Fiscal Unit/Academic Org	School of Earth Sciences - D0656
Administering College/Academic Group	Arts And Sciences
Co-adminstering College/Academic Group	
Semester Conversion Designation	Re-envisioned with significant changes to program goals and/or curricular requirements (e.g., degree/major name changes, changes in program goals, changes in core requirements, structural changes to tracks/options/courses)
Current Program/Plan Name	Geodetic Science
Proposed Program/Plan Name	Geodetic Science
Program/Plan Code Abbreviation	GEODSCM-PH
Current Degree Title	Doctor of Philosophy

Credit Hour Explanation

Program credit hour requirements		A) Number of credit hours in current program (Quarter credit hours)	B) Calculated result for 2/3rds of current (Semester credit hours)	C) Number of credit hours required for proposed program (Semester credit hours)	D) Change in credit hours
Total minimum credit hours required for completion of program		135	90.0	80	10.0
Required credit hours offered by the unit	Minimum	110	73.3	60	13.3
	Maximum	120	80.0	80	0.0
Required credit hours offered outside of the unit	Minimum	15	10.0	0	10.0
	Maximum	25	16.7	0	16.7
Required prerequisite credit hours not included above	Minimum	0	0.0	0	0.0
	Maximum	0	0.0	0	0.0

Explain any change in credit hours if the difference is more than 4 semester credit hours between the values listed in columns B and C for any row in the above table

The overall credit hour requirement has been reduced to match the present Graduate School requirement. In addition, the specializations available, the courses required within the remaining specializations,and the requirements for elective courses outside Geodetic Science have all been changed -- and generally have been reduced -- because fewer faculty members are available to support the program in Geodetic Science since it has moved to SES.

Program Learning Goals

Note: these are required for all undergraduate degree programs and majors now, and will be required for all graduate and professional degree programs in 2012. Nonetheless, all programs are encouraged to complete these now.

Program Learning Goals

Assessment

Assessment plan includes student learning goals, how those goals are evaluated, and how the information collected is used to improve student learning. An assessment plan is required for undergraduate majors and degrees. Graduate and professional degree programs are encouraged to complete this now, but will not be required to do so until 2012.

Is this a degree program (undergraduate, graduate, or professional) or major proposal? Yes

Does the degree program or major have an assessment plan on file with the university Office of Academic Affairs? No

Program Specializations/Sub-Plans

If you do not specify a program specialization/sub-plan it will be assumed you are submitting this program for all program specializations/sub-plans.

Pre-Major

Does this Program have a Pre-Major? No

Attachments

- Geodetic Science PhD conversion attachment 2 in progress 6 July.doc: Geodetic Sci Ph.D. Program Proposal

(Program Proposal. Owner: Krissek,Lawrence Alan)

Comments

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Krissek,Lawrence Alan	07/06/2011 10:51 PM	Submitted for Approval
Approved	Krissek,Lawrence Alan	07/06/2011 10:53 PM	Unit Approval
Pending Approval	Andereck,Claude David	07/06/2011 10:53 PM	College Approval

LETTER FROM PROGRAM-OFFERING UNIT

DATE: 9 June 2011 (modified 6 July 2011)

TO: NMS, Graduate School, and OAA Reviewers

FROM: Lawrence Krissek, Associate Director for Administration, School of Earth Sciences
and
W. Berry Lyons, Director, School of Earth Sciences

SUBJECT: Conversion of graduate programs (M.S. and Ph.D.) in the School of Earth Sciences from quarters to semesters

At the graduate level, the School of Earth Sciences presently offers an M.S. in Geological Sciences (with both a thesis option and a non-thesis option), and a Ph.D. in Geological Sciences. During the conversion to semesters, we request that the names of these programs be changed from Geological Sciences to Earth Sciences, so that the names of these degree programs match the name of our School. This detail was not included at the time the School of Earth Sciences was established, so the quarter-to-semester conversion provides an opportunity to establish uniformity between the name of our unit and the names of our undergraduate programs.

