

SOILS AND BIOGEOCHEMISTRY GRADUATE GROUP (SBG-GG)
Previously Approved: June 21, 2001; June 23, 2013
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Degree Requirements Policy

MASTER'S DEGREE REQUIREMENTS FOR M.S. PLAN I AND PLAN II

1) Admissions Requirements

A. Applicants for admission must meet the University of California requirement of a minimum GPA 3.0/4.0 grade point average. In addition, students must complete the following entrance requirements: two preparatory courses in each of the following areas chemistry, physics, biology, calculus and soil science. Applicants who are admitted without these prerequisites must show proficiency in these four areas through a petition process or must take remedial course work in their first year of study.

B. Three letters of recommendation;

C. A Major Professor who must confirm that they accept the student into their program and will provide essential resources and mentorship.

D. English proficiency exam (TOEFL or other University approved exam) with the minimum score set by the Office of Graduate Studies. This is required for international applicants who have not studied at an English speaking institution.

2) Master's Degree Plan I (Thesis) or Plan II (Comprehensive Examination)

Candidates may pursue the MS Degree under Plan I (Thesis) or Plan II (Comprehensive Examination). Students must be in residence for at least three quarters.

A. Plan I (Thesis)

Graduate Studies requirements (see <http://gradstudies.ucdavis.edu/continuing/degree.htm>) for residency and limitations on transfer units must be fulfilled. Plan I requires a thesis and a minimum of 30 units. Course work must be approved by the student's Guidance Committee. All Plan I students are required to submit a thesis approved by the Thesis Committee that is responsible for directing the student's research. The Thesis Committee will be chaired by the Major Professor. The Thesis Committee must sign the title page certifying the student has completed the thesis to the committee's satisfaction.

B. Plan II (Comprehensive Examination)

Students are required to complete a minimum of 36 units of upper division and graduate courses and pass a comprehensive written examination. Course work must be approved by the student's Guidance Committee and the Graduate Adviser. Following advancement to candidacy, students enrolled in the MS Plan II program are required to complete a written Comprehensive Examination with a passing grade.

3) Course Requirements – M.S. Plan I and Plan II

Plan I: At least 11 units of the 30 units must be SBG approved graduate courses (numbered 200 and higher; see Table 3) and must include SSC 205 (5 units, Field Studies of Soils in California Ecosystems), SSC 298 (2 units, Advances in Soils and Biogeochemistry*) and 4 additional units of SBG approved graduate courses. Students must take 1 unit of SSC 290 (soils seminar) and 2 units of other relevant seminars. At least one of the seminars must be participatory, meaning that students must take an active role in group discussion or give an oral presentation. The remaining 16 units may be a combination of upper division and graduate units including research. All students must maintain an average of a 3.0 grade point average (B) in all courses taken for a grade during residence. All courses taken to satisfy degree requirements and prerequisites during residence must be taken for a letter grade, except those for which letter grades are not normally assigned, such as research credits.

Summary Table 1, Course Requirements, Plan I:

SSC 205: Field Studies of Soils in California Ecosystems	5 units
SSC 298: Advances in Soils and Biogeochemistry	2 units
SBG approved graduate courses (see Table 3)	4 units
SSC 290: Soils seminar	1 unit
Other Seminars	2 units
Electives and research	16 units
Total required for M.S. Plan I	30 units

Plan II: At least 18 units of the 36 units must be SBG-GG approved graduate courses (numbered 200 and higher; see Table 3), and must include SSC 205 (5 units, Field Studies of Soils in California Ecosystems), SSC 298 (2 units, Advances in Soils and Biogeochemistry*), and 11 additional units of SBGG approved graduate courses. Students must take one unit of SSC 290 (soils seminar) and 2 units of other relevant seminars. At least one of the seminars must be participatory, meaning that students must take an active role in lead a group discussion or give an oral presentation. The remaining 15 units may be a combination of upper division and graduate units including research. All students must maintain an average of a 3.0 grade point average (B) in all courses taken for a grade during residence. All courses taken to satisfy degree requirements and prerequisites must be taken for a letter grade, except those for which letter grades are not normally assigned, such as research credits.

