material by assisting in laboratory, recitation, and lectures. Graded P/N.

Equivalent to: ENT 609, PBG 609, SOIL 609

This course is repeatable for 9 credits.

CROP 660. HERBICIDE SCIENCE. (4 Credits)

Absorption, movement, and mechanism of action in plants; behavior of herbicides in soil. Offered alternate years.

Recommended: BOT 331 and (CSS 440 or CSS 540 or CROP 440 or CROP 540)

CROP 670. PHYSIOLOGY OF CROP YIELD. (3 Credits)

Concepts of crop growth and production in relation to environmental and physiological factors and their interactions; current literature.

Recommended: BOT 331

CROP 699. SPECIAL TOPICS IN CROP SCIENCE AND SOIL SCIENCE. (1-16 Credits)

This course is repeatable for 16 credits.

Horticulture

HORT 112. INTRODUCTION TO HORTICULTURAL SYSTEMS, PRACTICES AND CAREERS. (2 Credits)

Overview of horticultural systems and practices, with an emphasis on the Pacific Northwest. Exploration of career opportunities in horticulture. Includes viticulture, environmental landscaping, turf management, greenhouse and nursery production, farming, education, and research. Required field trips.

HORT 199. SPECIAL TOPICS. (1-16 Credits)

Equivalent to: HORT 199H

This course is repeatable for 16 credits.

HORT 199H. SPECIAL TOPICS. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: HORT 199

This course is repeatable for 16 credits.

HORT 212. INTRODUCTION TO ORGANIC AGRICULTURAL SYSTEMS. (4 Credits)

An introduction to organic agricultural systems with a focus on history, regulations, principles and practices, performance, trends, and careers.

HORT 217. *SOCIAL IMPACTS OF SCIENCE. (3 Credits)

Contemporary societies provide funding for scientific research, at the same time they struggle with existing and emerging societal problems. This course will discuss how social problems can be addressed by science and technology, and how the impacts of research are quantified. (Bacc Core Course)

Attributes: CPSI – Core, Pers, Soc Proc & Inst

HORT 226. LANDSCAPE PLANT MATERIALS I: DECIDUOUS HARDWOODS AND CONIFERS. (4 Credits)

Identification of trees, shrubs, vines, and ground covers used in landscape horticulture. Basic plant taxonomy, nomenclature, anatomy, and use of plants in the landscape. Diverse plant material covered with an emphasis on deciduous hardwoods and conifers.

HORT 228. LANDSCAPE PLANT MATERIALS II: SPRING FLOWERING TREES AND SHRUBS. (4 Credits)

Identification of trees, shrubs, vines, and ground covers used in landscape horticulture. Basic plant taxonomy, nomenclature, anatomy, and use of plants in the landscape. Diverse plant material covered with an emphasis on spring flowering trees and shrubs. Lec/rec.

HORT 251. TEMPERATE TREE FRUIT, BERRIES, GRAPES, AND NUTS. (2 Credits)

Covers fruit and nut crops for temperate zones. Emphasis placed on scientific and common names, plant adaptation, basic morphology, major cultivars, and markets. Offered alternate years.

HORT 255. HERBACEOUS ORNAMENTAL PLANT MATERIALS. (3 Credits)

Identification and culture of herbaceous plants used in the landscape. Offered via Ecampus only.

HORT 260. ORGANIC FARMING AND GARDENING. (3 Credits)

Organic farming and gardening methods are discussed in class and practiced in the field. The philosophical background of organic farming as well as the biological, environmental and social factors involved in organic food production are covered. Emphasis is on hands-on application of scientific principles to create sustainable food production systems. Lec/lab.

HORT 270. INTRODUCTION TO THERAPEUTIC HORTICULTURE. (2 Credits)

An introduction to the history, benefits, and methods of therapeutic horticulture. Surveys program models for vocational, social/recreational, wellness and therapeutic applications of horticulture.

HORT 271. TECHNIQUES AND ADAPTIVE STRATEGIES IN THERAPEUTIC HORTICULTURE. (2 Credits)

An introduction to the characteristics of therapeutic gardens. Survey of year-round, indoor and outdoor therapeutic horticultural programming adaptations, strategies and techniques for different special populations. **Prerequisites:** HORT 270 with D- or better

HORT 272. BASIC THERAPEUTIC SKILLS I. (2 Credits)

The assessment and evaluation process in therapeutic horticulture. Development of communication strategies, helping skills, and horticultural skills for therapeutic situations.

Prerequisites: HORT 271 with D- or better

HORT 273. BASIC THERAPEUTIC SKILLS II. (2 Credits)

Assessment and documentation tools in therapeutic horticulture. Treatment issues related to different types of physical and mental issues. Conduct and evaluate therapeutic horticultural activity sessions.

Prerequisites: HORT 272 with D- or better

HORT 274. THERAPEUTIC HORTICULTURAL PROGRAMS FOR OLDER ADULTS/CHILDREN. (2 Credits)

Benefits and applications of therapeutic horticulture to older adults and special needs children.

Prerequisites: HORT 273 with D- or better

HORT 275. THERAPEUTIC GARDEN DESIGN, MAINTENANCE AND PROGRAMMING. (2 Credits)

The history, characteristics and design of the therapeutic garden. The use of the garden in therapeutic horticultural programming.

Prerequisites: HORT 274 with D- or better and HORT 280 [D-]

HORT 285. PERMACULTURE DESIGN AND THEORY: CERTIFICATE COURSE. (4 Credits)

Permaculture design course meets internationally recognized standards for certification. Lectures, hands-on activities, experiential learning, group discussions, readings, student projects and presentations. Two mandatory weekend days. Design intensive, utilizing graphic and verbal presentation skills. Research into other functioning permaculture systems through literature, websites, and as observed on field trips. Lec/lab.

This course is repeatable for 8 credits.

HORT 299. SPECIAL TOPICS. (0-16 Credits)

Equivalent to: HORT 299H

This course is repeatable for 16 credits.

HORT 299H. SPECIAL TOPICS. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: HORT 299

This course is repeatable for 16 credits.

HORT 300. CROP PRODUCTION IN PACIFIC NORTHWEST AGROECOSYSTEMS. (4 Credits)

Relation of crop production to human culture and the natural environment. Origins of agriculture and the processes of agricultural change, and productivity and sustainability of specific crop production systems in the Pacific Northwest. History, geography, resource requirements, and key challenges faced are presented. Fundamental crop production practices in relation to productivity and sustainability. Lec/lab/rec. CROSSLISTED as CROP 300.

Equivalent to: CROP 300

Recommended: One year of general biology

HORT 301. GROWTH AND DEVELOPMENT OF HORTICULTURAL CROPS. (3 Credits)

Gain fundamental knowledge of plant growth and development of horticultural crops from a micro- to macro-level starting at double fertilization through fruit growth—covering seed-to-seed. The last section specifically examines how environmental factors affect growth and development. Lec/lab.

Recommended: General biology or botany sequence.

HORT 303. HORTICULTURAL PROJECTS. (2 Credits)

Student-managed crop production projects with emphasis on container grown, greenhouse crops. Crop scheduling, propagation and planting, selecting temperature and lighting regimes, specifying growth regulator applications, nutrient management, irrigation management, pest monitoring, and problem diagnosis and correction.

Recommended: HORT 301

HORT 306. INPUTS IN ORGANIC CROPPING SYSTEMS: SOURCING AND EFFICACY. (2 Credits)

Applied course focused on the regulation, sourcing, and efficacy of organic inputs including soil amendments, fertilizers, and pesticides. Gain experience using science-, practice-, and regulation-based information to source and determine effectiveness of inputs in certified organic cropping systems.

Prerequisites: HORT 212 with C- or better and CROP 355 [C-]

HORT 307. ORGANIC SYSTEM PREDICAMENTS. (3 Credits)

Analyze controversial organic agriculture and systems issues while developing critical- and systems-thinking skills. Synthesis of information from diverse sources and application of scientific knowledge will be required to recommend possible solutions to real world organic agriculture predicaments.

HORT 308. WEED MANAGEMENT IN ORGANIC CROPPING SYSTEMS. (3 Credits)

Applied organic weed identification and management course. Learn real-world application of science-, practice-, and regulation-based weed management information while designing and evaluating organic weed management plans for certified organic farming systems.

