DEPARTMENT OF SOIL AND WATER SYSTEMS

The Department of Soil and Water Systems (SWS) addresses resource issues related to soil, water quality and quantity, and sustainable food, energy, agricultural and waste systems. The unit combines faculty with expertise in soil science, hydrology, sediment transport, water resources, irrigation engineering, bioenergy, precision agriculture, nutrient cycling, waste management, agronomy, and agricultural systems management to study complex problems and inform the management, use and sustainability of agro-ecosystems. SWS faculty fulfill this commitment through focused excellence in research, teaching and extension. With faculty located at four research centers throughout the state, SWS has statewide responsibility and impact. The department’s teaching program includes a Bachelor of Science in Soil and Water Systems (B.S.S.W.S.) with majors in Environmental Soil Science, Water Science and Management and Agricultural Systems Management. A college-wide major in Sustainable Food Systems is also administered through SWS. Graduate programs (MS and Ph.D) are available in Soil and Land Resources. Graduate degrees in water are offered through an interdisciplinary program in Water Resources.

The Agricultural Systems Management major prepares students to apply biological, physical, mechanical, and business knowledge to the production, service, sales, application, and management of the equipment and processes used in agriculture. The curriculum stresses courses in agricultural systems management, and basic and applied sciences. It also includes a strong background in agricultural economics, accounting, and business. It prepares students for a variety of important and rewarding career opportunities across the entire spectrum of the food and fiber sector. Many graduates return to farming, while others pursue careers as farm managers or are employed in agricultural and natural resource-oriented businesses, banking firms, educational institutions, or governmental agencies.

The Environmental Soil Science major prepares students to work in a variety of fields related to natural resource management. The curriculum stresses in-depth understanding of the field through interdisciplinary training in pedology, soil chemistry, soil physics, soil ecology and fertility. Graduates are employed as soil scientists, conservationists, agronomists, laboratory managers, and consultants. Students gain hands-on experience by working in laboratories and conducting undergraduate research. Students work towards becoming certified soil scientists prior to graduating.

The Water Science and Management major produces graduates that understand the critical importance of using science to better manage water resources. Graduates fill critical roles in the agricultural industry, research facilities and state and federal agencies. The breadth of the major offered in this curriculum allows students to develop strong expertise in managing water in complex ecosystems including agriculture, forestry, and rangeland. The degree includes additional math and GIS-based mapping requirements to ensure that graduates have the ability to be successful in job roles such as quantitative hydrologist, and irrigation, precision agriculture, and watershed management technicians.

The Sustainable Food Systems major takes an interdisciplinary, farm-to-plate approach to understanding of food, farming and human health. The degree is designed to provide a science-based understanding of the many facets of food-from sustainable production, food chemistry and safety, to policy and human nutrition. Students tie everything together in sophomore and senior level courses that explore local, regional and global food systems. Many laboratory-based courses offer hands-on experience. Students may specialize in specific areas of the food system. Students gain hands-on experience through required practicum courses and internships and can put concepts taught in courses to work while operating the campus organic farm.

Degree offerings within SWS are designed to prepare students for graduate school and a variety of rewarding career opportunities. All of our programs are based on curricula designed to prepare students for present and future employment. We offer students the opportunity to work closely with faculty in classroom and field situations. Our faculty members offer additional specialization through directed study, special topics, seminars and other courses as needed. Internships are available to provide students with practical job experience and to open doors for career opportunities. Students are encouraged to participate in international exchanges offered through the College of Agricultural and Life Sciences.

We offer many opportunities to conduct advanced, in-depth studies with our important scientific collections and cutting-edge facilities. The Maynard A. Fosberg Monolith collection is one of the largest in the world with 232 soil monoliths. We have a state-of-the-art analytical laboratory facility to accommodate faculty, staff and students. We also offer a greenhouse facility with controlled temperature and light-programmed rooms and growth chambers. The University has 1,145 acres located close to campus for field crops, orchards and livestock. Excellent field and laboratory facilities are also available at our research and extension centers at Aberdeen, Parma, Kimberly, and Twin Falls.

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*ALLEN, Richard G; 1998; Professor in Soil and Water Systems; Affiliate Faculty of Biological Engineering and Civil and Environmental Engineering; Ph.D.; 1984; University of Idaho.

BARRA, Ricardo; 2017; Adjunct Faculty in Soil and Water Systems; Ph.D.; 1993; Universidad de Concepcion.

*BOLL, Jan; 1996; Adjunct Professor in Soil and Water Systems; Ph.D.; 1995; Cornell University.