The School of Earth Sciences also offers an M.S. in Geodetic Science (with both a thesis option and a non-thesis option) and a Ph.D. in Geodetic Science; both the M.S. and the Ph.D. programs will be converted to the semester format. These programs will retain their present names, because of the long history and distinct identity of Geodetic Science at Ohio State.

Graduate Programs in Earth Sciences (presently Geological Sciences)

In addition to changing the names of our existing graduate programs in Geological Sciences, the extent of change during the quarter-to-semester conversion ranges from minimal (for the conversion of the M.S. in Geological Sciences to the M.S. in Earth Sciences) to slightly more significant (for the conversion of the Ph.D. in Geological Sciences to the Ph.D. in Earth Sciences, which includes a reduction in credit hour requirements beyond the standard 2/3rds ratio).

The process that developed the conversions proposed here was led by Prof. William Ausich, Associate Director for Graduate Studies in SES. The requirements of the existing graduate programs in Geological Sciences were discussed within the SES Graduate Studies Committee, with input from both faculty and graduate student members. Each member of the Graduate Studies Committee consulted with his/her constituency within SES (i.e., the Earth History Division, the Earth and Planetary Dynamics Division, the Water, Environment, and Climate Division, and the graduate students), so that all faculty and graduate students had the opportunity to provide input to the proposed conversions. In addition, Prof. Ausich held an open forum with all interested graduate students in Autumn 2010, and the plans for program conversion were discussed, as they developed, at several faculty meetings in Autumn 2010.

For the M.S. thesis option, concensus quickly developed that: 1) the quarter credit hour requirements should be reduced by the standard 2/3rds ratio, thereby keeping the semester requirements consistent with the minimum requirements established by the Graduate School; and 2) no new requirements should be added. The motion to convert the M.S. thesis option in this way was approved at a faculty meeting on 17 November 2010, with a vote of 21 in favor, 0 opposed, and 0 abstentions.

For the M.S. non-thesis option, concensus quickly developed to: 1) reduce the quarter credit hour requirements by the standard 2/3rds ratio; and 2) clearly define the courses that satisfy the core requirements and the capstone project. The Earth History Division, the Earth and Planetary Dynamics Division, and the Water, Environment, and Climate Division each identified a set of courses that will serve as core courses for their non-thesis M.S. students, and a new course (Earth Sci 8570) was created to satisfy the capstone requirement. The motion to convert the M.S. non-thesis option in this way was approved at a faculty meeting on 5 May 2011, with a vote of 16 in favor, 0 opposed, and 1 abstention.

For the Ph.D. program in Earth Sciences, discussion primarily focused on the number of graded credit hours to require under semesters. The Geological Sciences Ph.D. requirements for both graded quarter credit hours and total quarter credit hours were not changed several years ago, when the Graduate School reduced its minimum credit hour requirements; as a result, the standard 2/3rds reduction moving to semesters would have kept our requirements well above the minimum set by the Graduate School. Our Ph.D. students are – and will continue to be -- encouraged to take their candidacy exam during their 2nd year, in order to maintain "normal progress" toward their degree. However, an increasing number of them have encountered difficulty meeting our existing requirements for graded and total credit hours because of the combination of: 1) our continued requirement above the minimum established by the Graduate School; 2) the relatively early time when the Ph.D. candidacy exam is taken; and 3) the 3 credit limit for post-candidacy enrollment recently established by the Graduate School. This difficulty has been even more severe for our increasing number of students who enter the Ph.D. program without completing an M.S. first, because these students do not transfer credits – either graded or ungraded -- from their M.S. program.

