

Understanding Mississippi Delta subsidence by integrating continuous coring with geodetic methods

Land-surface subsidence is a major contributor to the rapid rate of land loss in the Mississippi Delta. Extensive debate persists about the driving mechanisms (e.g., fluid withdrawal, Holocene sediment compaction, growth faulting, glacial isostatic adjustment) and rates of subsidence (e.g., Kolker et al., 2011; Karegar et al., 2015). This uncertainty is well illustrated by the subsidence map in the 2012 Master Plan for coastal Louisiana, with values for the Mississippi Delta that range from 2 to 35 mm/yr. Previous studies have employed a variety of techniques that capture a wide range of spatial and temporal scales, often focusing on individual driving mechanisms. While this approach can offer valuable insights, it does not elucidate the full picture and hence has limited value for predictions of subsidence rates and their spatial patterns. Thus, integration of distinctly different measurement techniques is paramount to reduce the uncertainties about Mississippi Delta subsidence.

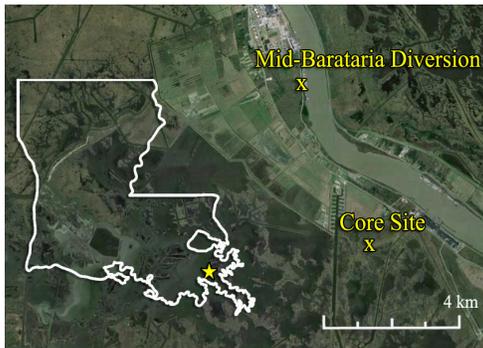


Figure 1. Location of the subsidence superstation.

This proposal requests funding to support MS student Jonathan Bridgeman (BA in Earth and Environmental Science, 2014, UCLA) to investigate a continuous sediment core that captures the entire Holocene sedimentary succession. This core serves as a critical element of a larger USACE-funded project that addresses subsidence at a carefully selected “subsidence superstation” through a coordinated collaboration of geodesists, coastal geologists, geophysicists, and ecologists. The new core will enable us to develop a direct connection between geodetic measurements of present-day subsidence rates and the nature of underlying strata.

The subsidence superstation is located ~1 km southeast of Myrtle Grove Marina, ~5 km from the envisioned Mid-Barataria diversion (Fig. 1) and adjacent to CRMS-site 0276 (established in 2009) that monitors present-day shallow subsidence by means of the rod surface elevation table-marker horizon (RSET-MH) method. The continuous core, along with three additional monitoring wells, will be drilled by Fugro within the context of the USACE-funded project. Each well will be equipped with instrumentation for GPS and optical fiber strain meter measurements, and in the future InSAR data will be collected at and near the site. To our knowledge, such an integration of subsidence measurement techniques – in one location – has never been attempted before, neither in coastal Louisiana or elsewhere.

Jon Bridgeman will perform sample analysis and interpretation of the 5” sediment core that is projected to reach a depth of 35-40 m, penetrating into the compaction-free Pleistocene substrate. The measurements will include grain size, organic-matter content, bulk density, sediment ages, as well as geotechnical parameters (notably compressibility and hydraulic conductivity). These data will make it possible to reconstruct the local Holocene subsidence history for the site. Following Törnqvist et al. (2008), comparison of the elevation of ^{14}C dated marsh peat beds from this core with published, nearby compaction-free basal peat ages will enable the student to quantify long-term compaction rates. In addition, the core data will be critical to interpret GPS and strain meter measurements. These instruments will be anchored at a range of depths in the four wells mentioned above and the core data will help to elucidate which subsurface strata are most prone to compaction and contribute most to land-surface subsidence.

The integration of different measurement techniques will provide novel insights regarding the depth-integrated nature of subsidence (i.e., the relative role of shallow vs. deep subsidence). Improved understanding of local subsidence rates can directly benefit upkeep of flood-control infrastructure, sediment dredging projects, and coastal habitat restoration efforts. In addition, the subsidence superstation has particular significance to the 2012 Master Plan due to its proximity to the proposed Mid-Barataria river diversion (Fig. 1). Continuous monitoring of subsidence while the diversion is ongoing could provide immediate insight into compaction rates due to sediment loading and help enable adaptive management of the diversion.