*BROOKS, Erin S; 2012; Associate Professor in Soil and Water Systems; Affiliate Faculty of Biological Engineering and Civil and Environmental Engineering; Ph.D.; 2003; University of Idaho.

CAAMANO, Diego; 2017; Adjunct Faculty in Soil and Water Systems; Ph.D.; 2008; University of Idaho.

*CHEN, Lide; 2015; Associate Professor in Soil and Water Systems; Affiliate Faculty in Biological Engineering; Affiliate Faculty in Civil Engineering; Ph.D.; 2008; Iowa State University.

CHESS, Dale; 2017; Adjunct Faculty in Soil and Water Systems; Ph.D.; 1998; University of Montana.

CORRAO, Mark V; 2017; Adjunct Faculty in Soil and Water Systems; Adjunct Faculty in Forest, Rangeland and Fire Sciences; Ph.D.; 2015; University of Idaho.

HEIMGARTNER, Marvin; 2008; Senior Instructor in Soil and Water Systems; M.S.; 2011; University of Idaho.
**Minors**
- Soil Science Minor (https://catalog.uidaho.edu/colleges-related-units/agricultural-life-sciences/soil-water-systems/soil-science-minor)

**Soil and Water Systems Graduate Programs**
- Soil and Land Resources (Ph.D.) (https://catalog.uidaho.edu/colleges-related-units/agricultural-life-sciences/soil-water-systems/soil-land-resources-phd)
- Soils (M.S.) (https://catalog.uidaho.edu/colleges-related-units/agricultural-life-sciences/soil-water-systems/soils-ms)

**Agricultural Systems Management**

**ASM 105 Survey of Agricultural Mechanics**
1-3 credits, max 3
This course is designed to introduce the student to the principles of technology in agriculture. It includes the development of knowledge and skills pertaining to agricultural mechanics, welding, power technology, electricity, and structures. It will provide introductory learning experiences for students in the areas of agricultural systems management.

**ASM 107 Beginning Welding**
2 credits
Principles of operation, use, and care of arc and acetylene welding equipment. One lec, one 2-hr lab, and two hrs of individual practice a wk. Enrollment limited to 12 per section. Cooperative: open to WSU degree-seeking students.

**ASM 112 Introduction to Agricultural Systems Management**
3 credits
Application of basic engineering principles to solving problems dealing with farm machinery, buildings, processing, irrigation, and energy use. Recommended Preparation: high school algebra.

**ASM 200 (s) Seminar**
Credit arranged.

**ASM 202 Agricultural Shop Practices**
2 credits
Primarily for agricultural mechanization and agricultural education students. Operation, use, and care of shop tools and equipment. One lecture and one 3-hour lab a week.

**ASM 204 (s) Special Topics**
Credit arranged.

**ASM 210 Small Engines**
2 credits
Principles of engine operation, tune-up, and maintenance; repair and overhaul of small engines. One lecture, one 2-hour lab, and two hours of individual practice a week. Enrollment limited to 12 per section.

**ASM 299 (s) Directed Study**
Credit arranged.
ASM 305 GPS and Precision Agriculture
3 credits
This course will cover the fundamentals of global positioning, yield monitors, and variable rate applications. Instrumentation used in agriculture, environmental science, and industry will be discussed. Two lectures and one 3-hour lab a week. Cooperative: open to WSU degree-seeking students.

ASM 315 Irrigation Systems and Water Management
3 credits
Irrigation methods, irrigation management, water rights, conveyance and measurement, pumps, soil-water-plant relationships, and drainage. Two lectures and one 3-hour lab a week. Cooperative: open to WSU degree-seeking students.
Prereq: SOIL 205, MATH 108, 143, 160 or 170 or Permission.

ASM 331 Electric Power Systems for Agriculture
3 credits
Basic circuits; wiring and the code; motors and controls; heating, lighting, and power. Two lectures and one 3-hour lab a week. Cooperative: open to WSU degree-seeking students.

ASM 398 (s) Internship
1-6 credits, max 6
Graded P/F.
Prereq: Permission.

ASM 400 (s) Seminar
Credit arranged.

ASM 403 (s) Workshop
Credit arranged.

ASM 404 (s) Special Topics
Credit arranged.