HORT 311. PLANT PROPAGATION. (4 Credits)

The regeneration of plants from vegetative and reproductive tissue and organs. Horticultural and physiological principles, methods, and techniques for laboratory, greenhouse nursery, field, and orchard.

Recommended: HORT 301

HORT 314. PRINCIPLES OF TURFGRASS MAINTENANCE. (4 Credits)

Identification and adaptation of common turfgrasses. Physiology of turfgrass growth and response to cultural and environmental stresses. Cultural practices including establishment, general maintenance, and pest control. Field trips required.

Recommended: (CSS 205 or CSS 305 or SOIL 205)

HORT 315. SUSTAINABLE LANDSCAPES: MAINTENANCE, CONSERVATION, RESTORE. (4 Credits)

Sustainable care and maintenance practices for non-turf landscape areas. Low input pruning, planting, fertilization, and pest control with an emphasis on IPM. Plant responses to stress, particularly those encountered in the urban environment. Outdoor labs required.

Recommended: Basic knowledge of plant physiology

HORT 316. PLANT NUTRITION. (4 Credits)

Basic concepts and principles of plant mineral nutrition that provide a basis for solving practical nutritional problems in horticultural crops. Areas covered include mineral nutrients, nutrient availability in the soil and plant uptake, nutrient deficiencies and toxicities and their causes and remedies, and plant and soil analysis. Lec/lab/rec.

Prerequisites: CSS 205 with D- or better or CSS 305 with D- or better or SOIL 205 with D- or better

HORT 318. *APPLIED ECOLOGY OF MANAGED ECOSYSTEMS. (3 Credits)

Survey of ecological processes in managed ecosystems emphasizing ecological management techniques. Ecosystem services; biodiversity management; weed dynamics; agroecology; urban ecology; restoration and mitigation; landscape management. Field trip required. (Writing Intensive Course)

Attributes: CWIC – Core, Skills, WIC

HORT 319. RESTORATION HORTICULTURE. (3 Credits)

As world population increases to some 9 billion plus by 2044, the importance of ecologically sound horticultural practices becomes increasingly apparent. Integration of ecological concepts and theory in management and development of created landscapes is critical for the preservation of many ecological services currently provided by undeveloped areas. Offered via Ecampus only.

Recommended: WR 121 with proficiency in writing skills and ability to communicate through writing. Basic ecology course or practical experience providing understanding of ecological principals and concepts

HORT 330. *PLAGUES, PESTS, AND POLITICS. (3 Credits)

Integration and interaction of agricultural and public health aspects of entomology in society and history. CROSSLISTED as ENT 300. (Bacc Core Course)

Attributes: CSST – Core, Synthesis, Science/Technology/Society

HORT 331. *POLLINATORS IN PERIL. (3 Credits)

Pollinators, human influences on pollination systems, and the potential consequences of pollinator decline. An introduction to the skills needed to investigate media reports and multidisciplinary scientific research. Effects of pesticides, habitat fragmentation, climate change, invasive species, pests, pathogens, and other threats to pollinators in critical natural and agricultural systems around the world. (Bacc Core Course) CROSSLISTED as ENT 331.

Attributes: CSGI – Core, Synth, Global Issues

Equivalent to: ENT 331

Recommended: Completion of a Baccalaureate Core biological science course.

HORT 344. INSECT AND DISEASE MANAGEMENT IN ORGANIC CROPPING SYSTEMS. (3 Credits)

A skills-based course on the science, practice, and regulations related to insect and disease management in organic cropping systems.

Prerequisites: BOT 350 with C- or better and ENT 311 [C-]

This course is repeatable for 3 credits.

HORT 349. DIAGNOSING PLANT PROBLEMS. (3 Credits)

Basic principles of problem diagnosis in crop, garden, and landscape plants are covered. Problems caused by cultural and environmental issues, plant diseases, insect pests, and other causes are addressed. Students will gain familiarity with resources for plant problem diagnosis. Offered via Ecampus only.

Recommended: Background in basic biology, plant pathology and/or entomology from a university or practical setting

HORT 350. URBAN FORESTRY. (3 Credits)

Introduction to principles and practices of planting and managing trees as a system of urban environment; understanding the economic, environmental, social aspects of urban forests, and an overview of contemporary land use issues and societal perspectives between people and plants. CROSSLISTED as FES 350. Offered via Ecampus only.

Equivalent to: FES 350, FOR 350

Recommended: Foundational forestry and horticulture courses

HORT 351. FLORICULTURE AND GREENHOUSE SYSTEMS. (4 Credits)

For students interested in growing plants in commercial or educational greenhouses. Actively explores the production and scheduling of floriculture crops for various markets. Combines the practical aspects of growing floral crops under environments created by traditional and technologically advanced greenhouses. Greenhouse structures and crop environment manipulation will be emphasized. Students actively manage a floriculture crop and are responsible for developing and implementing production schedules, and for making key decisions on the culture of diverse floral crops.

Recommended: HORT 301

HORT 358. LANDSCAPE CONSTRUCTION TECHNIQUES. (4 Credits)

Study of landscape construction process from initial site analysis to finished landscape. Techniques used in building hardscape and landscape areas. Field trips required. Lec/lab.

HORT 360. IRRIGATION AND DRAINAGE. (4 Credits)

Familiarizes students with the principles and practices of irrigation and drainage systems. Optimum use of water, irrigation and drainage system design, installation, repairs, and troubleshooting are emphasized. Lec/lab.

HORT 361. PLANT NURSERY SYSTEMS. (4 Credits)

Covers how to grow shrubs and trees, and herbaceous annuals and perennials in nurseries for use in urban landscapes and managed ecosystems such as forestry and restoration. Plant nursery systems are diverse and require intensive management involving a dynamic decision making process. This course actively explores field and container production systems as well as the marketing of plants, an overview of plant growth regulation and post-production handling, the influence of efficient production practices on plant quality, integrating pest management strategies, and natural resource utilization.

Recommended: HORT 301

HORT 380. SUSTAINABLE LANDSCAPE DESIGN. (3 Credits)

The assessment of design problems/situations, the development of solutions and the communication of those solutions to the client through the design. Specific topics include designing for ecosystem maintenance/enhancement, introduction to computer-aided design (CAD), using color in landscape designs and rendering section/elevation views.

HORT 399. SPECIAL TOPICS. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 401. RESEARCH. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 402. INDEPENDENT STUDY. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 403. THESIS. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 405. READING AND CONFERENCE. (1-16 Credits)

Equivalent to: HORT 405H

This course is repeatable for 16 credits.

HORT 405H. READING AND CONFERENCE. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: HORT 405

This course is repeatable for 16 credits.

HORT 406. PROJECTS: DATA PRESENTATIONS. (1 Credit)

For any student doing research, to learn to develop and evaluate poster and slide presentations containing scientific data. Students are exposed to a variety of scientific disciplines as they prepare and critique their own and other students' posters and oral presentations. Students improve written and oral communication skills. Letter grade is based on participation, improvement, and the quality of a final poster project and oral presentation. Offered winter term. CROSSLISTED as BRR 406.

Equivalent to: BRR 406

HORT 407. SEMINAR. (1 Credit)

Senior seminar intended to instruct students on proper techniques for presentation of scientific material. Each student is expected to prepare and present a scientific seminar and to attend and evaluate the seminars given by other class members.

HORT 408. WORKSHOP. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 409. PRACTICUM. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 410. INTERNSHIP. (1-12 Credits)

Work internship to acquaint horticulture majors with the practices of the horticulture industry. Under direction of departmental internship committee. Requires approved statement of intent, submission of employer and employee evaluation forms and written report.

This course is repeatable for 12 credits.

HORT 411. HORTICULTURE BOOK CLUB. (1 Credit)

Reading and discussion of noteworthy books and associated topics relating to agriculture, society and the environment.

This course is repeatable for 2 credits.

HORT 412. CAREER EXPLORATION: INTERNSHIPS AND RESEARCH PROJECTS. (1 Credit)

Provides orientation to the horticulture major internship and research project requirement. Covers procedures for selecting, performing, and reporting on an internship or research project. Includes guidance and skill development valuable in the pursuit of horticultural career goals, such as cover letter and resume preparation and interviewing experience.