Because we anticipate that Ph.D. students will continue to face this situation under semesters, it was proposed that the total credit hour requirement be reduced to 80 semester credit hours, in order to match the minimum requirements set by the Graduate School. This motion was approved by unanimous faculty vote on 17 November 2010. The remaining vote considered whether to set the minimum graded credit hour requirement at 30 semester credit hours or at 34 semester credit hours; at the faculty meeting of 17 November 2010, the vote was 12 in favor of 30 semester credit hours, 8 in favor of 34 semester credit hours, and 1 abstention. As a result, the semester version of our Ph.D. program requires a minimum of 30 graded semester credit hours, and a minimum of 80 semester credit hours.

Graduate Programs in Geodetic Science

The graduate programs in Geodetic Science are being re-envisioned during conversion, both in terms of their credit hour requirements and in terms of the structure and course offerings within each program. This re-envisioning reduces somewhat the credit hour requirements for the various Geodetic Science graduate programs while adhering to existing Graduate School guidelines. Primarily, this re-envisioning is necessary because the move of the Geodetic Science program from Engineering to SES has significantly reduced the number of faculty and courses available to support all options within the programs. As a result, the re-envisioned programs have been simplified and focused on the strengths of the existing Geodetic Science faculty within SES.

Conversion of the graduate programs in Geodetic Science was led by Prof. Christopher Jekeli, head of the Geodetic Science Division within SES. Conversion plans were developed through discussions and direct consultations within that Division. The final conversion plans were then distributed via e-mail to all SES faculty, and were discussed at an SES faculty meeting in February 2011. The proposed conversions were approved by an e-vote, with 20 in favor, 1 opposed, and no abstentions.

For the M.S. thesis option, the credit hour requirements are reduced by more than the standard factor of 2/3rds, from a range of 52-57 quarter credit hours (depending on the area of concentration and the specific courses chosen) to a minimum of 30 semester credit hours. In the semester format, "core courses" are selected in 4 categories from lists of options, whereas "core courses" were more completely prescribed in the quarter format. Three pre-approved tracks of "core courses" are available under semesters, in the areas of Geodesy, GIS, and Geodynamics, whereas pre-approved tracks in Geodesy, Photogrammetry, and Mapping & GIS were available under quarters. This change in subject area of the tracks reflects the change in composition of the Geodetic Science faculty as they moved from Engineering to SES, and the reduction in the minimum credit hour requirement reflects the reduced faculty numbers in the Geodetic Science program. The M.S. thesis option maintains the requirement for independent research and the completion and defense of a written research thesis.

For the M.S. non-thesis option, credit hour requirements also are reduced by more than the standard factor of 2/3rds, from a range of 58-67 quarter credit hours (with the range depending on the specific courses chosen) to a minimum of 30 semester credit hours. As with the other Geodetic Science graduate programs, the reduction in the minimum credit hour requirement reflects the reduced number of faculty and course offerings in the Geodetic Science program. The M.S. non-thesis option maintains the requirements for a written technical paper and a written comprehensive examination.

For the Ph.D., credit hour requirements are reduced by more than the standard factor of 2/3rds, in order to align the minimum credit hour requirement (i.e., 80 semester credit hours) with the minimum now set by the Graduate School. A credit hour requirement higher than this value has become increasingly difficult for students to achieve, given the 3 credit-hour limit on enrollment after a student passes the Ph.D. candidacy exam. In addition, specific track options within the semester-version of the Ph.D. program have been reduced from those in the quarter-version because the decreased number of faculty supporting the Geodetic Science program cannot regularly offer all of the courses that were required with the previous larger number of options. In addition, the number of core courses for the PhD has been reduced so that, in concert with the evolving interdisciplinary nature of geodetic science, students may be encouraged to include appropriate courses offered by other Divisions within SES.

The details of these conversions are included in the appropriate program templates and proposals. Please contact us if you have any questions.

Thank you for your attention to these proposals.

W. Berry Lyons
Professor and Director
School of Earth Sciences

Lawrence Krissek
Professor and Associate Director for Administration
School of Earth Sciences

Geodetic Science Ph.D. Program Rationale Statement

The overall goal of the Graduate Degree Program in Geodetic Science is to provide students the opportunity to develop advanced professional training in Geodetic Science. Specific objectives of the program include providing opportunities for students to participate in advanced classes and seminars and – for the Ph.D. -- to conduct independent research on fundamental issues in Geodetic Science. The products of Ph.D. research projects are expected to be suitable for publication in the refereed scientific literature.

