

Graduate Student Handbook: Policies, Procedures, and Recommendations

**The University of Tennessee
College of Agricultural Sciences and Natural Resources
Biosystems Engineering & Soil Science Department**

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by

The Faculty of the Biosystems Engineering & Soil Science Department

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This Handbook is applicable to all graduate degree programs offered by the Biosystems Engineering & Soil Science Department, as follow:

- Biosystems Engineering – MS, PhD
- Biosystems Engineering Technology – MS
- Environmental and Soil Sciences – MS
- Plants, Soils, and Insects (Environmental and Soil Sciences Concentration) – PhD

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The University does not discriminate on the basis of race, sex or disability in its education programs and activities pursuant to the requirements of Title VI of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act (ADA) of 1990.

Inquiries and charges of violation concerning Title VI, Title IX, Section 504, ADA or the Age Discrimination in Employment Act (ADEA) or any of the other above referenced policies should be directed to the Office of Equity and Diversity (OED), 2110 Terrace Avenue, Knoxville, TN 37996-3560, telephone 865.974.2498 (V/TTY available) or 974.2440. Requests for accommodation of a disability should be directed to the ADA Coordinator at the UT Office of Human Resources, 600 Henley Street, Knoxville, TN 37996-4125.

CONTACTS

Students are referred to the UT website (<http://www.utk.edu/>) for the most up-to-date listings of phone numbers and e-mail addresses.

The University of Tennessee

Knoxville, TN 37996-0220 Counseling
Office Hours: 8:00 a.m. – 5:00 p.m.
Monday – Friday 865.974.6087;
General Information: 865.974.1000
Voice/TTD
URL: <http://www.utk.edu/>

Disability Student Services

Service
2227 Dunford Hall
Fax 865.974.9552

Graduate and International Admissions

Director
218 Student Services Building 1620
865.974.3251; Fax: 865.974.6541

Center for International Education

Director
Melrose Avenue
865.974.3177; Fax 865.974.2985

Registrar

209 Student Services Building
865.974.2101 865.974.1507

Veteran's Benefits

209 Student Services Building

Transcripts

209 Student Services Building
865.974.2101 865.974.4466

Veteran's Pre-College Upward Bound

1914 Andy Holt

Financial Assistance

Assistantships: Head of the Biosystems Engineering & Soil Science Department, see also
<http://gradschool.utk.edu/gradfund.shtml>

Fellowships

and Scholarships: Office of Graduate & International Admissions

Loans, Work-Study: Office of Financial Aid & Scholarships

115 Student Services Building

<http://web.utk.edu/~finaid/>

email: finaid@utk.edu

Phone: 865.974.3131; Fax: 865.974.2175

Housing

Department of University Housing:

405 Student Services Building

Phone : 865.974-2571; Fax: 865.974.1420

<http://uthousing.utk.edu>

email: housing@utk.edu

DEPARTMENT HEAD WELCOME STATEMENT

I welcome you as you begin your graduate study here in the Department of Biosystems Engineering and Soil Science. You will find that the department has a dedicated faculty and staff who work hard to create an open teaching and research environment. This Graduate Student Handbook has been prepared to serve as a resource containing information, timelines, forms and links that you will need during your graduate study. Regardless of your emphasis of study or degree program, it is our hope that this handbook will help make your graduate experience more productive and meaningful. We encourage you to refer back to this document throughout your time with us, as the content includes information and forms that you will need at the various stages of your study here at the University of Tennessee.

Work hard, and have fun!

Eric C. Drumm, Ph.D., P.E.
Professor and Head

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INTRODUCTION

Training graduate students is one of the most critical missions of the Biosystems Engineering & Soil Science Department. Graduate studies in the department are characterized by challenging coursework, independent research, the development of strong writing and oral communication skills, and excellence at understanding and applying the scientific method. Successful completion of a graduate degree program also requires that students comply with a variety of formal requirements set forth by The University, The Graduate School, and the Department. The purpose of this handbook is to provide current and prospective students with information specific to all graduate degree programs offered by the Department. This handbook does not deviate from established Graduate School Policies as noted in the Graduate Catalog (<http://catalog.utk.edu/index.php?catoid=2>), but rather provides the specific ways in which those policies are carried out.

Administration of Departmental Graduate Programs

The departmental graduate programs are administered by the Department Head through the activities of the Graduate Admissions Committee and the Directors of Graduate Studies. The primary purpose of the Graduate Admissions Committee is to evaluate applicants for acceptance into departmental graduate programs. Committee membership consists of at least three (3) biosystems engineering and three (3) soil science regular faculty members. The recommendations of the Committee are made to the Department Head by the Graduate Directors.