HORT 414. PRECISION AGRICULTURE. (4 Credits)

Provides insight into the technology available to support precision agriculture and data management planning applications. Examines the concepts and applications of precision agriculture to teach practical use of hardware, equipment and software. An overview of current technology including autonomous vehicles, GPS, soil and crop proximal sensors, imagery and mapping, variable rate control systems, and yield monitors. Lec/lab. CROSSLISTED as CROP 414.

Equivalent to: CROP 414

HORT 418. GOLF COURSE MAINTENANCE. (4 Credits)

Basic aspects of golf course maintenance under temperate zone conditions. Lec/lab.

Recommended: HORT 314

HORT 421. HERBS, SPICES, AND MEDICINAL PLANTS. (3 Credits)

Principles of crop ecology, morphology, chemistry and utilization of natural products of herbs, spices, and medicinal plants (HSMP). Examines the history and importance of HSMP, their historic and modern uses, current market trends, botany, collection in the wild, fundamentals of production systems for HSMP, harvesting, drying, and other postharvest operations, natural products and their uses, regulations and legal concerns of herbal products.

Recommended: CROP 200 or equivalent horticulture course

HORT 433. SYSTEMATICS AND ADAPTATION OF VEGETABLE CROPS. (4 Credits)

Covers the botanical and taxonomic relationships, breeding systems and adaptation of vegetable crops. Fresh material is used to illustrate varietal differences and traits of importance. Lec/lab. CROSSLISTED as CROP 433/CROP 533.

Prerequisites: BI 102 with D- or better or BI 213 with D- or better or BI 311 with D- or better or HORT 430 with D- or better or CSS 430 with D- or better or HORT 450 with D- or better or CSS 450 with D- or better or PBG 450 with D- or better

Equivalent to: CROP 433, HORT 233

HORT 444. INSECT AGROECOLOGY. (3 Credits)

Agroecology incorporates ecological concepts and principles to the design and management of sustainable agricultural systems. Topics include: the role of insects in sustainable agricultural systems; application of the principles of insect ecology to better manage insect pests and maximize crop yield; conserving beneficial insects and other natural resources in agroecosystems and the surrounding landscape. CROSSLISTED as ENT 444.

Equivalent to: ENT 444

Recommended: General background or previous course work in entomology.

HORT 447. ARBORICULTURE. (4 Credits)

The principles and practices of arboriculture, the art and science of selecting, planting, establishing and maintaining trees in urban, suburban, commercial and residential landscapes. Lec/lab. CROSSLISTED as FES 447. Offered via Ecampus only.

Equivalent to: FES 447

Recommended: (FES 141 or FES 241 or HORT 226 or HORT 228) and (FOR 111 or HORT 112)

HORT 451. TREE FRUIT PHYSIOLOGY AND CULTURE. (4 Credits)

Plant growth and development in relation to tree fruit production; emphasis on canopy development and pruning theory, flowering and fruit set, and development, dormancy, and cold acclimation. Field trips required.

Recommended: Completion or concurrent enrollment in HORT 301 and BOT 331

HORT 452. BERRY AND GRAPE PHYSIOLOGY AND CULTURE. (4 Credits)

Production of wine grapes, caneberries, strawberries, blueberries, and other miscellaneous berry crops. Emphasis on plant growth and development; pruning and training systems; flower and fruit development and cultivars. Field trips required. Offered in alternate years.

Recommended: HORT 301

HORT 453. GRAPEVINE GROWTH AND PHYSIOLOGY. (3 Credits)

The physiological aspects of grapevine growth and development including dormancy, flowering and fruit set, vegetative growth, fruit development and water relations. Additional topics include taxonomy, morphology and physiological influences of vineyard mesoclimate and vine microclimate. Lec/lab.

Prerequisites: HORT 301 with C- or better

Recommended: HORT 301

HORT 454. PRINCIPLES AND PRACTICES OF VINEYARD PRODUCTION. (3 Credits)

The relationship of vineyard and canopy management to grapevine physiology and fruit quality. Nutrient/water relations within the soil/vine continuum. Vineyard microclimate, floor management, and pests will also be discussed. Lec/lab.

Prerequisites: HORT 301 with D- or better

Recommended: Completion or concurrent enrollment in HORT 453

HORT 455. URBAN FOREST PLANNING, POLICY AND MANAGEMENT. (4 Credits)

Examination of planning, policy, and management strategies used in the stewardship of urban natural resources. Fundamentals for developing effective programs to maximize the economic, environmental, and social values and benefits of urban forest landscapes. CROSSLISTED as FES 455. Taught via Ecampus only.

Equivalent to: FES 455

Recommended: FES 350 or FOR 350 or HORT 350

HORT 456. PHYSIOLOGY AND PRODUCTION OF BERRY CROPS. (4 Credits)

Physiology and production systems of blueberries, red and black raspberries, blackberries, and other berry crops. Emphasis on plant growth and development; flower and fruit development; cultivars; pruning and training systems; irrigation; harvesting; nutrient management; and conventional and organic production systems.

Prerequisites: HORT 301 with D- or better

HORT 463. SEED BIOLOGY. (3 Credits)

Information about reproductive development of plants such as pollination and fertilization, which is important for the initiation of seed formation, will be provided. Embryo and endosperm development as well as accumulation of seed storage materials, which are major events during seed development, will be covered, as well as the dormancy and germination mechanisms in mature seeds. Lectures and discussions (presentations required for graduate students). Offered every even year fall term. CROSSLISTED as CROP 463/CROP 563. Lec/lab.

Equivalent to: CROP 463

HORT 480. CASE STUDIES IN CROPPING SYSTEMS MANAGEMENT. (4 Credits)

Decision cases involving the production of field and horticultural crops; individual and group activities; discussion of the decision-making process. Multiple field trips required. A field trip fee will be charged. CROSSLISTED as CROP 480/CROP 580.

Equivalent to: CROP 480

This course is repeatable for 8 credits.

Recommended: CROP 300 or HORT 300

HORT 481. HORTICULTURE PRODUCTION CASE STUDIES. (4 Credits)

Field-based case studies investigate production issues encountered in horticultural crops; individual and group activities; discussion of processes for troubleshooting, decision-making and management recommendations; assessment of economic, practical and logistical feasibility. Prior knowledge of plant physiology, soils, entomology, and plant nutrition are required. Multiple field trips required. A field trip fee will be charged.

Prerequisites: HORT 301 with D- or better

HORT 482. DESIGN AND MANAGEMENT OF ORGANIC CROPPING SYSTEMS. (3 Credits)

This capstone course is the final stage of the Organic Farming Systems Certificate Program. Iteratively design and evaluate organic farming system management plans. Apply real-world science-, practice-, and regulation-based information to the design and management of organic farming systems.

Prerequisites: HORT 212 with C- or better and CROP 355 [C-] and HORT 306 (may be taken concurrently) [C-] and HORT 307 (may be taken concurrently) [C-] and HORT 308 (may be taken concurrently) [C-] and HORT 344 (may be taken concurrently) [C-] and SOIL 360 (may be taken concurrently) [C-]

HORT 485. ADVANCED PERMACULTURE DESIGN TOOLS FOR CLIMATE RESILIENCE. (3 Credits)

Permaculture is a design system for creating sustainable human habitation that enriches the natural world. With climate change, geophysical and social conditions are shifting on the planet. There are specific tools that the permaculture designer can use to assess, analyze and project future climate scenarios and respond to them with resilient design. Climate analogue identification and climate change forecasting provide the basis for a student design project that addresses current and future climatic conditions. Students will complete all design mapping assignments using Google Earth Pro, and tutorials will be provided as a component of the course curriculum.

Prerequisites: HORT 285 with B or better

HORT 495. HORTICULTURAL MANAGEMENT PLANS. (3 Credits)

Develop an integrated management plan for a horticultural enterprise.

This course is repeatable for 6 credits.

HORT 499. SPECIAL TOPICS. (1-16 Credits)

Equivalent to: HORT 499H

This course is repeatable for 16 credits.

HORT 499H. SPECIAL TOPICS. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: HORT 499

This course is repeatable for 16 credits.

HORT 501. RESEARCH. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 503. THESIS. (1-16 Credits)

This course is repeatable for 999 credits.