The Ph.D. degree is a research degree, so most coursework is taken during the first 2-3 years. Usually only advanced seminars – or pertinent courses that are offered infrequently – are taken after that time. The purpose of coursework in the Ph.D. program is threefold:

1) to prepare students to complete the Ph.D. candidacy exam (which should be completed no later than the end of the student's 3nd year in the program);
2) to prepare students to undertake significant original research in Geodetic Science, culminating in the Ph.D. dissertation; and
3) to prepare students for a long and productive career in the diverse field of Geodetic Science.

The Ph.D. program in Geodetic Science traditionally has enrolled students who have completed a thesis-based M.S. degree in Geodetic Science or an affiliated field, and we expect most future students to continue to have this background. These students import a significant number of credit hours from their M.S. However, exceptional students can be admitted directly to the Ph.D. program without having completed an M.S., with the approval of the Geodetic Science Graduate Studies Committee (GSC). At the time of the Ph.D. Candidacy Examination, these students are responsible for the knowledge and competencies developed during the Geodetic Science M.S. program, as well as those developed in the core courses of the Ph.D. curriculum. Students without an M.S. who complete the Ph.D. Candidacy Examination during their 2nd year – or early in their 3rd year -- have accumulated relatively few credit hours at the time of the Ph.D. candidacy exam. This fact – combined with our present high credit-hour requirements and the Graduate School's limit on credit hours/term after the candidacy exam – has presented a significant obstacle to some students as they attempt to meet our existing credit-hour requirements for the Ph.D. In order to reduce this obstacle, we are reducing our overall credit-hour requirements under semesters to the minimum set by the Graduate School (i.e., 80 semester credit hours, which is a reduction by more than the standard ratio of 2/3), and we are reducing our requirement for graded credit hours by more than the standard ratio of 2/3.

Most of our graduate-level semester-version courses in Geodetic Science are relatively direct conversions of existing quarter-version courses, although many have converted to semester-credit-hour values by greater than the standard ratio of 2/3. For example, some 5 quarter-credit-hour courses have converted to 4 semester-credit-hour courses, some 4 quarter-credit-hour courses have converted to 4 semester-credit-hour courses, and some 3 quarter-credit-hour courses have converted to 3- or 4-semester-credit-hour courses. In all cases, these conversions by greater than the standard ratio of 2/3 are justified by increased content and student contact, either as lectures or as laboratories. The increased course content arises from the need to incorporate information into these courses that used to be distributed through other courses, which are no longer available to support the graduate program in Geodetic Science.

Details of the Proposed Conversion

The date of the last significant revision of the Geodetic Science Ph.D. was in the 1990s.

The proposed changes to the Ph.D. in Geodetic Science can be categorized overall as a significant re-envisioning, both in terms of a reduction in credit hours required and in terms of the structure of, and courses available within, the degree program. This re-envisioning brings the credit hour requirements for the Geodetic Science Ph.D. program into alignment with existing Graduate School guidelines. In addition, this re-envisioning is necessary because the move of the Geodetic Science program from Engineering to SES has significantly reduced the number of faculty and courses available to support the Geodetic Science program. As a result, the re-envisioned Ph.D. program has been simplified and focused on the strengths of the existing Geodetic Science faculty within SES.

The minimum credit hour requirements are reduced by more than the standard factor of 2/3rds, from a minimum of 135 quarter credit hours to a minimum of 80 semester credit hours. In the semester format, each Ph.D. student is required to complete at least 10 semester credit hours from a list of "core courses", which will require completing at least 3 courses chosen from a list of 7 options. In the quarter format, each student was required to complete 34-49 quarter credit hours in "core courses", with the exact value depending on the student's area of specialization; this required completion of 9-11 courses. This decrease in required courses, as well as changes in the subject areas of specializations that are available, reflects the change in composition of the Geodetic Science faculty as they moved from Engineering to SES, and the reduced faculty numbers in the Geodetic Science program.