Jon Bridgeman’s MS project will be carried out within the framework of the larger, multidisciplinary subsidence monitoring effort described above (funded by a \$300K cooperative agreement between USACE and Tulane) that includes investigators from, among others, Scripps/UCSD, Columbia, and USF. This will provide the student with extensive exposure to leading researchers in various disciplines. He is a member of Tulane’s Quaternary Research Group that includes PI Torbjörn Törnqvist, 2 postdocs, and 4 PhD students, all of whom work on closely related subjects that provide numerous opportunities for cross-fertilization. This group has a long track record of subsidence studies in coastal Louisiana. Tulane has the lab infrastructure for most of the core analytical measurements; for a few more specialized methods we will work with UC-Irvine (¹⁴C dating) and LSU (geotechnical measurements).

Tulane University’s Department of Earth and Environmental Sciences (EENS) will provide Jon Bridgeman with a wide selection of classes to deepen his knowledge of coastal and deltaic processes, as well as related subjects. Several of the current EENS faculty (Mead Allison, Nancye Dawers, Alex Kolker) have studied subsidence in coastal Louisiana. A selection of relevant classes is listed in the table below. As a former UCLA athlete, Jon Bridgeman also has access to personal funds to support his graduate school experience; he plans to use these funds to attend conferences where he will present his findings.

References

- Karegar, M.A. et al. (2015) A three-dimensional surface velocity field for the Mississippi Delta: Implications for coastal restoration and flood potential. *Geology* 43: 519-522.
- Kolker, A.S. et al. (2011) An evaluation of subsidence rates and sea-level variability in the northern Gulf of Mexico. *Geophysical Research Letters* 38: L21404, doi:10.1029/2011GL049458.
- Törnqvist, T.E. et al. (2008) Mississippi Delta subsidence primarily caused by compaction of Holocene strata. *Nature Geoscience* 1: 173–176.

Course Number	Course Title	Professor
EENS 6040	Coastal Marine Geology	Mead Allison
EENS 6080	Geologic Dating Methods	Brent Goehring
EENS 6050	Natural Disasters	Stephen Nelson
EENS 6300	Subsurface Geology	Nancye Dawers
EENS 6030	Groundwater Hydrology	Karen Johannesson
EENS 6410	Structural Geology	Nancye Dawers
EENS 6180	Remote Sensing	Reda Amer
EENS 6260	Paleoclimatology	Torbjörn Törnqvist

Tulane University



**Graduate Program
in**



Student Handbook

Last updated on September 18, 2015

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Policies & Procedures for Graduate Study

Department of Earth & Environmental Sciences at Tulane University

Note: In addition to the mainly departmental policies below, please see the current [SSE Graduate Handbook](#), as well as other policy documents on <http://tulane.edu/sse/academics/graduate/forms-policies-procedures.cfm>.

Admission Requirements

Applicants to the Department of Earth and Environmental Sciences are expected to have a broad scientific background with undergraduate degrees in the natural and physical sciences or related fields such as engineering and mathematics. In addition to thorough preparation in their major degree field, students are expected to have taken general courses in calculus, physics, chemistry, biology, and geosciences relevant to their research interests. All applicants must meet Tulane's [School of Science and Engineering](#)'s GRE and GPA requirements. Application information is available online from the [School of Science and Engineering](#) (SSE) and from the [Department of Earth and Environmental Sciences](#) (EES).

Financial Support

Usually, admission to the graduate program depends upon one or more of the faculty expressing an interest in having the student as an advisee. However, exceptionally prepared students will be offered admission with the expectation that they commit to a program of study by the end of their first year for Ph.D. and by the end of their first semester for Masters. The EES Department supports students with Teaching Assistantships (TA), Research Assistantships (RA), and Research Fellowships (RF). In addition, students are encouraged to pursue funding for their research by applying for outside awards and grants.

