SOIL SCIENCE

Dual-Titles

Dual-Title Ph.D. in Soil Science and Biogeochemistry

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs (https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-208-dual-titles/).

Doctoral students with research and educational experiences in soil science may apply to the Soil Science/Biogeochemistry dual-title doctoral degree program. The goal of the dual-title Ph.D. degree in Soil Science and Biogeochemistry is to enable SOILS graduate students to acquire the knowledge and skills of their major area of specialization in SOILS, while at the same time gaining expertise and skills in biogeochemistry. Graduate study in this program seeks to provide students with the intellectual foundation for integrated and mechanistic understanding of interactions between microbes, soils, and plants in diverse environmental systems. Interdisciplinary training that includes biogeochemistry will prepare students for positions in academia, government, non-profit organizations, and the private sector. It will also prepare students for a wide array of research careers in the private sector, including agricultural and environmental sciences, energy industries, and the integrated study of the sustainability of biological systems.

Admission Requirements

For admission to the dual-title doctoral degree in Biogeochemistry, a student must first apply and be admitted to the Soil Science graduate program and The Graduate School. It is preferable but not necessary to discuss the dual-title interest beforehand with a major adviser who has been appointed to the Biogeochemistry program. Refer to the Admission Requirements section of the Biogeochemistry Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/biogeochemistry/). After admission to the Soil Science program, students must apply for admission to the Biogeochemistry dual-title program by submitting an application to the Biogeochemistry Graduate Program Coordinator. The application consists of a written personal statement describing the student's biogeochemistry research interests and career goals that can be met by earning a dual-title SOILS/BGC degree. The statement should be signed by the student's major adviser in support of the student's taking on the academic responsibilities of the dual-title degree. The application will be reviewed by the BGC Program Coordinator, in consultation with the BGC Executive Committee, who will make the admission decision and notify the Graduate School. Students must be admitted into the BGC program prior to taking the qualifying exam.

Degree Requirements

To qualify for the dual-title degree, students must satisfy the Soil Science Ph.D. degree requirements. In addition, students pursuing the dual-title Ph.D. in Soil Science and Biogeochemistry must complete the degree requirements for the dual-title Biogeochemistry Ph.D., listed on the Biogeochemistry Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/biogeochemistry/). Students are required to have two advisers from separate disciplines: one individual serving as a primary adviser in their major degree program and a secondary adviser in an area within a field covered by the dual-title program who is a member of the Biogeochemistry Graduate Faculty. The major program adviser normally will also be a member of the Biogeochemistry Graduate Faculty. The two faculty advisers can represent different academic programs, but this is not required, as faculty from a scientifically diverse department could represent very different areas of expertise.

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Soil Science and must include at least one Graduate Faculty member from the Biogeochemistry program. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both Soil Science and Biogeochemistry. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for Ph.D. committees (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/phd-dissertation-committee-formation/), the Ph.D. committee of a Soil Science and Biogeochemistry dual-title doctoral degree student must include at least one member of the Biogeochemistry Graduate Faculty. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. If the chair of the Ph.D. committee is not also a member of the Graduate Faculty in Biogeochemistry, the member of the committee representing Biogeochemistry must be appointed as co-chair. The Biogeochemistry representative on the student's Ph.D. committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students enrolled in the dual-title program are required to write and orally defend a dissertation on a topic that reflects their original research and education in Soil Science and Biogeochemistry. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School.

Dual-Title M.S. and Ph.D. in Soil Science and International Agriculture and Development

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs (https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-208-dual-titles/).

Graduate students with research and educational interests in international education may apply to the Soil Science/INTAD Dual-Title Degree Program. The goal of the dual-title degree in Soil Science and INTAD is to enable graduate students from Soil Science to acquire the knowledge and skills of their primary area of specialization in Soil Science, while at the same time gaining the perspective and methods needed for work in the international agriculture. Graduate study in this program seeks to prepare students to assume leadership roles in science, science education, outreach, and project management anywhere in the world. Students are required to write research proposals and expected to write grants to support their research activities, reflecting the dual-title degree. As part of their professional development presentations, publication of research articles and active participation in professional societies is expected. Emphasis is placed upon the professional development of the student. Students are able to specialize in the research program areas of soil genesis, classification, morphology, mapping, microbiology, chemistry, physics, mineralogy, fertility, geographic information systems, remote sensing, watershed analysis, hydrology, and land management. At the same time they will acquire a broad perspective about how to apply their research findings in the context of the broader international community. Thus, the dual-title will

allow students to master their field of specialization from an international perspective so that they can compare practices and outcomes between countries and regions.