ASM 407 Advanced Welding
1 credit
This course provides the student an opportunity to learn various advanced welding theories, practices and applications for ferrous and non-ferrous metals, which include Gas Metal Arc Welding (GMAW), Flux Cored Arc Welding (FCAW), Gas Tungsten Arc Welding (GTAW) and Plasma Arc Cutting (PAC). These are only introduced in ASM 107, Beginning Welding, and will be covered in depth in this course. This course will also provide the student with a technical understanding of calculating material and use of proper procedures for the completion of project manufactured in the lab. Student presentations and demonstrations are required. This course will introduce emerging technologies in welding and fabrication industries.
Prereq: ASM 107 and Permission.

ASM 409 Agricultural Tractors, Power Units and Machinery Management
4 credits
This course focuses on the selection, operation, adjustment, and servicing of farm tractors and power units. Fuels, lubrication, cooling, and electrical systems will also be covered. Machinery operation, power transmission systems, hitching, traction, and safety are also discussed. The course will conclude with discussions on depreciation and machinery replacement. Three 1-hour lectures and one 3-hour lab a week.

ASM 412 Agricultural Safety and Health
2 credits
Covers a broad variety of items related to agricultural safety and health: identification of safety and health hazards, maximizing capabilities of farmers and ranchers with disabilities, grain and livestock handling, chemical and gases handling, and fire safety; corrective measures to eliminate hazards and application of information learned to student’s own situation. (Alt/hrs)

ASM 433 Agricultural Processing Systems
3 credits
Grain cleaning, mixing, and drying; materials handling, heat transfer, pumps, fans, refrigeration, and instrumentation. Two lectures and one 3-hour lab a week; one 1-day field trip. Recommended Preparation: MATH 160.

ASM 498 (s) Internship
1-6 credits, max 6
Graded P/F.
Prereq: Permission.

ASM 499 (s) Directed Study
Credit arranged.

Soils

SOIL 205 The Soil Ecosystem
3 credits
Gen Ed: Natural and Applied Sciences
Introduction to the physical, chemical, and biological nature of soils.
Prereq: CHEM 101 or CHEM 111 or Instructor Permission.

SOIL 206 The Soil Ecosystem Lab
1 credit
Gen Ed: Natural and Applied Sciences
Lab study relevant to SOIL 205. Experiments and demonstrations on basic and applied aspects of soil science. One 3-hour lab a week. Coreq: SOIL 205.

SOIL 210 Food Systems and Healthy Lifestyles
3 credits
Introduction to food systems including the historical development of our current global food system. Linkages among the production, marketing and transportation of food and food policy on human health will be explored. Students will complete a semester-long assessment of the local food system and its impacts on individual, school and community health and strategies to improve the food system.

SOIL 299 (s) Directed Study
Credit arranged.

SOIL 398 (s) Internship
1-6 credits, max 6
Graded P/F.
Prereq: Permission of department.

SOIL 400 (s) Seminar
Credit arranged.

SOIL 404 (s) Special Topics
Credit arranged.
SOIL 415 Soil and Environmental Physics  
3 credits  
Joint-listed with SOIL 515  
Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Two lec and one 3-hr lab a wk.  
Recommended Preparation: SOIL 205, SOIL 206, and PHYS 111. SOIL 415 is a cooperative course available to WSU degree-seeking students. (Alt/ yrs, Fall)

SOIL 417 Market Garden Practicum  
1-6 credits  
Experiential learning based course that covers all aspects of running a small acreage vegetable farm. Topics include farm planning, crop rotation, soil fertility and testing, weed management and food systems. Students satisfy credit hours through participation in lecture/discussion, field work and field trips. Class meets at the Plant Science Farm.  
Recommended preparation: SOIL 205. (Summer only)

SOIL 422 Environmental Soil Chemistry  
3 credits  
Chemical processes in soil environment. Recommended Preparation: SOIL 205, SOIL 206, and CHEM 112. Cooperative: open to WSU degree-seeking students. (Alt/hrs)

SOIL 425 Microbial Ecology  
3 credits  
Joint-listed with SOIL 525  
Biogeochemical activities and relationships of microorganisms in soil, water, plants, and animals. Extra oral and/or written assignments required for graduate credit. Recommended Preparation: MATH 137 or 143. (Spring alt/hrs).  
Prereq: BIOL 154 or 250.

SOIL 427 Sustainable Food Systems  
3 credits  
Joint-listed with SOIL 527  
The purpose of this course is to help students apply systems thinking and systems methodological problem solving skills to identify and describe current and future food system issues. Through lectures, case studies and research students will explore elements and behavior of food systems that impart sustainability. Students taking the course for graduate credit will complete additional readings, research and presentations.  
Prereq: FOR 221, REM 221, or SOIL 210; or Instructor Permission.