HORT 505. READING AND CONFERENCE. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 506. PROJECTS. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 507. SEMINAR. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 508. WORKSHOP. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 509. PRACTICUM. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 510. INTERNSHIP. (1-12 Credits)

Offered via Ecampus only.

This course is repeatable for 12 credits.

HORT 511. RESEARCH AND EDUCATIONAL PERSPECTIVES IN HORTICULTURE. (2 Credits)

Introduces beginning graduate students to the faculty in horticulture and provides an in-depth discussion of their research and education programs.

HORT 518. CURRENT TOPICS IN ENTOMOLOGY. (2 Credits)

This is a core course of the Horticulture graduate program. Provides an advanced understanding of entomology and its relationship to other disciplines through critical analysis of the scientific literature. Students practice synthesizing information and presenting findings to peers. Instructors, topics, and specific learning objectives vary from term to term. CROSSLISTED as ENT 518.

Equivalent to: ENT 518

This course is repeatable for 12 credits.

HORT 519. CURRENT TOPICS IN PLANT BREEDING AND GENETICS. (2 Credits)

Provides an advanced understanding of plant breeding and genetics and their relationship to other disciplines through critical analysis of the scientific literature. Students practice synthesizing information and presenting findings to peers. Instructors, topics, and specific learning objectives vary from term to term. CROSSLISTED as PBG 519.

Equivalent to: PBG 519

This course is repeatable for 12 credits.

HORT 520. CURRENT TOPICS IN HORTICULTURAL RESEARCH. (2 Credits)

This is a core course in the horticulture graduate program. Students gain an advanced understanding of horticulture science and its relationship to other disciplines through critical analysis of the scientific literature. Students practice synthesizing information and presenting findings to their peers. Instructors, topics and specific learning objectives vary from term to term.

This course is repeatable for 12 credits.

HORT 521. HERBS, SPICES, AND MEDICINAL PLANTS. (3 Credits)

Principles of crop ecology, morphology, chemistry and utilization of natural products of herbs, spices, and medicinal plants (HSMP). Examines the history and importance of HSMP, their historic and modern uses, current market trends, botany, collection in the wild, fundamentals of production systems for HSMP, harvesting, drying, and other postharvest operations, natural products and their uses, regulations and legal concerns of herbal products.

Recommended: CROP 200 or equivalent course in HORT.

HORT 533. SYSTEMATICS AND ADAPTATION OF VEGETABLE CROPS. (4 Credits)

Covers the botanical and taxonomic relationships, breeding systems and adaptation of vegetable crops. Fresh material is used to illustrate varietal differences and traits of importance. Lec/lab. CROSSLISTED as CROP 433/CROP 533.

Equivalent to: CROP 533

Recommended: BI 102 or BI 213 or BI 311 or HORT 430 or CSS 430 or HORT 450 or CSS 450

HORT 544. INSECT AGROECOLOGY. (3 Credits)

Agroecology incorporates ecological concepts and principles to the design and management of sustainable agricultural systems. Topics include: the role of insects in sustainable agricultural systems; application of the principles of insect ecology to better manage insect pests and maximize crop yield; conserving beneficial insects and other natural resources in agroecosystems and the surrounding landscape. CROSSLISTED as ENT 544.

Equivalent to: ENT 544

Recommended: General background or previous course work in entomology.

HORT 547. ARBORICULTURE. (4 Credits)

The principles and practices of arboriculture, the art and science of selecting, planting, establishing and maintaining trees in urban, suburban, commercial and residential landscapes. Lec/lab CROSSLISTED as FES 447.

Equivalent to: FES 547

HORT 552. BERRY AND GRAPE PHYSIOLOGY AND CULTURE. (4 Credits)

Production of wine grapes, caneberries, strawberries, blueberries, and other miscellaneous berry crops. Emphasis on plant growth and development; pruning and training systems; flower and fruit development and cultivars. Field trips required. Offered in alternate years.

Recommended: HORT 301

HORT 555. URBAN FOREST PLANNING, POLICY AND MANAGEMENT. (4 Credits)

Examination of planning, policy, and management strategies used in the stewardship of urban natural resources. Fundamentals for developing effective programs to maximize the economic, environmental, and social values and benefits of urban forest landscapes. CROSSLISTED as FES 555. Taught via Ecampus only.

Equivalent to: FES 555

Recommended: FOR 350 or FES 350 or HORT 350

HORT 556. PHYSIOLOGY AND PRODUCTION OF BERRY CROPS. (4 Credits)

Physiology and production systems of blueberries, red and black raspberries, blackberries, and other berry crops. Emphasis on plant growth and development; flower and fruit development; cultivars; pruning and training systems; irrigation; harvesting; nutrient management; and conventional and organic production systems.

HORT 563. SEED BIOLOGY. (3 Credits)

Information about reproductive development of plants such as pollination and fertilization, which is important for the initiation of seed formation, will be provided. Embryo and endosperm development as well as accumulation of seed storage materials, which are major events during seed development, will be covered, as well as the dormancy and germination mechanisms in mature seeds. Lectures and discussions (presentations required for graduate students). Offered every even year fall term. CROSSLISTED as CROP 463/CROP 563. Lec/lab.

Equivalent to: CROP 563

HORT 580. CASE STUDIES IN CROPPING SYSTEMS MANAGEMENT. (4 Credits)

Decision cases involving the production of field and horticultural crops; individual and group activities; discussion of the decision-making process. Multiple field trips required. A field trip fee will be charged. CROSSLISTED as CROP 480/CROP 580.

Equivalent to: CROP 580

Recommended: CROP 300 or HORT 300

HORT 581. HORTICULTURE PRODUCTION CASE STUDIES. (4 Credits)

Field-based case studies investigate production issues encountered in horticultural crops; individual and group activities; discussion of processes for troubleshooting, decision-making and management recommendations; assessment of economic, practical and logistical feasibility. Prior knowledge of plant physiology, soils, entomology, and plant nutrition are required. Multiple field trips required. A field trip fee will be charged.

Recommended: HORT 301

HORT 599. SPECIAL TOPICS. (0-16 Credits)

This course is repeatable for 16 credits.

HORT 601. RESEARCH. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 603. DISSERTATION. (1-16 Credits)

This course is repeatable for 999 credits.

HORT 605. READING & CONFERENCE. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 606. PROJECTS. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 607. SEMINAR. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 608. WORKSHOP. (1-16 Credits)

This course is repeatable for 16 credits.

HORT 699. SPECIAL TOPICS. (1-16 Credits)

This course is repeatable for 16 credits.

Plant Breeding and Genetics

PBG 199. SPECIAL TOPICS. (1-16 Credits)

Equivalent to: PBG 199H

This course is repeatable for 16 credits.

PBG 199H. SPECIAL TOPICS. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: PBG 199

This course is repeatable for 16 credits.

PBG 299. SPECIAL TOPICS. (1-16 Credits)

Equivalent to: PBG 299H

This course is repeatable for 16 credits.

PBG 299H. SPECIAL TOPICS. (1-16 Credits)**Attributes:** HNRS – Honors Course Designator**Equivalent to:** PBG 299*This course is repeatable for 16 credits.***PBG 399. SPECIAL TOPICS. (1-16 Credits)***This course is repeatable for 16 credits.***PBG 401. RESEARCH. (1-16 Credits)***This course is repeatable for 16 credits.***PBG 403. THESIS. (1-16 Credits)**

Graded P/N.

*This course is repeatable for 99 credits.***PBG 405. READING AND CONFERENCE. (1-16 Credits)****Equivalent to:** PBG 405H*This course is repeatable for 16 credits.***PBG 405H. READING AND CONFERENCE. (1-16 Credits)****Attributes:** HNRS – Honors Course Designator**Equivalent to:** PBG 405*This course is repeatable for 16 credits.***PBG 407. SEMINAR. (1-16 Credits)***This course is repeatable for 16 credits.***PBG 409. TEACHING PRACTICUM. (1-16 Credits)**

Graded P/N.

*This course is repeatable for 16 credits.***PBG 410. INTERNSHIP. (1-12 Credits)**

Offered via Ecampus only.

*This course is repeatable for 12 credits.***PBG 430. PLANT GENETICS. (3 Credits)**

Introduction to the principles of plant genetics with an emphasis on the structure and function of economically important plant genomes.