Admission Requirements

For admission to the dual-title graduate degree under this program, a student must first apply and be admitted to the Soil Science graduate program. Once accepted into the Soil Science program, the student can then submit an application to the INTAD Academic Program Committee for the dual-title degree program. Refer to the Admission Requirements section of the INTAD Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/international-agriculture-development/). The application consists of an application form, a written personal statement indicating the career goals that a student hopes to accomplish by earning a dual-title SOILS/INTAD degree, and a letter from the Soil Science academic adviser supporting the student's taking on additional academic responsibilities. The letter also must confirm that the student is in good standing and is capable of taking on the dual-title degree. The application will be reviewed by the INTAD Academic Program Committee, which will make all final admission decisions. Doctoral students must be admitted into the INTAD program prior to taking the qualifying exam.

Degree Requirements for the Dual-title M.S.

To qualify for this dual-title degree, students must satisfy the requirements of the Soil Science Master of Science degree program. In addition, they must satisfy the INTAD program requirements for the dual-title master's degree. Refer to the Master's Degree Requirements section of the INTAD Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/international-agriculture-development/). Some courses may satisfy both the primary graduate program requirements and those of the INTAD program. The double counting of credits must be approved by the student's adviser(s), the head of the SOILS graduate program, and the INTAD Co-Chairs.

For the dual-title M.S. degree in Soil Science and INTAD, the thesis must reflect the student's education and interest in both Soil Science and INTAD. All members of the student's committee must be members of the Graduate Faculty. The master's committee must include at least one Graduate Faculty member from INTAD. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role.

Degree Requirements for the Dual-Title Ph.D.

To qualify for the dual-title degree, students must satisfy the degree requirements for the Ph.D. in Soil Science. In addition, students must complete the degree requirements for the dual-title in INTAD, listed on the INTAD Bulletin page (http://bulletins.psu.edu/graduate/programs/majors/international-agriculture-development/). Some courses may satisfy both Soil Science and INTAD degree requirements. The double counting of credits must be approved by the student's adviser(s), the head of the SOILS graduate program, and the INTAD Co-Chairs.

Graduates of the dual-title INTAD master's degree program who wish to pursue an INTAD doctoral degree must re-apply to the INTAD program for admission. INTAD master's degree credits may be carried over to the doctoral program. Six additional INTAD credits will be required. INTAD master's degree graduates who pursue an INTAD Ph.D. are required to take the INTAD 820 International Agricultural Development Seminar a second time.

Qualifying Examination

Qualifying examination procedures will be based on the procedures of the Soil Science graduate degree program, but will integrate the fields of Soil Science and International Agriculture and Development. Although not encouraged, the dual-title degree student may require an additional semester or more to fulfill requirements for the dual-title degree program. Therefore, under exceptional circumstances, the qualifying exam may be delayed at the discretion of the student's Soil Science adviser in consultation with the INTAD program coordinators. The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Soil Science and must include at least one Graduate Faculty member from INTAD.

Committee Composition

In addition to the general Graduate Council requirements for Ph.D. committees (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/phd-dissertation-committee-formation/), the Ph.D. committee of a Soil Science and INTAD dual-title Ph.D. student must include at least one member of the INTAD Graduate Faculty. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. If the chair of the Ph.D. committee is not also a member of the Graduate Faculty in INTAD, the member of the committee representing INTAD must be appointed as co-chair.

Comprehensive Exam

At the end of the course work, students in the dual-title doctoral degree program in Soil Science and INTAD will be required to pass an oral and written comprehensive examination based on their dissertation proposal and area of specialization in Soil Science, while reflecting their dual-title curriculum. A separate comprehensive examination is not required by the INTAD program, but international agriculture must be one of the key areas of the comprehensive exam and the INTAD representative on the student's Ph.D. committee must have input into the development of and participate in the evaluation of the comprehensive examination.