Directors of Graduate Studies and Graduate Coordinator

There are two (2) Directors of Graduate Studies in the Department. One Director is responsible to the Biosystems Engineering (BsE) and Engineering Technology (BsET) programs, and the other to the Environmental and Soil Sciences (ESS) programs. The Directors are responsible for the administration of their respective graduate programs, and they each serve as a contact person with the Graduate School. The more pertinent responsibilities of the Director are:

- Serves as liaison between the Department and the Graduate School on matters related to graduate education
- Serves as the primary contact with prospective students and departmental faculty regarding departmental graduate programs
- Oversees graduate student application process
- Manages the admission process and monitors the admission policies for graduate students
- Registers international graduate students for the SPEAK test and monitors scores
- Oversees departmental orientation of new graduate students
- In conjunction with graduate faculty, ensures graduate students are aware of and meet established deadlines for timely graduation
- Approves and signs Admission to Candidacy forms
- Provides academic leadership in the department for graduate program curricula
- Oversees the annual progress/evaluation of graduate students

A complete list of the responsibilities of the Director of Graduate Studies can be found at <http://gradschool.utk.edu/GraduateCouncil/GradStudDirResp2010.pdf>.

The Director of Graduate Studies for the Biosystems Engineering (BsE) and Engineering Technology (BsET) programs is:

Dr. Paul Ayers
865.974.4942
314 BEES Office Building
pdayers@utk.edu

The Director of Graduate Studies for the Environmental and Soil Sciences programs is:

Dr. Michael Essington
865.974.8819
213 BEES Office Building
messington@utk.edu

The Coordinator for all departmental graduate programs is:

Ms. Sandra Marine
865.974.7266
111 BEES Office Building
smarine@utk.edu

GENERAL DUTIES AND RESPONSIBILITIES OF FACULTY AND GRADUATE STUDENTS

Graduate Student Responsibilities

Each graduate student must assume full responsibility for knowledge of rules and regulations of The Graduate School and of departmental requirements for their chosen degree program. All Biosystems Engineering & Soil Science Department graduate programs have requirements beyond the minimum established by The Graduate School.

The Graduate School maintains a website (<http://gradschool.utk.edu/default.shtml>) with pertinent information, electronic copies of the *Graduate Catalog*, *Grad Sources* (a guide to funding for graduate students), and up-to-date listing of deadlines, policies and procedures, and degree programs. The Graduate School website displays the latest information on Graduate School matters, some of which may supersede this handbook. Publications on the Appeals Procedure and the Graduate Assistant Handbook are also available on the Graduate School website (<http://gradschool.utk.edu/GraduateCouncil/Acad Poli//appealprocedure.pdf>). Students are urged to keep abreast of current rules and regulations by visiting The Graduate School website at least once a semester.

A statement on graduate students' responsibilities is printed on the back of the student's admission status form. The statement is also available in the Graduate Catalog and in the *Hilltopics* Student Handbook (<http://web.utk.edu/~homepage/hilltopics/>).

Faculty Responsibilities

The graduate faculty of the Biosystems Engineering & Soil Science Department are fully committed to graduate education and student success. The graduate faculty offer advanced education and training exceeding that of the four-year baccalaureate of science or engineering degrees to promote the advancement of the fields of Biosystems Engineering, Environment and Soil Science, and associated applied technology. These programs are open to qualified individuals seeking advanced training in science and engineering related to biological resource production, soil science, and/or environmental science.

ADMISSION REQUIREMENTS AND APPLICATION PROCEDURES

Academic Requirements

Admission to Biosystems Engineering & Soil Science departmental graduate degree programs is contingent upon the following requirements, which differ between degree programs:

All Degree Programs

Applicants are expected to present documentation that demonstrates the capacity to successfully pursue advanced study, e.g., through letters of recommendation describing specific undergraduate or graduate accomplishments or professional experience.

Instructions and materials for application to the departmental graduate programs are available at: <http://bioengr.ag.utk.edu/gradStudies/admission.asp>. In addition to the application requirements of the Graduate School (<http://graduateadmissions.utk.edu/apply.shtml>), the department requires (1) a statement of purpose (less than one page), including research interests; (2) a completed BESS Graduate Student Data Form (<http://bioengr.ag.utk.edu/gradStudies/Data%20Form.pdf>); and (3) three letters of recommendation from individuals who are familiar with the professional attributes of the applicant and who can comment on the applicants potential to successfully complete a graduate program of study. The department provides a rating form (<http://bioengr.ag.utk.edu/gradStudies/ratingformDept.pdf>) that may be used in place of the letter of recommendation. Copies of the relevant application forms are also shown in Appendix B.