Categories of Admission

Regular degree students are ordinarily admitted into the graduate program to pursue a Doctor of Philosophy or Master of Science degree with financial support associated with the student's faculty advisor or SSE.

Provisional admission may be granted to students who have not completed all application requirements.

Probationary (non-degree) admission may be granted with conditions that must be fulfilled in the first-year of graduate enrollment in order to achieve regular degree status.

Special (non-degree) students are individuals who do not plan to pursue a graduate degree. There may be limits to the amount of graduate credit hours they can enroll in (see [SSE policies](#)); special students may reapply for admission into a regular degree program.

Faculty Advisor

Students are encouraged to formalize this relationship by selecting an advisor, and communicating this to the EES Graduate Committee by the end of the first semester of study. The advisor must be a faculty member of the department; this will be a tenure-track faculty, unless an exception is granted by the SSE Dean's office. Note that the department also has an agreement with the Louisiana Universities Marine Consortium (LUMCON) that allows scientists there to serve as advisors for graduate students, provided that they have an adjunct appointment with the department and that the SSE Associate Dean for graduate programs is in approval. The student will consult his/her advisor in order to develop a course of study; course registration must have the advisor's approval. Students who do not elect to choose an advisor in the first semester of study should contact the Graduate Committee to plan a course of study. The faculty advisor may be changed upon request by submitting a letter to the Graduate Committee signed by the student and the faculty advisor(s).

Annual Report and Quality of Work Rules

All graduate students who have been enrolled in EES for at least six months must submit to the department (101 Blessey Hall) an annual report that briefly describes progress made during the previous year. A call for annual reports will be sent out by EES staff at the end of each summer. Annual reports will be reviewed by the EES Graduate Committee and departmental faculty to determine whether or not satisfactory progress is being made. Unsatisfactory progress for one year may result in temporary probationary status.

All SSE students must receive a grade of B or better in all of their classes, regardless of the level of the class or the Department in which the class is given (see the [SSE Grad Handbook](#)).

If a student earns a B- grade in any class and it is the student's first B-, the course will not count towards the total required coursework and the student will receive a warning from the department indicating that they are not in good academic standing. A second B- will result in immediate termination of degree status. A grade below B- in an EES class will result in immediate termination of degree status. If the student earns a grade below B- in a class outside the EES Department, and it is the student's first grade of B- or below, it will likely result in immediate termination of degree status, although decisions will be made on a case-by-case basis.

A grade below B- in a class outside the EES department will result in immediate termination of degree status if the student has already received a B- or lower grade.

Continuing Registration

A student admitted to Tulane University in a degree program must be in continuous registration (exclusive of Summer Session) until the degree is awarded. Supported students must be registered for a minimum of 3 credit hours in order to be considered full time students; however see the [SSE Grad Handbook](#) for definition of full-time continuing registration and how fees may vary depending on credits. PhD Students who have advanced to candidacy (see section below) must register for ***Dissertation Research***, which carries 3 credit hours but maintains continuous registration; similarly, MS students who have finished their course requirements may register for ***Masters Research***. PhD students who have finished their coursework, but have not yet been

admitted to candidacy, may register for up to 9 credit hours of ungraded ***Research in Geosciences***. Students in residence not receiving a university stipend and who have not completed the minimum course requirement for the degree must enroll for a minimum of three semester hours each semester, or register for Master's or Dissertation Research, in order to maintain continuous registration; tuition and fees may apply (see the [SSE Grad Handbook](#)).

Duration of Stipend Support

In most cases the maximum timespan for stipend support (via TA, RA or fellowship or combination thereof) for master's students is 2 years and for doctoral students is 5 years. After these periods, the student must meet with their advisor and the EES Graduate Committee annually in order to request an extension. The Committee's decision to grant an extension will be determined on the basis of departmental resources (available RA's and TA's etc), as well as any extenuating circumstances that will vary from case to case.

Course Tenure

SSE requires that coursework for the MS degree must have all been taken within the last 5 years, and for the PhD within the last 7 years (see the [SSE Grad Handbook](#)). If this is not the case, the EES department must either: 1. test students on relevant knowledge and certify that the student's knowledge of their field is up to date, or 2. provide SSE with copies of papers published by the student illustrating that the student is current in their field.