Summary Table 2, Course Requirements, Plan II:

SSC 205: Field Studies of Soils in California Ecosystems	5 units
SSC 298: Advances in Soils and Biogeochemistry	2 units
SBG approved graduate courses (see Table 3)	11 units
SSC290: Soils seminar	1 unit
Other seminars	2 units
Electives	15 units
Total required for M.S. Plan II	36 units

Table 3. List of Approved Courses for the Soils and Biogeochemistry Graduate Group Degree Requirements.

Course #	Title	Quarter	Units
SSC 202	Topics in Advanced Soil Chemistry	II	3
SSC 205	Field Studies of Soils in California Ecosystems	IV	5
SSC 208	Soil-Plant Interrelationships	II-alt yr	3
SSC 211	Advanced Soil Microbiology	III alt yr	3
SSC 219	Ecosystem Biogeochemistry	III alt yr	4
SSC 220	Pedology	I alt yr	3
SSC 220	Global Carbon Cycle	II alt yr	3
SSC 298*	Advances in Soils and Biogeochemistry	II	2
SSC 299	Research		1-12
EBS 215	Soil-Machine Relations in Tillage and Traction	II alt yr	3
EBS 240	Infiltration and Drainage	II alt yr	3
EBS 242	Hydraulics of Surface Irrigation	III alt yr	3
EBS 265	Design and Analysis of Engineering Experiments	III	5
ECI 245A	Applied Environmental Chemistry: Inorganic	III alt yr	4
ECI 245B	Applied Environmental Chemistry: Organic	III alt yr	4
ECI 264B	Transport, Mixing and Water Quality in Estuaries and Wetlands	III alt yr	4
ECI 272C	Multiphase Reactive Transport	III alt yr	4
ECI 281A	Advanced Soil Mechanics	I	4
ECI 281B	Advanced Soil Mechanics	II	4
ECI 283	Physico-Chemical Aspects of Soil Behavior	I	3
ECI 284	Theoretical Geomechanics	II	4
ECI 240	Water Quality	II	4

ECI 276	Watershed Hydrology	II	4
ECL 216	Ecology and Agriculture	I alt yr	3
ECL 206	Concepts and Methods in Plant Community Ecology	I	4
ETX 220L	Analysis of Toxicants Laboratory	I	2
ETX 240	Ecotoxicology	III	3
GEO 200AN	Geographical Concepts	I	4
GEO 200BN	Theory & Practice of Geography	II	4
GEOCN	Quantitative Geography	III	4
GEO 211	Physical Geography Traditions and Methods	I alt yr	3
GEL 216	Tectonics	II alt yr	3
GEL 227	Stable Isotope Biogeochemistry	II	4
GEL 235	Surface Processes	II	3
HRT 203	Research Perspectives in Horticulture	I alt yr	3
HRT 251	Modeling Horticultural Systems	II	3
HYD 210	Vadose Zone Transport Processes and Modeling	III alt yr	3
HYD 252	Hillslope Geomorphology and Sediment Budgets	III alt yr	4
HYD 273	Introduction to Geostatistics	I alt yr	3
PBI 210	Plant Ecophysiology	II alt yr	3
PLS 205	Experimental Design and Analysis	II	5
PLS 206	Applied Multivariate Modeling in Agricultural and Environmental Sciences	I	4
VEN 216	Vineyard Establishment and Development	I	4
VEN217	Field and GIS Evaluation of Soils	II alt yr	3

*SSC 298 will be changed to SSC 200 upon course approval.

4) Special Requirements

M.S. Plan I students are required to present an exit seminar to the SBG faculty and students prior to submitting the thesis to the Office of Graduate Studies. MS Plan II students must present an exit seminar to the SBG faculty and students during the same quarter of the comprehensive exam. The maximum time that a student may remain in the Soils and Biogeochemistry Graduate Program is five years for the MS degree.

5) Committees

A. Admissions Committee: The Admissions Committee is composed of a Chair, two additional faculty members of the SBG-GGSBG, and a graduate student representative from the SBG-GG. This committee reviews applications and makes recommendations for admission to the Chair of SBG.