The details of selecting a Ph.D. dissertation project, completing the Ph.D. candidacy exam, conducting Ph.D. research, and writing/defending the Ph.D. dissertation remain the same in the conversion from the quarter-version to the semester-version of the Geodetic Science Ph.D. program.

Ph.D. Program in Geodetic Science

Semester Version

1) Expected Background

Students entering the Geodetic Science Graduate Degree Program with the goal of attaining the Ph.D. degree generally have obtained a M.S. degree (thesis option) in an equivalent discipline. In some cases, a student may be admitted directly to the Ph.D. program with approval of the Graduate Studies Committee. A Ph.D. student is responsible for knowledge and competency at the M.S. level in Geodetic Science or a related field, and the core courses of the Ph.D. curriculum are designed to prepare for the general examination that will allow the student to become a candidate for the Ph.D. degree.

The basic entrance requirements to the program include courses in advanced calculus, linear algebra, and introductory physics, and some knowledge of and experience with scientific computer programming using a high-level language. Matlab, C++, Java, and FORTRAN are some of the most commonly used computer programming languages in Geodetic Science.

2) Degree Requirements

A minimum of 80 graduate semester credit hours beyond the baccalaureate degree is required for the Ph.D. degree. Students may apply 30 semester credit hours (20 hours of graded coursework plus 10 research hours) earned as part of a Master's degree toward the 80 semester hours, according to the rules of the Graduate School.

For the Ph.D. in Geodetic Science, the student must complete a minimum of 10 credit hours of letter-graded, advanced courses from the list below, or from available advanced courses in the Earth Sciences or related disciplines with approval of the Geodetic Science GSC. The remaining credit hours may be fulfilled with elective courses (including research and seminar courses). The entire curriculum for a student must be approved by the Geodetic Science GSC before the student begins the Ph.D. Candidacy Examination.

Advanced Geodetic Science Courses for the core requirements of the Ph.D.

GS7763	Advanced Adjustment Computations, 4 semester credit hours
GS7765	Analysis and Design of Geodetic Networks, 2 semester credit hours
GS7837	Computational Cartography, 4 semester credit hours
GS8862	Adjustment Computations for Random Processes, 2 semester credit hours
GS8871	Advanced Physical Geodesy, 3 semester credit hours
GS8873	Advanced Satellite Geodesy, 3 semester credit hours
GS7875	Spectral Methods in Geodesy, 3 semester credit hours

A Ph.D. aspirant must pass the Ph.D. Candidacy Examination to be admitted to candidacy for the Ph.D. degree, and must complete and defend a dissertation that presents the results of an independent, original research project that is a scholarly contribution to the science. All components of these requirements (i.e.,

the Ph.D. Candidacy Examination, the Ph.D. dissertation, and the Ph.D. oral defense) must be fulfilled to meet the requirements of the Graduate School.

A Ph.D. aspirant who enters the program with an M.S. in Geodetic Science is expected to complete the Ph.D. Candidacy Examination by the end of his/her 2nd year in the program. A Ph.D. aspirant who enters the program without an M.S. in Geodetic Science is expected to complete the Ph.D. Candidacy Examination by the end of his/her 3rd year in the program; the additional time is required for the student to achieve the competencies expected of an M.S. student in Geodetic Science.