Foreign Language Requirements

There is no foreign language requirement for either EES graduate degree, but if knowledge of a foreign language is necessary to carry out the proposed research, a student's thesis/dissertation committee may require demonstration of proficiency in one or more languages within guidelines established by the SSE. For PhD students, any such language requirement must be fulfilled prior to the qualifying examination.

Exceptions

Students may petition the EES Graduate Committee in writing on an individual basis for exceptions to the aforementioned procedures.

DOCTOR OF PHILOSOPHY DEGREE PROGRAM

Course Requirements

A total of 48 semester hours of approved graduate course work must be completed for the doctoral degree and students must maintain a GPA of B or better. A maximum of 24 semester hours of transfer credit is generally allowed for doctoral students; these credits must be approved by the EES Graduate Committee and must have been acquired from an accredited university within six years of graduate admission at Tulane. See the [SSE webpages](#) for the transfer of credit form.

The 7000-level EENS scientific writing course is a required for all graduate students, and should be taken in the student's 3rd semester. Enrollment in EENS 7100 for 1 credit (weekly Friday seminar) is also required for all students in the 1st through 3rd semesters.

Qualifying Examination

The qualifying examination is a test of scholarly competence and knowledge with emphasis on the student's area of research. The qualifying examination for the Ph.D. will occur either before the start of the student's fifth semester (for students who matriculated in a fall semester) or before January 31 of the student's fifth semester (for students who matriculated in a spring semester). At the request of the student, the EES Graduate Committee will meet with the student and their advisor to discuss the requirements during the preceding semester. The qualifying examination is designed to evaluate whether the prospective Ph.D. candidate can successfully meet and complete the requirements of the Ph.D. in EES at Tulane University. The exam will test the prospective Ph.D. candidate's knowledge of the broad field of Earth and environmental sciences, and will evaluate the student's ability to identify and outline procedures to address and solve particular research questions.

The exam consists of a written and oral portion. The student will present two research proposals based on small research projects initiated during the first academic year of study at Tulane. A chief objective is for the student to show that he/she is capable of conducting worthwhile research on a specified topic, recognize the significance of the research, and place the potential results within the context of current knowledge of the topic. The student will not be required to have fully completed the research, but she/he will be expected to have preliminary data; in circumstances when data collection/generation has been disrupted or cannot be completed, the student will still be expected to demonstrate skills in data analysis and interpretation. The student will be asked to convincingly demonstrate to the Examining Committee the depth of knowledge they have gained in their research efforts, to thoughtfully be able to discuss experiments and /or additional data required to complete the research, and address the implications of such research. Addressing the projects in terms of how they advance the general understanding will provide the student the chance to demonstrate a breadth of knowledge about his/her field of study.

For their qualifying exam research projects, the student will select subjects that will allow them to demonstrate both their depth and their breadth of knowledge in the Earth and Environmental Sciences. When possible, choosing two different projects under two different faculty will benefit the student by exposing them to multiple ways of approaching scientific questions. The student will supply the EES Graduate Committee with the names of three Tulane faculty (one of whom is tenured) to serve as the core of their Examining Committee. The Graduate Committee will provide the name of one further faculty member to sit on the Examining Committee. The Examining Committee must approve the topics of the two exam proposals before the end of the student's third semester at Tulane. The student must seek approval of exam proposal topics and the make-up of the Examining Committee from their primary advisor, and then to talk to the tentative Examining Committee members prior to this time in the case that the projects do not sufficiently address a breadth of knowledge in the Earth and Environmental Sciences. At this time the student must also discuss expectations for the content of each proposal with each Examining Committee member. If it is necessary to include a scientist/engineer from outside of

the Department of Earth and Environmental Sciences in order to fully evaluate the merits of a proposed research project, the student can petition the EES Graduate Committee in advance for inclusion of such professionals within the examination.