B. Course Guidance Committee: The Guidance Committee consists of the Academic Adviser, the Major Professor and an additional Graduate Group faculty member. The Committee is appointed by the Academic Adviser when a new student begins his/her graduate program. A graduate student may discuss the membership of the guidance committee with both his/her Major Professor and Academic Adviser. The Guidance Committee assists the student with academic planning such as course selection and timing and serves as another source of academic information. A student's program of study is subject to the approval of his/her Graduate Adviser

and Guidance Committee. The Guidance Committee will meet as needed until the student advances to candidacy or passes the MS exam. Either the student or any member of the Guidance Committee may request guidance committee meetings. Typically, the Guidance Committee will meet at least once a year, or more often as needed in the first year of a student's residency.

C. Thesis Committee: The MS Thesis Committee consists of the student's Major Professor and at least two additional faculty members. Committee members are typically selected through consultation between the student, the Major Professor and the Guidance Committee. The Academic Adviser nominates the committee members to the Dean of Graduate Studies, who appoints the members. External Committee members are allowed with the approval of the SBG Graduate Adviser and the Dean of Graduate Studies. Students must complete the approval process set by the Graduate Council for external committee members. The thesis committee advises the student, supervises the student's research and has the final authority to review and approve the thesis. It is the responsibility of the student to keep the thesis committee informed of his/her progress.

6) Advising Structure and Mentoring

Students are assigned an Academic Adviser. The Adviser maintains student records, is available for advice on course requirements, answers academic questions and is the liaison between the student and the Dean of Graduate Studies. The liaison role is to recommend examination, thesis and dissertation committee membership to Graduate Studies. The Adviser will appoint a Guidance Committee and complete official forms and documents (e.g., Advancement to Candidacy and Qualifying Examination Committee Nomination forms).

Three faculty members typically serve on a Guidance Committee. Plan I MS students will also have a Thesis Committee. Each of these individuals and committees play a role in helping a graduate student reach his/her educational goals.

A Major Professor is identified for each student as a condition of admission to the graduate program. Once in the program, students are allowed to select a new Major Professor among the SBG faculty. The choice is subject to mutual agreement by the student and the Major Professor. The Major Professor is primarily responsible for advising and mentoring his/her graduate students, guiding and directing a graduate student's research. Faculty mentors should follow and adhere to the Graduate Council's Mentorship Guidelines and the UC Davis Principles of Community.

7) Advancement to Candidacy

A student may advance to candidacy for the MS degree after completion of at least one-half of the course work requirements for the degree. A student must submit an advancement to candidacy form (<http://www.gradstudies.ucdavis.edu/forms/index.html>). The form must be signed by the Graduate Adviser and, for Plan I applicants, by the thesis adviser. The advancement to candidacy form must be filed at least one quarter prior to completion of all degree requirements.

8) Time Line and Sequence of Events

Year one, Fall Quarter: submit approved Guidance Committee report. Year two, Fall Quarter: submit petition to Advance to Candidacy. Spring Quarter, complete all required coursework for Plan I and Plan II. Plan II, take the Comprehensive Exam. Year three (if necessary): Complete research project, write thesis, submit thesis to Office of Graduate Studies.

9) Sources of Funding

Funding sources from the Graduate Group that are available to students include work study, Henry A. Jastro Awards, and Graduate Program Fellowship Allocations. Internal (campus) and external fellowships are also available. Students should consult with individual faculty regarding research funding (Graduate Student Researcher) and Teaching Assistant appointments. For graduate students to receive any Soils and Biogeochemistry Graduate Group funds, they must turn in the Annual Progress Report in a timely manner.

10) PELP and Filing Fee Status

Students must maintain appropriate student status at all times to be eligible to complete the degree. Students will be required to follow PELP and Filing Fee Status guidelines and procedures set by the Graduate Studies.

11) Thesis Requirements

There are no program specific requirements.

12) Comprehensive Examination requirements for Plan II Students

The comprehensive examination is given during the fifth week of Fall and Spring Quarters each year. Questions for this examination are written by the SBG members. There are questions in the following core disciplines: Soil Chemistry, Soil Physics, Soil Microbiology, Soil Genesis/Classification (Pedology), Biogeochemistry and Soil Fertility/Plant Nutrition. Typically, students are given three hours to write answers to the exam questions. Each section of the examination is graded separately and students must earn a passing grade on all sections of the exam. Students who do not pass any or all sections may take the examination one additional time.