Recommended: One year of biology and chemistry.**PBG 431. PLANT GENETICS RECITATION. (1 Credit)**

Review and demonstration of plant genetics principles.

PBG 441. PLANT TISSUE CULTURE. (4 Credits)

Principles, methods, and applications of plant tissue culture. Laboratory is important part of course. Topics include callus culture, regeneration, somaclonal variation, micropropagation, anther culture, somatic hybridization, and transformation. Lec/lab.

Recommended: (BI 311 and BOT 331) or PBG 430 or CSS 430**PBG 450. PLANT BREEDING. (4 Credits)**

An introduction to the genetic improvement of self-pollinated, cross-pollinated, and asexually propagated species and the genetic principles on which breeding methods are based. Examples are drawn from a wide range of crops, including cereal grains, grasses, fruits, nuts, and vegetables; guest lecturers discuss their breeding programs. Additional topics include crop evaluation, germplasm preservation, disease resistance, and biotechnology. Lec/lab.

Prerequisites: PBG 430 with D- or better**Recommended:** BI 311 or PBG 430**PBG 499. SPECIAL TOPICS. (1-16 Credits)****Equivalent to:** PBG 499H*This course is repeatable for 16 credits.***PBG 499H. SPECIAL TOPICS. (1-16 Credits)****Attributes:** HNRS – Honors Course Designator**Equivalent to:** PBG 499*This course is repeatable for 16 credits.***PBG 501. RESEARCH. (1-16 Credits)**

Graded P/N.

*This course is repeatable for 16 credits.***PBG 503. THESIS. (1-16 Credits)**

Graded P/N.

*This course is repeatable for 999 credits.***PBG 505. READING AND CONFERENCE. (1-16 Credits)***This course is repeatable for 16 credits.***PBG 506. PROJECTS. (1-16 Credits)***This course is repeatable for 16 credits.***PBG 507. SEMINAR. (1-16 Credits)**

Graded P/N.

*This course is repeatable for 16 credits.***PBG 508. WORKSHOP. (1-16 Credits)***This course is repeatable for 16 credits.***PBG 509. PRACTICUM IN TEACHING. (1-3 Credits)**

Developing skills and competence in teaching under staff supervision; organization and presentation of instructional materials by assisting in laboratory, recitation, and lectures. CROSSLISTED as ENT 509, CROP 509, SOIL 509.

Equivalent to: CROP 509, ENT 509, SOIL 509*This course is repeatable for 9 credits.***PBG 510. INTERNSHIP. (4 Credits)**

Offered via Ecampus only.

*This course is repeatable for 12 credits.***PBG 513. PLANT GENETIC ENGINEERING. (3 Credits)**

Principles, methods, and recent developments in the genetic engineering of higher plants. Offered alternate years.

Recommended: (BI 311 and BOT 331) or (CSS 430 or CSS 530) or (HORT 430 or HORT 530) or (PBG 430 or PBG 530)**PBG 519. CURRENT TOPICS IN PLANT BREEDING AND GENETICS. (2 Credits)**

Provides an advanced understanding of plant breeding and genetics and their relationship to other disciplines through critical analysis of the scientific literature. Students practice synthesizing information and presenting findings to peers. Instructors, topics, and specific learning objectives vary from term to term. CROSSLISTED as HORT 519.

Equivalent to: HORT 519*This course is repeatable for 12 credits.***PBG 530. PLANT GENETICS. (3 Credits)**

Introduction to the principles of plant genetics with an emphasis on the structure and function of economically important plant genomes.

Recommended: One year of biology and chemistry.**PBG 541. PLANT TISSUE CULTURE. (4 Credits)**

Principles, methods, and applications of plant tissue culture. Laboratory is important part of course. Topics include callus culture, regeneration, somaclonal variation, micropropagation, anther culture, somatic hybridization, and transformation. Lec/lab. CROSSLISTED as MCB 541.

Equivalent to: MCB 541**Recommended:** (BI 311 and BOT 331) or PBG 430

PBG 550. PLANT BREEDING. (4 Credits)

An introduction to the genetic improvement of self-pollinated, cross-pollinated, and asexually propagated species and the genetic principles on which breeding methods are based. Example are drawn from a wide range of crops, including cereal grains, grasses, fruits, nuts, and vegetables; guest lecturers discuss their breeding programs. Additional topics include crop evaluation, germplasm preservation, disease resistance, and biotechnology. Lec/lab.

Recommended: BI 311 or PBG 430 or PBG 530

PBG 551. BREEDING CLONAL CROPS. (1 Credit)

The overall goal of the course is to gain fundamental knowledge of breeding methods for clonal crops; these methods are different from those used for seed-propagated crops. Specific examples from a wide array of plant species (tree fruits, berries, tree nuts, potato, sweet potato, cassava, cacao) will be provided to illustrate application of the fundamental knowledge.

Prerequisites: PBG 450 with C or better or PBG 550 with C or better

PBG 552. PLANT BREEDING AND SEED PRODUCTION IN ORGANIC SYSTEMS. (3 Credits)

Genetic improvement and seed propagation of self-pollinated and cross-pollinated crops bred for and used in organic production. The philosophical basis for organic agriculture will be reviewed in the context of what breeding technologies are allowed and why. Important traits for adaptation to organic production will be described. Models for organic plant breeding and examples of such programs are provided.

Prerequisites: PBG 530 with D or better

Recommended: BI 311 or PBG 430

PBG 556. CROP PLANT DOMESTICATION. (2 Credits)

Learning is based on discussion of the contemporary literature on crop plant origins and domestication. The major agronomic and horticultural crops will be covered. Topics include primary centers of domestication, traits altered by domestication, effect of genetic architecture and local ecology on domestication, and importance of genetic diversity to current plant improvement efforts.

PBG 557. PLANTS AND PATENTS. (2 Credits)

Learn about different methods of intellectual property protection in agriculture with a focus on plant patents, plant variety protection and utility patents. The rights, current issues and restrictions that different types of patents allow will be presented through reading the current literature.

PBG 591. SELECTED TOPICS. (1-16 Credits)

This course is repeatable for 16 credits.

PBG 598. PLANT CHROMOSOME BIOLOGY. (3 Credits)

Exploration of the relationship between chromosome number, structure, and behavior to gene inheritance, organization, and expression.

Discussion of chromosome manipulation strategies for genomics research, genetic analysis, and plant breeding.

Recommended: 6 credits of genetics

PBG 599. SPECIAL TOPICS. (1-16 Credits)

This course is repeatable for 16 credits.

PBG 601. RESEARCH. (1-16 Credits)

Graded P/N.

This course is repeatable for 16 credits.

PBG 603. DISSERTATION. (1-16 Credits)

Graded P/N.

This course is repeatable for 999 credits.

PBG 605. READING AND CONFERENCE. (1-16 Credits)

This course is repeatable for 16 credits.

PBG 607. SEMINAR. (1-16 Credits)

This course is repeatable for 16 credits.

PBG 609. PRACTICUM IN TEACHING. (1-3 Credits)

Developing skills and competence in teaching under staff supervision; organization and presentation of instructional material by assisting in laboratory, recitation, and lectures. Graded P/N.

Equivalent to: CROP 609, ENT 609, SOIL 609

This course is repeatable for 9 credits.

PBG 620. DNA FINGERPRINTING. (1 Credit)

Principles and methods for producing and analyzing DNA fingerprints. Offered even years. CROSSLISTED as MCB 620.

Recommended: BI 311 or CSS 430 or CSS 530 or PBG 430 or PBG 530 or HORT 430 or HORT 530

PBG 621. GENETIC MAPPING. (1 Credit)

Principles and methods for constructing genetic maps comprised of molecular and other genetic markers. Offered even years. CROSSLISTED as MCB 621.

Recommended: BI 311 or CSS 430 or CSS 530 or PBG 430 or PBG 530 or HORT 430 or HORT 530

PBG 622. MAPPING QUANTITATIVE TRAIT LOCI. (1 Credit)

Principles and methods for mapping genes underlying phenotypically complex traits. Offered even years. CROSSLISTED as MCB 622.