During the student's fourth semester at Tulane, the student, advisor and all Examining Committee members will mutually agree upon the day and time of the oral portion. The oral exam will be scheduled such that sufficient time is given for the student to talk with examiners about how he/she should prepare. The student is responsible for communicating the date and time of the exam to the EES Graduate Committee; the student must also provide titles of their projects to the EES departmental staff and ensure that an appropriate room is reserved. If a student is not able to take the exam during this timeframe he/she must meet with the Graduate Committee to discuss options if a deferment is granted. In some cases deferment may result in forfeiting the opportunity for retaking the exam if the student is not successful on the first attempt.

One month prior to the oral exam, the student shall present each member of the Examining Committee with the two written proposals between 5 and 10 pages each (counting figures but not references), single spaced, with 12 point font. (This is the format of NSF postdoctoral proposals.) Within 2 weeks, the Examining Committee will provide the student with written feedback on the proposals' strengths and, importantly, weaknesses. This feedback comes from all committee members, but is in one document. The advisor is in charge of collating the committee's feedback. Deficiencies in the proposals will be addressed in the oral exam.

During the oral portion of the qualifying exam, the student will be questioned on the two proposed projects by members the Examining Committee. This questioning may include the student's general knowledge of the Earth and environmental sciences as well as the details of both proposals, including elemental assumptions/knowledge and literature underlying each proposed project. The student should also expect to answer questions about any of the weaknesses identified in the written feedback on the proposals.

Immediately following the oral examination, the Examining Committee will inform the prospective Ph.D. candidate regarding the entire examination's outcome. The outcome will be either successful or unsuccessful. In the case of a successful outcome, the student will be allowed to apply for candidacy for the Ph.D. degree upon successful completion of the required course work.

In the case of an unsuccessful outcome, the Examining Committee may elect to provide the student with a second opportunity for a successful outcome of the written portion, oral portion or both. Second opportunities to take the qualifying exam will take place in the following semester with the same Examining Committee. A student who has a second unsuccessful outcome will be removed from the doctoral degree program, but may be allowed to pursue a Master of Science degree at the discretion of the Faculty. For all possible outcomes, the Examining Committee will provide a written statement to the student and the Graduate Committee outlining the result of the qualifying exam that may include suggestions regarding the student's preparation for candidacy.

Dissertation Committee

The faculty advisor and other members of the Dissertation Committee are selected to guide the student's research; note that the PhD examining committee is distinct from the dissertation committee, but there will often be considerable overlap. The Dissertation Committee must be formalized after successful completion of the qualifying exam and while the student is preparing the full dissertation prospectus. The faculty advisor serves as chair of the Dissertation Committee and ensures that the student develops a course of study that will give proper foundation to the dissertation research. The Dissertation Committee shall be chaired by the student's advisor and shall consist of at least 3 others; two of which shall be Tulane faculty and one of whom will be a tenured Tulane professor. One Dissertation Committee member must be from outside the University. At least half of the committee will be tenure-track Tulane faculty. The Dissertation Committee shall be formed with the intention of involving researchers of broad expertise who will serve to benefit the student's understanding of the scientific problems central to the dissertation.

Dissertation Research-In-Progress Talk

During the semester following the qualifying exam, i.e. during the 5th semester, the student will give an open oral presentation on his/her dissertation research. This should include preliminary results, the status of ongoing and planned research, and the significance of the work needs to be made clear to a broad audience. The talk should be 20-25 minutes in length and allow an additional 5-10 minutes for questions.

Full Prospectus

After successful completion of the qualifying examination, the student will submit a draft of his or her dissertation prospectus (10 – 15 pages) to the Dissertation Committee. The Dissertation Committee will lay out the guidelines and expectations for the prospectus. One or both of the proposals from the qualifying exam can form the basis for the prospectus. The prospectus outlines the program of research that will result in an acceptable dissertation. The prospectus must describe proposed research aimed at answering specific questions and should demonstrate that all necessary equipment, literature, technical skills, and other resources necessary to execute the planned work are available. The proposed research questions should be clear and specific; the answers to the questions should promise to be important conceptual generalizations in the field of study. The dissertation prospectus will be included as part of the application packet to SSE for [admission to candidacy](#).