DOCTOR OF PHILOSOPHY DEGREE (PLAN B)

1) Admissions requirements

A. Applicants for admission must meet the University of California requirement of a minimum GPA 3.0/4.0 grade point average. In addition, students must complete the following entrance requirements: two preparatory courses in each of the following areas chemistry, physics, biology, calculus, and soil science. Applicants who are admitted without these prerequisites must show proficiency in these five areas through a petition process or must take remedial course work in their first year of study.

B. Three letters of recommendation.

C. A Major Professor who must confirm that she/he accepts the student into her/his program and will provide essential resources and mentorship.

D. English proficiency exam (TOEFL or other University approved exam) with the minimum score set by the Graduate Council. This is required for international applicants who have not studied at an English speaking institution.

2) Ph.D. Dissertation

Students must be in residence for at least six regular quarters. Graduate Council's requirements (see:

<http://gradstudies.ucdavis.edu/gradcouncil/GC201103%20Residence%20and%20Transfer%20Credit%20approved%2010-7-11.pdf>) for residency and limitations on transfer units must be fulfilled. Course work must be approved by the student's Guidance Committee and the Graduate Adviser. All students are required to submit a dissertation approved by the Dissertation Committee chaired by their Major Professor and responsible for directing the student's research. The Dissertation Committee must sign the title page certifying the student has completed the dissertation to the committee's satisfaction.

Two Tracks of Study

There are two tracks: (a) Soil Science and (b) Soils and Biogeochemistry. Students will choose one of two tracks during the initial planning phase of their course of study with their Academic Adviser and Guidance Committee. Both tracks have the same course requirements, but differ in the Qualifying Examination subject matter.

The Soil Science track is based on a traditional soil science course of study consisting of five core disciplines: Soil Chemistry, Soil Physics, Soil Microbiology, Soil Genesis/Classification (Pedology), and Soil Fertility/Plant Nutrition.

The Soils and Biogeochemistry track is based on a broader definition of soil science that includes soils in relation to environment and ecological processes. This track is more flexible, and can allow students to emphasize a particular area.

3) Course Requirements

The Soils and Biogeochemistry Graduate Group offers a Plan B Ph.D. program (see http://www.mrak.ucdavis.edu/senate/ddregulations_0405_revisions.pdf). The minimum unit requirement is at least 18 units in addition to a variable number of research units. At least 13 units must be in SBG approved graduate courses (200 and higher; see Table 3), and must include SSC 205 (5 units, Field Studies of Soils in California Ecosystems), SSC 298 (2 units, Advances in Soils and Biogeochemistry) and 6 units of SBG approved graduate courses. Students must take 3 units of SSC 290 (soils seminar) and 2 units of other relevant seminars. At least two of the seminars must be participatory, meaning that students must take an active role in group discussion or give an oral presentation. The remaining units may be a combination of upper division and graduate units including research. Additional units may be required by the Major Professor, Academic Adviser and/or Guidance Committee prior to students being admitted to the Qualifying Examination. All students must maintain an average of a 3.0 grade point average (B) in all courses taken for a grade during residence. All courses taken to satisfy degree requirements and prerequisites during residence must be taken for a letter grade, except those for which letter grades are not normally assigned, such as research credits.

Summary Table 4, Ph.D. Course Requirements

SSC 205: Field Studies of Soils in California Ecosystems	5 units
SSC 298: Advances in Soils and Biogeochemistry	2 units
SBG approved graduate courses (see Table 3)	6 units
SSC290: Soils seminar	3 units
Other Seminars	2 units
SSC 299: Research	variable
Total required	18 units

4) Special Requirements

PhD students are required to present an exit seminar to the SBG faculty and students prior to submitting the dissertation to the Office of Graduate Studies. The maximum time that a student may remain in the Soils and Biogeochemistry Graduate Program is ten years for the Ph.D. degree.

5) Committees

A. Admissions Committee: The Admissions Committee is composed of a Chair, two additional faculty members of the SBG Group, and, a graduate student representative from SBG. This committee reviews applications and makes recommendations for admission to the Chair of SBG.