Recommended: CROP 590 or CSS 590 or ST 513

PBG 650. ADVANCED PLANT BREEDING AND QUANTITATIVE GENETICS. (3 Credits)

Pedigree, bulk, single-seed-descent, doubled haploid, backcross, testcross, mass, and half-sib, S~1~, and S~2~ family breeding methods; breeding hybrids and selecting sources of alleles for developing superior hybrids; the nature and consequences of genotype by environment interactions; marker-assisted backcross and inbred line breeding; quantitative trait locus mapping; random linear models; designing and analyzing cultivar, line, and family selection experiments. Offered odd years.

Recommended: (CSS 430 or CSS 530 or PBG 430 or PBG 530 or HORT 430 or HORT 530) and (CSS 450 or CSS 550 or PBG 450 or PBG 550 or HORT 450 or HORT 550) and (ST 411 or ST 511) and (ST 412 or ST 512) and (ST 413 or ST 513)

PBG 691. SELECTED TOPICS. (1-16 Credits)

This course is repeatable for 16 credits.

PBG 699. SPECIAL TOPICS. (1-16 Credits)

This course is repeatable for 16 credits.

Soil Science

SOIL 101. INTRODUCTION TO CROP, SOIL, AND INSECT SCIENCE. (1 Credit)

Introduces students with interests in crop, soil, and insect sciences to educational and professional opportunities in these disciplines. Speakers will discuss opportunities in research and academia as well as in the applied professional job market. Open to all students. CROSSLISTED as ENT 101, CROP 101.

SOIL 199. SPECIAL TOPICS. (1-16 Credits)

Equivalent to: SOIL 199H

This course is repeatable for 16 credits.

SOIL 199H. SPECIAL TOPICS. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: SOIL 199

This course is repeatable for 16 credits.

SOIL 205. SOIL SCIENCE. (3 Credits)

Introduction to the chemical, physical and biological nature of soils. Examines how soils function in terms of plant growth, nutrient supply, the global carbon cycle, ecological habitat, and water purification. Community-based learning projects provide hands-on experience with fundamental soil science principles and the impact of human activities on soil quality and sustainability. Lec. (Bacc Core Course if taken with SOIL 206 or FOR 206)

Attributes: CPBL – Core, Pers, BioSci Attached Lec; CPPL – Core, Pers, PhySci Attached Lec

Prerequisites: SOIL 206 (may be taken concurrently) with D- or better or FOR 206 (may be taken concurrently) with D- or better

Equivalent to: CSS 205, CSS 305

SOIL 206. *SOIL SCIENCE LABORATORY FOR SOIL 205. (1 Credit)

Students will gain hands-on experience with soil science concepts and applications. Laboratory exercises and field trips will help students develop proficiency in the methods/tools for analyzing soil chemistry, biology, morphology, physical properties, and soil forming factors. Skills will be taught in the context of soils' social, economic, and environmental importance. (Bacc Core Course if taken with SOIL 205)

Attributes: CPBS – Core, Pers, Biological Science; CPPS – Core, Pers, Physical Science

Corequisites: SOIL 205

SOIL 299. SPECIAL TOPICS. (1-16 Credits)

Equivalent to: SOIL 299H

This course is repeatable for 16 credits.

SOIL 299H. SPECIAL TOPICS. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: SOIL 299

This course is repeatable for 16 credits.

SOIL 316. NUTRIENT CYCLING IN AGROECOSYSTEMS. (4 Credits)

Nutrient forms, transformations, and cycling. Diagnosis and correction of nutrient deficiencies, pH and salinity. Impact of nutrient management practices on crop production, soil health, nutrient use efficiency, and environmental quality. Organic and inorganic fertilization. Labs include soil sampling and testing procedures, data collection on soil and plants, computer applications for soil fertility management, and field trips. Lec/lab.

Prerequisites: (CH 121 with D- or better or CH 231 with D- or better) and (SOIL 205 [C] or CSS 205 [C] or CSS 305 [C])

SOIL 360. SOIL MANAGEMENT FOR ORGANIC PRODUCTION. (3 Credits)

This is a skills-based soil management course that is part lecture and part student-centered learning. Significant class time will be devoted to making field-scale management decisions. The course includes individual and group work, presentation, and discussion. The intent is to prepare students for real-world application of soil management decisions in certified organic systems. Using the National Organic Program as a starting point as well as farm system descriptions with extensive long-term data sets, we will interpret soil nutrient analyses, cover cropping systems, and organic amendments, to design soil management plans for two model cropping systems (annual and perennial).

Prerequisites: (SOIL 205 with C or better and (SOIL 206 [C] or FOR 206 [C])) or CSS 205 [C]

Recommended: Introductory soil science course with lab

SOIL 366. ECOSYSTEMS OF WILDLAND SOILS. (3 Credits)

Focuses on soils that occur in relatively undisturbed ecosystems such as forests and rangelands. Topics covered include properties and processes specific to understanding and managing the soil resource in these areas. An overview of US Soil Taxonomy will also be given.

Prerequisites: SOIL 205 with D- or better or CSS 205 with D- or better or CSS 305 with D- or better

Recommended: An understanding and appreciation of environmental chemistry, biology, ecology, and physics

SOIL 388. SOIL SYSTEMS AND PLANT GROWTH. (4 Credits)

Introduces soils as providers of critical resources for plant growth. Explains how soils supply water, air, thermal energy and nutrients to plants. Shows that sustainable management of soil resources requires substantial understanding of their role in the functioning of natural, forest, and agricultural systems. Explains controls on stocks and availabilities of individual soil resources and mechanisms making these resources plant-available.

Prerequisites: ((SOIL 205 with D- or better and (SOIL 206 [D-] or FOR 206 [D-])) or CSS 205 [D-]) and (CH 121 [D-] or CH 231 [D-]) and (BOT 220 [D-] or (BI 204 [D-] or BI 205 [D-] or BI 206 [D-]) or (BI 211 [D-] or BI 212 [D-] or BI 213 [D-]))

SOIL 395. *WORLD SOIL RESOURCES. (3 Credits)

The properties, global distribution, and agricultural productivity of major world soil groups are described. Potentials for human-accelerated soil degradation are introduced for each soil group, and reasons for conflicting assessments of degradation are discussed. Offered via Ecampus only. (Bacc Core Course) (Writing Intensive Course)

Attributes: CSST – Core, Synthesis, Science/Technology/Society; CWIC – Core, Skills, WIC

Prerequisites: CH 121 with D- or better or CH 122 with D- or better or CH 123 with D- or better or CH 201 with D- or better or CH 202 with D- or better or CH 231 with D- or better or CH 231H with D- or better or CH 232 with D- or better or CH 232H with D- or better or CH 233 with D- or better or CH 233H with D- or better

Recommended: One term of chemistry

SOIL 399. SPECIAL TOPICS. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 401. RESEARCH. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 403. THESIS. (1-16 Credits)

Independent, original study and preparation of a senior thesis.

This course is repeatable for 16 credits.

SOIL 405. READING AND CONFERENCE. (1-16 Credits)

Equivalent to: SOIL 405H

This course is repeatable for 16 credits.

SOIL 405H. READING AND CONFERENCE. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: SOIL 405

This course is repeatable for 16 credits.

SOIL 407. SEMINAR. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 408. WORKSHOP. (1-16 Credits)

Evaluation and judging of soils in Oregon and other states; directed studies of soil morphology, soil survey, soil fertility, soil physics, soil chemistry, soil biology, and soil information systems.

This course is repeatable for 16 credits.

SOIL 409. PRACTICUM. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 410. INTERNSHIP. (1-6 Credits)

Professional work experience previously approved and supervised by the department, written report required.

This course is repeatable for 12 credits.

SOIL 435. ENVIRONMENTAL SOIL PHYSICS. (3 Credits)

Covers principles of soil physical properties and processes as they relate to agricultural, hydrological and environmental problems. Lec/lab. Offered odd years.

Prerequisites: CSS 205 with D- or better or CSS 305 with D- or better or SOIL 205 with D- or better

Recommended: CH 123 and MTH 241 and PH 201

SOIL 445. ENVIRONMENTAL SOIL CHEMISTRY. (3 Credits)

Structural chemistry of clay minerals and organic matter, cation and anion exchange, and soil solution equilibria of soils. Ion exchange, mineral-solution equilibria, and adsorption reactions of silicate clays, oxides, and organic matter are emphasized. Covers the sorption behavior of environmental contaminants and the weathering reactions that govern the transport of reactive solutes through soils. Lec/rec. Offered odd years.