The following are suggested 2-year coursework plans for Ph.D. students specializing in Geodesy, GIS, and Geodynamics who have entered the program without an M.S. degree:

	Geodesy	GIS	Geodynamics
Autumn Semester, Year 1	GS5636, GS5652, GS5660 Other courses or research Total = 15 credits	GS5636, GS5652, GS5660 Other courses or research Total = 15 credits	GS5636, GS5652, GS5660 Other courses or research Total = 15 credits
Spring Semester, Year 1	CE7442, GS6776, GS6777 Other courses or research Total = 15 credits	GS6786 Other courses or research Total = 15 credits	GS5781, CE7442 Other courses or research Total = 15 credits
Summer Semester, Year 1	Research 15 credits	Research 15 credits	Research 15 credits
Autumn Semester, Year 2	GS 7763, GS 7875 Other courses or research Total = 15 credits	GS 7763, GS 7837 Other courses or research Total = 15 credits	GS 7763, GS 7875 Other courses or research Total = 15 credits
Spring Semester, Year 2	GS 7765, GS 8871, GS 8873 Other courses or research Total = 15 credits	GS 7765, GS 7837 Other courses or research Total = 15 credits	GS 7765, GS 8862, GS 8871, GS 8873 Other courses or research Total = 15 credits
Summer Semester, Year 2	Research 15 credits	Research 15 credits	Research 15 credits
Total after 2 calendar years	90 semester credits, with M.S. core competencies fulfilled and minimum of 10 credits of advanced coursework in Geodetic Science. At this point, the student can complete the Ph.D. Candidacy Examination, can be limited to 3 semester credit hours/semester, and can still meet the credit-hour requirements for the degree in a timely manner.		

The following is a suggested 1-year coursework plan for Ph.D. students specializing in Geodesy, GIS, and Geodynamics who have entered the program with an M.S. degree, and are able to count 30 semester credits toward the Ph.D. requirements:

	Geodesy	GIS	Geodynamics
Autumn Semester, Year 1	GS 7763, GS 7875 Other courses or research Total = 15 credits	GS 7763, GS 7837 Other courses or research Total = 15 credits	GS 7763, GS 7875 Other courses or research Total = 15 credits
Spring Semester, Year 1	GS 7765, GS 8871, GS 8873 Other courses or research Total = 15 credits	GS 7765, GS 7837 Other courses or research Total = 15 credits	GS 7765, GS 8862, GS 8871, GS 8873 Other courses or research Total = 15 credits
Summer Semester, Year 1	Research 15 credits	Research 15 credits	Research 15 credits
Total after 1 calendar year	45 semester credits earned, with minimum of 10 credits of advanced coursework in Geodetic Science. At this point, the student has accumulated a total of 75 semester credit hours, can complete the Ph.D. Candidacy Examination, can be limited to 3 semester credit hours/semester afterward, and still meet the credit-hour requirements for the degree in a timely manner.		

3) Selection of Advisor, Research Topic, and Advisory Committee

Each Ph.D. student will meet with, or correspond with, a potential advisor either during the application process or within the first semester of enrollment. Possible research topics will be discussed at this time. A student will be considered to have an advisor when the both the student and the potential advisor have agreed to establish this relationship, and it has been approved by the Geodetic Science GSC. If necessary, the Chair of the Geodetic Science GSC will serve as interim advisor, and will assist the student in finding an advisor. The advisor and the student will choose additional faculty members to serve on the Ph.D. Advisory Committee, subject to approval by the GSC.

The student's research topic will be identified by mutual agreement of the student and advisor, subject to approval by the other members of the Ph.D. Advisory Committee and the Geodetic Science GSC. To formalize this agreement, the student will write a Dissertation proposal after completing the Ph.D. Candidacy Examination; the Dissertation proposal will be approved by the student's advisor and the other members of his/her Ph.D. Advisory Committee, and will be filed with the Geodetic Science GSC.

4) Ph.D. Candidacy Examination

The advisor and the student collectively determine the precise timing of the Ph.D. Candidacy Examination, but a student who enters the program with an M.S. in Geodetic Science should complete the

Ph.D. Candidacy Examination no later than the Spring Semester of his/her 2nd year. A student who enters the program without an M.S. in Geodetic Science should complete the Ph.D. Candidacy Examination no later than the Spring Semester of his/her 3rd year.