SOIL 438 Pesticides in the Environment  
3 credits  
Gen Ed: Senior Experience  
Cross-listed with ENT 438 and PLSC 438  
Principles of pesticide fate in soil, water, and air; pesticide metabolism in plants, pesticide toxicity, and pesticide mode-mechanism of action; pest resistance to pesticides; biotechnology in pest control; regulations and liability; equipment application technology; pesticide transport, storage, and disposal; and social and ethical considerations. Recommended Preparation: CHEM 275.

SOIL 446 (s) Soil Fertility  
1-3 credits, max 3  
Principles of soil fertility management; availability of plant nutrients and their relationship to plant growth and fertilization practices.  
Recommended Preparation: SOIL 205 and 206.

SOIL 450 Environmental Hydrology  
3 credits  
Cross-listed with ENVS 450  
Carries no credit after BE 355 or CE 325. Comprehensive understanding of the hydrologic processes associated with the environmental processes. Includes components of the hydrologic cycle, analysis of precipitation and run off, evapotranspiration, routing, peak flow, infiltration, soil and water relationships, snowmelt, and frequency analysis. (Spring only)  
Prereq: MATH 170.

SOIL 454 Pedology  
3 credits  
Morphology, genesis, and classification of soils; distribution of soils as related to environmental processes and factors. Two lectures and one 4-hr lab a week. Recommended Preparation: SOIL 205 and SOIL 206.  
Cooperative: open to WSU degree-seeking students.

SOIL 456 North Idaho Field Trip  
1 credit  
Soils and land use in northern Idaho ecosystems; emphasis on soil parent materials, soil formation and morphology, and soil-plant community relationships. Graded P/F. One 3-day field trip; additional class meetings and assignments before and after field trip. Cooperative: open to WSU degree-seeking students.  
Prereq: SOIL 205 or Permission.

SOIL 499 (s) Directed Study  
Credit arranged.

SOIL 500 Master's Research and Thesis  
Credit arranged.

SOIL 501 (s) Seminar  
Credit arranged.

SOIL 502 (s) Directed Study  
Credit arranged.

SOIL 504 (s) Special Topics  
Credit arranged.

SOIL 514 Environmental Geophysics  
3 credits  
This course will provide an introduction to near-surface geophysical techniques. The aim is to provide a solid foundation on physical principles used to non-invasively study characteristics and properties of the earth in general, and the shallow subsurface in particular. We will discuss applications ranging from eco-hydrology, precision agriculture, and civil engineering to archeology. The course consists of two parts. Lectures will provide a conceptual understanding of the theory and methods, and a field-based case study will apply these concepts collecting integrated geophysical data that will be processed and interpreted to introduce students to practical procedures and challenges in environmental geophysics. Cooperative: open to WSU degree-seeking students.

SOIL 515 Soil and Environmental Physics  
3 credits  
Joint-listed with SOIL 415  
Physical properties of soils and their relationships to moisture, aeration, and temperature; plant-soil-atmospheric relationships; solute transport and soil salinity. Two lec and one 3-hr lab a wk.  
Recommended Preparation: SOIL 205, SOIL 206, and PHYS 111. SOIL 415 is a cooperative course available to WSU degree-seeking students. (Alt/ yrs, Fall)
SOIL 525 Microbial Ecology
3 credits
Joint-listed with SOIL 425
Biogeochemical activities and relationships of microorganisms in soil, water, plants, and animals. Extra oral and/or written assignments required for graduate credit. Recommended Preparation: MATH 137 or 143. (Spring alt/hrs).
Prereq: BIOL 154 or 250.

SOIL 527 Sustainable Food Systems
3 credits
Joint-listed with SOIL 427
The purpose of this course is to help students apply systems thinking and systems methodological problem solving skills to identify and describe current and future food system issues. Through lectures, case studies and research students will explore elements and behavior of food systems that impart sustainability. Students taking the course for graduate credit will complete additional readings, research and presentations.
Prereq: FOR 221, REM 221, or SOIL 210; or Instructor Permission.

SOIL 537 Soil Biochemistry
3 credits
Origin, chemical structure, and significance of soil biochemical compounds. Cooperative: open to WSU degree-seeking students. (Alt/hrs)
Prereq: SOIL 422, BIOL 380, BIOL 250 or Permission.

SOIL 597 (s) Practicum
Credit arranged.

SOIL 598 (s) Internship
Credit arranged
Graded P/F.
Prereq: Permission.

SOIL 599 (s) Research
Credit arranged
Research not directly related to a thesis or dissertation.
Prereq: Permission.

SOIL 600 Doctoral Research and Dissertation
Credit arranged.