SOIL 455. BIOLOGY OF SOIL ECOSYSTEMS. (4 Credits)

A detailed study of the organisms that live in the soil and their activities in the soil ecosystems, soil as a habitat for organisms, taxonomy and biology of soil organisms, fundamentals of nutrient cycles, special topics in soil biology, review basis of soil microbial and ecological principles. Lec/rec/lab.

Recommended: (CSS 305 or CSS 205 or SOIL 205). Courses in chemistry, physics, and microbiology

SOIL 466. SOIL MORPHOLOGY AND CLASSIFICATION. (4 Credits)

Observation and description of soil properties in the field; writing soil profile descriptions; evaluating criteria that define features used to classify soils; using soil classification keys. Lec/lab.

Prerequisites: SOIL 205 with D- or better or CSS 205 with D- or better or CSS 305 with D- or better

SOIL 468. SOIL LANDSCAPE ANALYSIS. (4 Credits)

Principles of soil geomorphology, soil stratigraphy, and surficial processes as applied to understanding the soil system and landscape scales. Emphasis on field observations of soils, geomorphic surfaces, and environment. Field project entails design of soil survey map units, field mapping and GIS cartographic techniques. Lec/lab. Offered even years.

Prerequisites: SOIL 466 (may be taken concurrently) with D- or better or CSS 466 (may be taken concurrently) with D- or better

SOIL 475. SOIL RESOURCE POTENTIALS. (4 Credits)

Course builds on knowledge from introductory pedology, soil chemistry, soil physics and soil biology to practice the evaluation of nutrient availability and soil moisture storage in the rooting space. Results from the application of pedotransfer functions to observations at the pit wall are translated into quantitative, numerical expressions of soil resource potentials. Lec/lab.

Prerequisites: SOIL 435 with D- or better and SOIL 455 [D-] and SOIL 466 [D-]

SOIL 499. SPECIAL TOPICS. (1-16 Credits)

Equivalent to: SOIL 499H

This course is repeatable for 16 credits.

SOIL 499H. SPECIAL TOPICS. (1-16 Credits)

Attributes: HNRS – Honors Course Designator

Equivalent to: SOIL 499

This course is repeatable for 16 credits.

SOIL 501. RESEARCH AND SCHOLARSHIP. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 503. THESIS/DISSERTATION. (1-16 Credits)

This course is repeatable for 999 credits.

SOIL 505. READING AND CONFERENCE. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 506. PROJECTS. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 507. SEMINAR. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 508. WORKSHOP. (1-16 Credits)

Evaluation and judging of soils in Oregon and other states; directed studies of soil morphology, soil survey, soil fertility, soil physics, soil chemistry, soil biology, and soil information systems.

This course is repeatable for 16 credits.

SOIL 509. PRACTICUM IN TEACHING. (1-3 Credits)

Developing skills and competence in teaching under staff supervision; organization and presentation of instructional material by assisting in laboratory, recitation, and lectures. CROSSLISTED as ENT 509, CROP 509, PBG 509.

Equivalent to: CROP 509, ENT 509, PBG 509

This course is repeatable for 9 credits.

SOIL 510. INTERNSHIP. (1-6 Credits)

Professional work experience previously approved and supervised by the department, written report required.

This course is repeatable for 6 credits.

SOIL 511. SOIL: A NATURAL AND SOCIETAL RESOURCE. (3 Credits)

Serves degree- and non-degree-seeking graduate learners wanting soil science knowledge but having minimal science background. Understanding soil physical, chemical, and biological properties promotes informed soil management while supporting individual to global societal values. Established curriculum facilitates graduate degrees or certificates, continuing education, professional certification, and self-improvement goals. A highly interactive social media framework supports weekly student-student and instructor-student learning interactions.

SOIL 512. METHODS OF SOIL ANALYSIS - FIELD. (1 Credit)

Recognition and quantitative description of soil properties in agroecosystems. Assessments of soil environments used for crop production in Oregon. Demonstration and practice of volumetric and bulk soil sampling techniques as well as the application of pedotransfer functions. Each participant will be responsible for analyzing at least one soil sample in the chemical level. Five-day duration with four overnight stays at campgrounds. Participants will use their own or borrowed camping equipment.

Recommended: SOIL 205 with a minimum grade of C

SOIL 513. PROPERTIES, PROCESSES, AND FUNCTIONS OF SOILS. (4 Credits)

Physical, chemical, biological, and landscape properties; processes of fluid retention and movement, weathering and cation exchange, decomposition and C-N dynamics, erosion and sedimentation; functions of hydrologic regulation, nutrient cycling, environmental protection, ecological habitat.

Equivalent to: CSS 513

Recommended: CH 223 or CH 233 or CH 233H or equivalent

SOIL 514. METHODS OF SOIL ANALYSIS - LABORATORY. (2 Credits)

Provide the theoretical background, as well as practical experience needed to plan, select, execute, and interpret soil chemical and physical analyses such as those typically used for nutrient management recommendations. Individual and group activities involve classroom presentations, as well as hands-on work in a teaching laboratory. Samples processed are those collected in SOIL 512, Methods of Soil Analysis - Field. Duration is five full work days.

Prerequisites: SOIL 512 (may be taken concurrently) with C or better

Recommended: SOIL 205 and successful completion of EH&S Laboratory

SOIL 515. SOIL FERTILITY MANAGEMENT. (3 Credits)

Management of plant nutrients in agronomic systems; diagnosis of nutrient availability and prediction of crop response to fertilizers; interactions between nutrient response and chemical, physical and biological properties of soils.

Recommended: CSS 315 and courses in statistics, chemistry and plant physiology.

SOIL 523. PRINCIPLES OF STABLE ISOTOPES. (3 Credits)

An introduction to the theory and use of stable isotopes. Applications of stable isotopes to soil science, plant physiology, hydrology, and ecosystem studies. Offered even years.

SOIL 525. MINERAL-ORGANIC MATTER INTERACTIONS. (3 Credits)

Studies the fundamental properties of the mineral-organic interface and the mechanisms of interaction between mineral and organic soil properties.

Recommended: CSS 305 or CSS 205 or SOIL 205

SOIL 530. ORGANIC SOIL AND CROP MANAGEMENT. (3 Credits)

Overview of organic soil and crop management, organic soil system management, soil microbiology under organic systems, cropping systems, organic cereal production systems, organic forage production system, organic horticultural systems management, organic field and horticulture cropping systems; recent research and case studies. CROSSLISTED AS CROP 530.

Equivalent to: CROP 530

Recommended: (SOIL 525, CROP 200 and SOIL 205 or introductory biology) and completion or concurrent enrollment in AGRI 520

SOIL 535. SOIL PHYSICS. (3 Credits)

Theoretical elements of soil physical properties and processes related to agricultural, hydrological and environmental problems. Offered fall term in even years.

Recommended: CSS 305, CSS 205, SOIL 205, MTH 241, CH 123, PH 201

SOIL 536. VADOSE ZONE HYDROLOGY LABORATORY. (1 Credit)

Experimental elements of soil physical properties and processes allowing practical experience in the measurement and analysis of soil physical processes related to agricultural, hydrological and environmental problems. Weekly laboratory. Offered even years.

Recommended: CH 123 and PH 201

SOIL 545. ENVIRONMENTAL SOIL CHEMISTRY. (3 Credits)

Structural chemistry of clay minerals and organic matter, cation and anion exchange, and soil solution equilibria of soils. Ion exchange, mineral-solution equilibria, and adsorption reactions of silicate clays, oxides, and organic matter are emphasized. Covers the sorption behavior of environmental contaminants and the weathering reactions that govern the transport of reactive solutes through soils. Lec/rec. Offered odd years.