The Candidacy Examination includes both written and oral portions, in accordance with procedures outlined by the Graduate School. The student is responsible for knowledge and competency at the M.S. level in Geodetic Science or a related field, as well as competencies presented in the core courses of the Ph.D. curriculum. The Candidacy Examination is administered by the student's Advisory Committee (Dissertation Committee).

The student becomes a Ph.D. candidate on successful completion of the Candidacy Examination. NOTE: If the final oral exam is not taken within five years of admission to Candidacy, the Candidacy exam must be retaken, as required by the Graduate School.

5) Dissertation

To be awarded the Ph.D. degree, a student must complete a dissertation that presents the results of an independent, original research project that is a scholarly contribution to the sciences. The dissertation document must be prepared according to the guidelines described in the Graduate School Handbook.

6) Final Oral Examination

A Ph.D. candidate must satisfactorily defend the dissertation research in a Final Oral, and must submit an approved copy of the dissertation to the Graduate School. These requirements must be fulfilled according to the requirements of the Graduate School.

The committee for the Final Oral Examination will meet the requirements set by the Graduate School. It will include the members of the Dissertation Committee plus a Graduate Faculty representative appointed by the Graduate School.

The rules and regulations covering the PhD Final Oral Examination are detailed in the Graduate School Handbook. The Geodetic Science GSC adheres to these rules and regulations. The format, principles and policies of the Final Oral Examination in Geodetic Science satisfy the Graduate School's requirements. The format, principles, and policies of the examination enable the Ph.D. aspirant to present research results and engage in discussion of these and other topics before an audience of mentors, teachers and the student's peer group, as well as responding to formal questioning by the Examination Committee.

7) Registration Guidelines

A Ph.D. student is generally expected to complete all requirements for his or her degree within five years of the semester following successful completion of the Candidacy Examination.

A student must register for at least one credit hour to maintain office space and to use School and University facilities.

A student must meet Graduate School guidelines for registration during the semester in which any portion of the General Examination is taken, the semester during which the Final Oral Examination is taken, and the semester of expected graduation.

8) Financial Support for Graduate Students

Support for graduate students in Geodetic Science generally is funded by fellowships or research grants; few GTAs are available because Geodetic Science offers no undergraduate courses. Continuation of any support offered at the time a student is admitted is conditional on maintaining normal progress, on maintaining good standing in the Graduate School, and on satisfactory performance of appropriate duties. Support is also conditional on availability of funds.

Registration requirements for GTAs (if available), GRAs, fellowships, etc. are those set by the Graduate School.

Ph.D. Program in Geodetic Science

Quarter Version

1) Expected Background -- same as for semester version

2) Degree Requirements – minimum of 135 graduate quarter graded credits, including the following coursework requirements:

a) 5 courses from a list of approved offerings in supporting fields (CIS, Electrical Eng, Geol Sci, Math, or Stat) – 15-25 quarter credit hours, depending on courses chosen. Two courses may be double-counted from the M.S., if earned in Geodetic Science.

b) a core of 6 courses, specific to each specialization – 19-24 quarter credit hours

1. Geodesy specialization: Geod Sci 760, 762, 781, 871, 873, and 774/875 (23-24 credit hours)
2. Photogrammetry specialization: Geod Sci 762, 774/875, 828, 829, 830, and 831 (20-21 credit hours)
3. Mathematical-statistical methods specialization: Geod Sci 762, 765, 774/875, 862, plus two from the chosen specialization (which may include Mapping & GIS) (19-22 credit hours)
4. Mapping and Geographic Information Science specialization: Geod Sci 774, 787 (894A), 831, 837, 840 (894B), 862 (21-22 credit hours)

Other requirements same as for semester version.

3) Selection of Advisor, Research Topic, and Advisory Committee – same as for semester version.

4) Ph.D. Candidacy Examination – same as for semester version.

5) Dissertation – same as for semester version.

6) Final Oral Examination – same as for semester version.