Dissertation and Dissertation Defense

Ph.D. students enrolled in the dual-title degree program are required to write and orally defend a dissertation on a topic that reflects the integration of their original research and education in Soil Science and International Agriculture and Development. In order to satisfy the INTAD dissertation requirement, students may: 1) conduct all or part of their research in an international location, 2) conduct an analysis of a subject in an international context, 3) conduct an analysis of secondary data of international origin, or 4) incorporate another international dimension by approval of the INTAD committee member. Additionally, the dissertation should reflect the student's technical knowledge, knowledge of and sensitivity to a wide diversity of cultures and backgrounds, and the perspective needed to transfer their knowledge in other cultures, particularly in the developing world. The dissertation should contribute to the body of knowledge in soil science and global agricultural development and have potential application in both U.S and international contexts. A public oral presentation of the dissertation is required. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School.

Dual-Title M.S. and Ph.D. in Soil Science and Transdisciplinary Research on Environment and Society

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs (https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-208-dual-titles/).

M.S. and Ph.D. students with research and educational interests in contemporary natural resource and societal changes may apply to the

dual-title program in Soil Science (SOILS) and Transdisciplinary Research on Environment and Society (TREES).

The goal of the dual-title graduate program is to enable graduate students from SOILS to acquire the knowledge and skills of their primary area of specialization in SOILS, while at the same time gaining experience in creating engaged approaches to transdisciplinary scholarship. Graduate study in this program seeks to prepare students to draw upon materials from the soil and/or water, sociocultural, and sociodemographic arenas in an integrated, collaborative framework. Graduates of the TREES program are equipped with the ability to communicate effectively with stakeholders affected by natural resource and environmental change issues in public settings. Students are required to write research proposals for collaboration and are expected to write grants to support their transdisciplinary research activities reflecting both research areas of the dual-title degree. As part of their professional development presentations, publication of research articles and active participation in professional societies is expected. Emphasis is placed upon the professional development of the student.

Admission Requirements

Students must apply and be admitted to the graduate program in SOILS and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the TREES dual-title program. Refer to the Admission Requirements section of the TREES Bulletin page (https://bulletins.psu.edu/graduate/programs/majors/transdisciplinary-research-environment-society/). Doctoral students must be admitted into the dual-title degree program in TREES prior to taking the qualifying examination in their primary graduate program.

Degree Requirements for the Dual-Title M.S.

To qualify for this dual-title degree, students must satisfy the requirements of the SOILS Master of Science degree program, listed on the Degree Requirements tab. In addition, they must satisfy the TREES program requirements for the dual-title master's degree. Refer to the Master's Degree Requirements section of the TREES Bulletin page (https://bulletins.psu.edu/graduate/programs/majors/transdisciplinary-research-environment-society/). Some courses may satisfy both the graduate primary program requirements and those of the TREES program. Final course selection is determined by the student after consulting, in advance, with their SOILS and TREES advisers.

For the dual-title M.S. degree in SOILS and TREES, the thesis must reflect the student's education and interest in both SOILS and TREES. All members of the student's committee must be members of the Graduate Faculty. The thesis supervisor and chair of the student's committee shall be a member of SOILS and TREES. Upon selection of the committee members, the committee should be officially appointed via the current outlined process from the Graduate School and must be approved by the TREES Academic Program Committee Co-chair.

Degree Requirements for the Dual-Title Ph.D.

To qualify for the dual-title degree, students must satisfy the degree requirements for the Ph.D. in SOILS, listed on the Degree Requirements tab. In addition, students must complete the degree requirements for the dual-title in TREES, listed on the TREES Bulletin page (https://bulletins.psu.edu/graduate/programs/majors/transdisciplinary-research-environment-society/).

The qualifying examination for SOILS will satisfy the qualifying exam requirement for the dual-title degree program in TREES. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for Ph.D. committees (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/phd-dissertation-committee-formation/), the Ph.D. committee of an SOILS and TREES dual-title Ph.D. student must include at least one member of the TREES Graduate Faculty. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. If the chair of the Ph.D. committee is not also a member of the Graduate Faculty in TREES, the member of the committee representing TREES must be appointed as co-chair. The TREES representative on the student's Ph.D. committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their Ph.D. committee and reflects their original research and education in SOILS and TREES. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School.