SOIL 547. NUTRIENT CYCLING. (3 Credits)

Reviews and discusses ecosystem-level biogeochemical concepts for terrestrial and freshwater ecosystems, primarily by reading and discussing classic and current literature to determine the state-of-knowledge and uncertainties associated with it. Topics include root nutrient uptake mechanisms, soil chemical and biochemical transformations in different soil and ecosystems, measuring soil solution and watershed fluxes, soil organic matter formation and structure, the meaning of sustainability, the concept of N saturation in terrestrial ecosystems, and the use of natural abundance and tracer isotopes in ecosystem biogeochemistry. While forest biogeochemical processes will be emphasized, desert, aquatic, wetland, and prairie ecosystems will also be explored. CROSSLISTED as BOT 547.

Recommended: College-level chemistry and biology and one class in ecology (eg. BI 370) and/or soils (eg. SOIL 205)

SOIL 555. BIOLOGY OF SOIL ECOSYSTEMS. (4 Credits)

A detailed study of the organisms that live in the soil and their activities in the soil ecosystems, soil as a habitat for organisms, taxonomy and biology of soil organisms, fundamentals of nutrient cycles, special topics in soil biology, review basis of soil microbial and ecological principles. Lec/rec/lab.

Recommended: CSS 305 or CSS 205 or SOIL 205. Courses in chemistry, physics, and microbiology

SOIL 566. SOIL MORPHOLOGY AND CLASSIFICATION. (4 Credits)

Observation and description of soil properties in the field; writing soil profile descriptions; evaluating criteria that define features used to classify soils; using soil classification keys. Lec/lab.

Recommended: CSS 305 or CSS 205 or SOIL 205

SOIL 568. SOIL LANDSCAPE ANALYSIS. (4 Credits)

Principles of soil geomorphology, soil stratigraphy, and surficial processes as applied to understanding the soil system at landscape scales. Emphasis on field observations of soils, geomorphic surfaces, and environment. Field project entails design of soil survey map units, field mapping and GIS cartographic techniques. Lec/lab. Offered odd years.

Prerequisites: CSS 566 (may be taken concurrently) with C or better or SOIL 566 (may be taken concurrently) with C or better

SOIL 591. SELECTED TOPICS. (1-16 Credits)

Course content and title will change with each offering. *This course is repeatable for 16 credits.*

SOIL 599. SPECIAL TOPICS. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 601. RESEARCH. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 603. THESIS/DISSERTATION. (1-16 Credits)

This course is repeatable for 999 credits.

SOIL 605. READING AND CONFERENCE. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 606. PROJECTS. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 607. SEMINAR. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 608. WORKSHOP. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 609. PRACTICUM IN TEACHING. (1-3 Credits)

Developing skills and competence in teaching under staff supervision; organization and presentation of instructional material by assisting in laboratory, recitation, and lectures. Graded P/N.

Equivalent to: CROP 609, ENT 609, PBG 609

This course is repeatable for 9 credits.

SOIL 635. ADVANCED SOIL PHYSICS. (3 Credits)

Explores theoretical development of a key topic in soil physics. Topics may include evaporation from porous media, multiphase fluid movement, soil deformation, and soil salinization, with respect to either historical development, present day understanding or future needs of the field. Course structure incorporates lectures and discussion requiring intensive student participation. Offered odd years.

Prerequisites: CSS 535 with C or better or SOIL 535 with C or better

Recommended: A working knowledge of soil physics and a passing grade in a graduate-level soil physics course

SOIL 645. SOIL MICROBIAL ECOLOGY. (3 Credits)

An advanced treatment of current topics in soil microbiology, with an emphasis on the ecology of soil microorganisms. Topics include the size, composition, diversity, and activity of soil microbial communities, linkage of microbial community structure to ecosystem functions, and applications of molecular biology to soil microbiology. Offered even years.

Recommended: SOIL 455 or CSS 455 or MB 448

SOIL 684. GLOBAL BIOGEOCHEMICAL CYCLES. (4 Credits)

An in-depth treatment of global biogeochemical cycles, focusing on cycles of carbon, oxygen, nitrogen, phosphorus, and sulfur in the atmosphere, hydrosphere, and lithosphere. CROSSLISTED as GEO 684.

Equivalent to: GEO 684

Recommended: One year of college-level physics and chemistry, including introductory biology. One year of graduate coursework in soil, earth, ocean, atmospheric or forest science

SOIL 691. SELECTED TOPICS. (1-16 Credits)

This course is repeatable for 16 credits.

SOIL 699. SPECIAL TOPICS. (1-16 Credits)

This course is repeatable for 16 credits.

Sustainability

SUS 102. *INTRODUCTION TO ENVIRONMENTAL SCIENCE AND SUSTAINABILITY. (4 Credits)

An introduction to the science behind critical environmental issues and the biological basis of creating and maintaining sustainable ecosystems. Focus on such questions as: how do we decide what to believe about environmental issues? How do we quantify, restore, and value biodiversity? What is valid science in the global warming debate? Lec/lab. (Bacc Core Course)

Attributes: CPBS – Core, Pers, Biological Science

SUS 103. *INTRODUCTION TO CLIMATE CHANGE. (4 Credits)

An introduction to the principles of climate change science with an emphasis on the empirical evidence for climate change. Students will learn critical thinking skills to assess such questions as: How do we determine the processes controlling global warming? How do we predict trends in climate change? How do we calculate and understand uncertainty in these predictions? What is valid science in the global warming debate? Lec/lab. (Bacc Core Course)

Attributes: CPPS – Core, Pers, Physical Science

SUS 304. *SUSTAINABILITY ASSESSMENT. (4 Credits)

Explores theories and application of sustainability assessment techniques and analysis methods. Practical application of globally recognized assessment protocol, including checklists, footprinting, life-cycle analysis and the indicators used to conduct these analyses. Emphasis on ecological and social indicators, although economic indicators are explored. (Bacc Core Course)

Attributes: CSST – Core, Synthesis, Science/Technology/Society

SUS 325. ^AG AND ENVIRONMENTAL PREDICAMENTS: A CASE STUDY APPROACH. (3 Credits)

Analyze controversial agricultural and environmental issues, synthesize information from diverse sources, and apply scientific knowledge to recommend specific courses of action to solve real world problems.

Develop oral and written communication skills through individual and group work. (Writing Intensive Course)

Attributes: CWIC – Core, Skills, WIC

SUS 350. *SUSTAINABLE COMMUNITIES. (4 Credits)

Introduction to the concept of sustainable communities from a multidisciplinary perspective. Instructors from a broad array of disciplines and professions. Development of holistic thinking skills and innovative solutions to complex problems. (Bacc Core Course)

Attributes: CSGI – Core, Synth, Global Issues

SUS 401. RESEARCH. (1-16 Credits)

This course is repeatable for 16 credits.

SUS 410. INTERNSHIP. (1-16 Credits)

This course is repeatable for 16 credits.

SUS 420. SOCIAL DIMENSIONS OF SUSTAINABILITY. (3 Credits)

Focuses on the social aspects of sustainability, including how the environment, the economy, social life interact to create the world we live in. Explores how social institutions (school, government, business, family) contribute to sustainability and promote or discourage social and environmental justice at local and global scales. Also offered at OSU-Cascades and via Ecampus.

SUS 499. SPECIAL TOPICS. (3 Credits)

This course is repeatable for 15 credits.

SUS 512. TOPICS IN THE SCIENCE OF SUSTAINABILITY. (4 Credits)

Provides a graduate-level introduction to key concepts and issues in environmental science and sustainability, targeted at business-oriented graduate and post-bacc students who do not have a science background. The course is a core requirement of the Sustainable Business certificate program offered jointly by the College of Business (COB) and the College of Agricultural Sciences' (CAS) Sustainability Double-Degree (SDD) Program.

SUS 514. SUSTAINABILITY PLANNING AND ASSESSMENT. (4 Credits)

Sustainability is fundamentally about balancing social, economic and ecological systems. This course examines a range of different methodologies for measuring and evaluating performance towards established sustainability criteria and indicators. Students will critically evaluate tools for making sustainable decisions and understand the limitations of individual assessment approaches in different contexts. Specific assessment techniques to be explored include ecological footprinting, sustainable community indicators, greenhouse gas emissions inventories, sustainability checklists, environmental management systems (ISO standards), life-cycle analysis, and business sustainability reporting. Students will leave the course with the fundamental skills required to complete sustainability assessments via globally relevant approaches.

SUS 599. SPECIAL TOPICS. (0-16 Credits)

This course is repeatable for 16 credits.