7) Registration Guidelines – same as for semester version.

8) Financial Support for Graduate Students – same as for semester version.

Transition Plan

Students who began their degree under quarters will not be penalized as we move to semesters, either in terms of progress towards their degree or their expected date of graduation. Arrangements will be made for individual students on a case-by-case basis by their advisors and the Graduate Studies Committee within Geodetic Science, but we anticipate few complications because few of our courses are contained in sequences.

Because our Ph.D. degree requirements are specified in terms of a required number of credit hours, rather than a required number of courses, credit hours will serve as the "currency" during the transition. Students who have completed graded coursework under quarters will be allowed to count the equivalent number of semester credit hours toward their degree requirements. Students who have completed the quarter equivalent of a pre-approved semester "core course" will be considered to have fulfilled that semester-course requirement; students who have completed quarter courses that are not included in the new pre-approved "core courses" will apply the semester-equivalent credit hours toward their electives.

GEODETIC SCIENCE SEMESTER COURSES AVAILABLE IN GEODETIC SCIENCES Ph.D. (INCLUDES M.S. COMPETENCIES)

Geod Sci 5194	Group Studies (1-6 semester credits)
Geod Sci 5612	Introduction to Geodesy (3 semester credits)
Geod Sci 5636	Geovisualization Geometry (4 semester credits)
Geod Sci 5637	Topics in Mapping (3 semester credits)
Geod Sci 5652	Adjustment Computations (5 semester credits)
Geod Sci 5660	Geometric Reference Systems (4 semester credits)
Geod Sci 5781	Geodesy and Geodynamics (3 semester credits)
Geod Sci 6193	Individual Studies (2-6 semester credits)
Geod Sci 6776	Physical Geodesy (4 semester credits)
Geod Sci 6777	Satellite Geodesy (3 semester credits)
Geod Sci 6786	Geospatial Data Structures for Computer Mapping and GIS (3 semester credits)
Geod Sci 7745	Inertial Navigation/Positioning Analysis (4 semester credits)
Geod Sci 7763	Advanced Adjustment Computations (4 semester credits)
Geod Sci 7765	Analysis and Design of Geodetic Networks (2 semester credits)
Geod Sci 7837	Computational Cartography (4 semester credits)
Geod Sci 7875	Spectral Methods in Geodesy (3 semester credits)
Geod Sci 7998	Research in Geodetic Science (1-12 semester credits)
Geod Sci 7999	Research for M.S. Thesis in Geodetic Science (1-12 semester credits)
Geod Sci 8862	Adjustment Computations for Random Processes (2 semester credits)
Geod Sci 8871	Advanced Physical Geodesy (3 semester credits)
Geod Sci 8873	Advanced Satellite Geodesy (3 semester credits)
Geod Sci 8785	Research Principles and Techniques (2-6 semester credits)
Geod Sci 9998	Research in Geodetic Science (1-12 semester credits)
Geod Sci 9999	Research for Ph.D. Dissertation in Geodetic Science (1-12 semester credits)

SEMESTER COURSES FROM OTHER BOOK 3 LISTINGS AVAILABLE IN GEODETIC SCIENCES Ph.D. VIA M.S. COMPETENCIES

CE 7442	Fundamentals of GPS and Reference Systems (4 semester credit hours)
Earth Sci 5642	Geomathematical Analysis (3 semester credit hours)
Earth Sci 5646	Geodynamics (3 semester credit hours)
Earth Sci 5650	Glaciology (4 semester credit hours)
Earth Sci 5655	Land Surface Hydrology (3 semester credit hours)
Earth Sci 5781	Gravity Exploration (3 semester credit hours)
Earth Sci 5782	Magnetic Exploration (3 semester credit hours)
Math 5601	Essentials of Numerical Methods (3 semester credit hours)
Physics 5300	Theoretical Physics (4 semester credit hours)
Stat 6450	Applied Regression Analysis (4 semester credit hours)