B. Course Guidance Committee: The Guidance Committee consists of the Academic Adviser, the Major Professor and an additional Graduate Group faculty member. The Committee is appointed by the Academic Adviser when a new student begins his/her graduate program. A graduate student may discuss the membership of the guidance committee with both his/her Major Professor and Academic Adviser. The Guidance Committee assists the student with academic planning such as course selection and timing and serves as another source of academic information. A student's program of study is subject to the approval of his/her Graduate Adviser and Guidance Committee. The Guidance Committee will meet as needed until the student advances to candidacy. Either the student or any member of the Guidance Committee may request meetings. Typically, the Guidance Committee will meet at least once a year, or more often as needed in the first year of a student's residency.

C. Qualifying Examination Committee: Students must pass a Qualifying Examination for the Ph.D. degree that tests the student's eligibility to attain Ph.D. Candidate status. The Qualifying Examination must be taken within seven academic quarters (not including summer) after admission to the Soils and Biogeochemistry Graduate Group. All required courses must be completed before admission to the Qualifying Examination. Application for taking the Qualifying Examination is made by filing the application for Qualifying Examination form with Graduate Studies.

The Qualifying Examination Committee consists of five faculty members. One member of the committee is designated as the committee chair. The Major Professor may not be a member of the Qualifying Exam Committee. The members are selected by the Guidance Committee in consultation with the student. SBG members must represent the majority of the committee.

Before scheduling the Qualifying Examination, the faculty member of the examination committee closest to the student's research interest may decide to give a comprehensive written examination to determine if the student is prepared for the Qualifying Examination. Prior to the Qualifying Examination, one or more members of the Qualifying Examination Committee may choose to give a preliminary written examination to the student.

The Qualifying Examination typically begins with a brief presentation by the student of her/his research proposal and preliminary results. The proposal, based on the general format of USDA-NRI grant proposal programs, will be 12-15 pages double-spaced, including tables and figures. This is followed by both general knowledge questions and questions about the student's research proposal from each member of the examination committee. No time limit has been set for the length of the examination but a typical examination is three hours in length. It is the student's responsibility to arrange the date and time of the examination in consultation with committee members. The student is responsible for reserving the room for the examination.

Soil Science Track: A majority of this committee is composed of members of the SBG who have expertise in the five core areas -- Soil Chemistry, Soil Fertility/Plant Nutrition, Soil Microbiology, Soil Physics, Soil Genesis/Classification (Pedology).

Soils and Biogeochemistry Track: A majority of this committee is composed of members of the SBG who have expertise in the following five areas:

- (1) Principles of Soil Science (breadth of knowledge based on SSC 100, SSC 205 and SSC 298*)
- (2) Methods/Tools/Quantitative Skills
- (3) A major emphasis topic from one of the five traditional soil science disciplines (Soil Chemistry, Soil Fertility/Plant Nutrition, Soil Microbiology, Soil Physics, Soil Genesis/Classification (Pedology))
- (4) A minor emphasis topic chosen by the student and Guidance Committee. This topic is of minor emphasis with regard to the student's research area.
- (5) A second minor emphasis topic chosen by the student and Guidance Committee. This topic is of minor emphasis with regard to the student's research area.

Examples of topics for minor emphasis are: (a) Monitoring Environmental Quality and Ecosystem Services, (b) Biogeosciences, (c) Global Change, (d) Environmental Degradation and Restoration, (e) Isotope Biogeochemistry, (f) Nutrient Cycling, (g) Fate and Transport Processes, (h) Plant-Soil Interactions, (i) Soil-Plant-Water Interactions, (j) Rhizosphere Ecology, (k) Microbial Ecology and (j) other soil science sub-disciplines not selected as major emphasis.

D. Dissertation Committee: The Dissertation Committee consists of the student's Major Professor and at least two additional faculty members who are typically selected through consultation between the student, the Major Professor, and the Guidance Committee. The Academic Adviser nominates the committee members to the Dean of Graduate Studies, who appoints the members. External Committee members are allowed with the approval of the SBG-GG Graduate Adviser and the Dean of Graduate Studies, and students must complete the approval process of the Graduate Council. The Dissertation Committee advises the student, supervises the student's research and has the final authority to review and approve the dissertation. Students are responsible for keeping their committee informed of their progress.