Evaluation and approval of the dissertation prospectus will be the purview of the student's Dissertation Committee.

Admission to Candidacy

To be admitted officially to candidacy for the doctoral degree, a student must have completed all course requirements, satisfied all foreign language requirements (if any), passed the qualifying examination, and submitted the approved dissertation prospectus, as well as all [SSE forms](#).

Dissertation

The written dissertation is the culmination of doctoral degree work and is the necessary demonstration of the candidate's ability as a scientist and scholar. The dissertation, therefore, must be a genuine and original contribution to the body of scientific knowledge in the field of study. The dissertation must be at least partially worthy of publication in scholarly journals and must include all data generated for the dissertation in addition to publications. If the student has already published papers on his or her research, these may be included as chapters in the dissertation. The faculty advisor and the Dissertation Committee must assess the acceptability of the dissertation before it is defended. Instructions on preparing the dissertation document are found in the [Doctoral Dissertation and Masters Thesis Completion Guide](#) on the [SSE website](#). Strict adherence to SSE formatting guidelines is required.

Dissertation Defense (Final Examination) and Seminar

The final examination is an oral defense of the dissertation following a public presentation of the dissertation research.

All doctoral candidates must present their dissertation research as a public lecture. The subsequent dissertation defense is conducted in closed session by the student's faculty advisor and Dissertation Committee. ***The Dissertation Committee must have received the completed final document 1 month prior to the anticipated defense date; a defense cannot be scheduled without the approval of the entire committee and requires 2 weeks to schedule.*** Candidates, who have successfully defended their dissertation, and who have met all other departmental and university requirements, are recommended for the doctoral degree. An additional copy of the dissertation must be submitted to the department.

MASTER OF SCIENCE DEGREE PROGRAM

Course Requirements

Twenty-four semester hours of approved graduate course work are required for the Master's degree, plus thesis research that must result in the production of an acceptable thesis. In general, up to 12 semester hours of transfer credit will be accepted toward the master's degree; these credits must be approved by the EES Graduate Committee. See the [SSE Grad Catalogue](#) for transfer credit form and procedures.

The 7000-level EENS scientific writing course is a required for all graduate students, and should be taken in the student's 3rd semester. Enrollment in EENS 7100 for 1 credit (weekly Friday seminar) is also required for all students in the 1st through 3rd semesters.

Thesis Committee

The faculty advisor and Thesis Committee are selected (by the student) to guide the student's research. ***Students are expected to form a committee by the end of their second semester.*** The faculty advisor serves as chair of the Thesis Committee and ensures that the student develops a course of study that will give proper foundation to the thesis research. The Thesis Committee must consist of at least three faculty members of the EES faculty or two EES faculty and an outside faculty member; at least half of the committee must be tenure-track Tulane faculty. See the EES website for the form that the committee members must sign. Membership in the Thesis Committee may be dynamic, but each subsequent change in its composition must be approved by the student, his/her advisor, and the EES Graduate Committee.

Prospectus

Students pursuing the M.S. degree are required to meet with their committee in the beginning of the third semester, and preferably during their second semester, to discuss their proposed thesis research. A full prospectus is required by the end of the third semester. The Thesis Committee will consider the student's academic background and approve the proposed course of study. The prospectus outlines the program of research that will result in an acceptable thesis. The prospectus must describe proposed research aimed at answering specific questions and should demonstrate that all necessary equipment, literature, technical skills, and other resources necessary to execute the planned work are available. The posed research questions should be clear and specific; the answers to the questions should promise to be important conceptual generalizations in the field of study, or better, extend to other fields as well. Once the Thesis committee has approved the prospectus, the student should complete the EES master's prospectus approval form and submit it to the EES office for placement in the student's file.

Thesis

A Masters thesis should be equivalent in scope, length and quality to a publishable manuscript, suitable for submission to a mainstream geoscience journal. In other words, it is original research that leads to defensible interpretations and conclusions that are supported by the data.