6) Advising Structure and Mentoring

Students are assigned an Academic Adviser who maintains student records, is available for advice on course requirements, who answers academic questions and who is the liaison between the student and the Dean of Graduate studies. The liaison role is to recommend examination, thesis and dissertation committee membership to Graduate Studies. The Academic Adviser is also responsible for appointing a Guidance Committee and for completion of various official forms and documents such as the advancement to candidacy form and Qualifying Examination committee nomination form.

Graduate students will have both a Major Professor who serves as the student's research adviser and an assigned faculty member who serves as an Academic Adviser. In addition three faculty

members typically serve on a Guidance Committee for each student. Each of these individuals and committees plays a role in helping a graduate student reach his/her educational goals.

The primary responsibility for advising and mentoring graduate students will be the Major Professor and the respective laboratory group. The Major Professor guides and directs a graduate student's research. Faculty mentors should follow and adhere to the Graduate Council's Mentorship Guidelines and the UC Davis Principles of Community. A Major Professor is identified for each student as a condition of admission to the graduate program. Once in the program, students are allowed to select a new Major Professor among the SBG faculty. The choice is subject to mutual agreement by the student and the Major Professor.

7) Advancement to Candidacy

A student may advance to candidacy for the Ph.D degree after completion of all required coursework and successful completion of the Qualifying Examination. A student must submit an advancement to candidacy form (<http://www.gradstudies.ucdavis.edu/forms/index.html> , or available from Graduate Studies). The form must be signed by the Graduate Adviser. The advancement to candidacy form must be filed at least one quarter prior to completion of all degree requirements.

8) Normative Time and Time to Degree

The normative time to degree for a student entering with a M.S. degree is approximately 3-4 years. Students without a M.S. degree normally take 4-6 years. The Graduate Council allows a maximum time of four years after a student passes the qualifying examination before s/he goes on probation for one year. If a student does not complete all degree requirements at the end of the probationary period the student will be dismissed (please see <http://gradstudies.ucdavis.edu/gradcouncil/timetodegree.pdf>).

9) Typical Timeline and Sequence of Events

Year one, Fall Quarter: submit approved Guidance Committee report. Year two, Spring Quarter or earlier: submit request for Qualifying Examination. After successful completion of this exam, student submits form to advance to candidacy. Year three and beyond: complete research project, write dissertation, receive comments from Dissertation Committee and submit to Office of Graduate Studies.

10) Sources of Funding

Funding sources from the Graduate Group that are available to students include work study, Henry A. Jastro Awards, and Graduate Program Fellowship Allocations. Internal (campus) and external fellowships are also available. Students should consult with individual faculty regarding research funding (GSR) and Teaching Assistant appointments. The current year's student fees are available at <http://budget.ucdavis.edu/studentfees>. Domestic students may establish residency in one year, however international students are subject to nonresident tuition in each quarter of registration. As per the current University policy, the non-resident tuition is reduced to zero for a

period of three years for all international students who are advanced to candidacy. In-state educational fees for students on 25% or greater research assistantship positions are paid as part of the research assistantship. Nonresident tuition fee waivers are awarded to both domestic and international students through decisions made by the scholarship committee of the SBG. For graduate students to receive any Soils and Biogeochemistry Graduate Group funds, they must turn in the Annual Progress Report in a timely manner.

11) PELP and Filing Fee Status

Students must maintain appropriate student status at all times to be eligible to complete the degree. Students will be required to follow PELP and Filing Fee Status guidelines and procedures set by the Graduate Council.

12) Dissertation Requirements

Ph.D. students have the option of using three manuscripts that are worthy of publication in a major research journal instead of a traditional dissertation. The dissertation would consist of an Introductory chapter and three substantive chapters (three manuscripts). The Dissertation Committee is authorized to approve the appropriate content of the manuscripts. There are no program specific requirements. The program requires an exit seminar of each student. Satisfaction of this requirement must be verified by the Dissertation Committee Chair.

Figure 1. Portrayal of the two tracks for the Qualifying Examination.