Thesis Defense and Seminar

The thesis research must be presented to the department in a public forum and defended at an oral examination conducted by the Thesis Committee. ***The Thesis Committee must have received the completed final document 1 month prior to the anticipated defense date; a defense cannot be scheduled without the approval of the entire committee and requires 2 weeks to schedule.*** Specific instructions for thesis preparation can be found in the [Doctoral Dissertation and Masters Thesis Completion Guide](#) on the [SSE website](#). Strict adherence to SSE format for theses is required.

Changing from the M.S. to the Ph.D. program

Students accepted into the master's program must petition the EES Graduate Committee for admission into the EES doctoral program, provided that the student's advisor (see above) is in approval. Students who transfer from the M.S. to the Ph.D. program must complete all requirements for the Ph.D. degree outlined above, including the qualifying examination.

PROGRAM MILESTONES

The following figures represent the upper limits of time spent achieving the given milestones. In most cases, it is preferable that the student reach these milestones in a more timely fashion.

Milestones	Master of Science	Doctor of Philosophy
Selection of Advisor	2 nd Semester	2 nd Semester
Research Topic Identified	2 nd Semester	2 nd Semester
Selection of Thesis/Dissertation Committee	2 nd Semester	4 th Semester
Writing Course	3 rd Semester	3 rd Semester
Courses Completed	4 th Semester	6 th Semester
Submit Abstracts for Two Exam Projects	NA	3 rd Semester
Selection of Qualifying Exam Committee	NA	3 rd Semester
Qualifying Examination	NA	4 th Semester
Research-In-Progress Talk	NA	5 th Semester
Prospectus Approved	before end of 3 rd semester	before end of 6 th semester
Defense & Submission of Thesis/ Dissertation	5 th Semester	12 th Semester

The EES Graduate Committee monitors the progress of all students. To continue in a degree program, a student must make satisfactory progress towards the degree. If the Graduate Committee determines that satisfactory progress is not being made a student may be required to withdraw because of academic deficiency. A student may appeal a determination of lack of satisfactory progress to SSE.

NON-THESIS M.S. PROGRAMS

Note: in some years the EES department may not be accepting students to these programs

EES offers additional M.S. programs that are based solely on coursework. These programs include: 1) an M.S. in Earth and Environmental Sciences; and 2) a joint-degree program with

EES leading to an M.S. in Environmental Sciences. Thirty semester hours of approved course work are required for the non-thesis Master's degree. Students must adhere to the quality of work rules given above. In general, up to 6 semester hours of transfer credit will be accepted toward the master's degree; forms and guidelines for acceptability of transfer credit can be found on [the SSE website](#). The EES Graduate Committee must approve all transfer credits.

The five-year, combined non-thesis degree program (the "4+1") is open to students enrolled in Tulane University's Newcomb-Tulane College. It combines the Bachelor of Science degree in the Department of Earth & Environmental Sciences (EES) with the terminal Master of Science degree in Earth & Environmental Sciences, condensing what would normally be about six years of study into five years.

Undergraduate students typically graduate after four years of study, having fulfilled all regular requirements for the B. S. degree. The accelerated master's degree component allows six graduate credits (two 6000- or 7000- level courses) completed during the senior year to be applied to the B.S. degree as well as to the M.S. degree. Each student pursuing the M.S. degree then completes course work toward the master's degree during one additional year of graduate study. During the fifth (graduate) year the student typically completes a minimum of 24 credits (eight courses, four each semester) of graduate work for a minimum total of 30 semester hours (10 courses).

Candidates for the program should apply for admission during the junior year, but students in their senior year also may apply. By the end of the junior year (or at the time of application), candidates should have completed all core and major requirements for the B.S. degree. In addition, candidates are required to have a minimum 3.0 cumulative GPA in their major. To advance to the fifth (graduate) year, candidates must complete all requirements for the B.S. degree in EES by the end of the senior year, while maintaining the minimum 3.0 cumulative and EES. Teaching assistantships and tuition waivers are not available to students pursuing the non-thesis 4+1.