Applicants must provide official documentation of a grade-point average (GPA) from previous studies that meets the requirements of The Graduate School. International applicants on a non-immigrant visa cannot be admitted if their baccalaureate GPA is less than 3.0/4.0. Official documentation of Graduate Record Exam (GRE) scores is also required. The departmental graduate faculty has not set minimum GRE scores for acceptance into the graduate programs. Instead, the GRE scores are used to assess the applicant's preparation and potential for the successful completion of the graduate program, as are grades from previous coursework performed by the applicant.

Self-reported GPA or GRE scores are unacceptable, as are copies of transcripts or GRE scores sent to the student and forwarded to the department. Scores must be sent directly from the institution to Graduate Admissions.

Biosystems Engineering Degrees

Documentation that the applicant possesses a four-year baccalaureate degree in engineering or documentation that the applicant possesses a four-year baccalaureate degree in one of the physical, biological, or applied sciences along with coursework in the following major subject areas covered by the Fundamentals of Engineering (FE) exam is required: chemistry, computers, statics, dynamics, electrical circuits, engineering economics, fluid mechanics, mathematics (through differential equations), mechanics of materials, and thermodynamics. Note however that professional engineering (P.E.) licensure in some states requires that the applicant have earned an undergraduate engineering degree from an ABET-accredited institution. Students intending to pursue the P.E. are urged to check with the appropriate state board of engineering regarding specific licensure requirements in that state.

Biosystems Engineering Technology Degree

Admission requires documentation that the applicant possesses a four-year baccalaureate degree in one of the physical, biological, or applied sciences or technologies.

Environmental and Soil Sciences Degree

Documentation that the applicant possesses a four-year baccalaureate degree in soil science (including environmental soil science) or a "hard" science (including chemistry, geology, physics, or biology) is required. One semester of coursework in each of the following: organic chemistry, physics, plant physiology or microbiology, and statistics. Fifteen (15) semester credits in soil science courses (course deficiencies may be satisfied during the first year of graduate study).

Once an applicant has been approved for admission into the Graduate School, the application packet (containing the transcripts and GRE scores) is forwarded to the department. The Graduate School materials and the departmental application materials (e.g., letters of reference, Student Data Form) are combined into a completed packet. The Graduate Admissions Committee then evaluates the complete application packet for acceptance into one of the department's graduate programs. The committee renders one of three recommendations: (1) Admit; (2) Admit with Prerequisites (e.g., required coursework); or (3) Deny Admission. The recommendation is then forwarded to the Department Head by the Director of Graduate Studies. The Department Head then makes the final determination to admit or deny admission into the departmental graduate programs. If the applicant is admitted, the Department Head will notify the applicant by letter which will identify the initial graduate advisor assignment. The letter may also include an offer of financial assistance (see the Financial Support section below).

Language Requirement

Applicants who received their prior degrees from institutions in non-English speaking countries, and whose native language is not English, must score 550 or higher on the Test of English as a Foreign Language (TOEFL) before admission will be considered; a computerized TOEFL score of 213 or higher is required; or an iBT score of 80 or higher. The TOEFL score must be less than two years old.

Admission Status

Graduate students are admitted into one of three categories: provisional, non-degree, or degree (M.S. or Ph.D.). Students in the provisional status are automatically changed to non-degree status upon earning at least a 3.0 grade-point average in all course work attempted at The University of Tennessee (graduate and undergraduate) including at least six hours of graduate coursework. A request for change of status from non-degree to degree must be submitted by the student to the Office of Graduate Admissions and Records upon satisfactory completion of the requirements as outlined in The Graduate School Catalog.

Applicants with a baccalaureate degree from an institution in the United States, who have a GPA below 2.7/4.0, can only be admitted on probation. International applicants on a non-immigrant visa cannot be admitted if their baccalaureate GPA is less than 3.0/4.0. The probationary status will be removed after completion of nine or more hours of graduate credit with a minimum GPA of 3.0. Failure to maintain a 3.0 while in this status will result in dismissal.

Housing

The Department of University Housing **no longer maintains Graduate Student rental properties** and closed the last existing units in Sutherland Village in May 2010. Information about alternative housing resources, available units in the area, and related issues may be found at [Sutherland Village Transition Online Resource Center \(http://uthousing.utk.edu/sutherland/sutherlandresources.htm\)](http://uthousing.utk.edu/sutherland/sutherlandresources.htm)

Health Care

Because of the critical role that graduate research and teaching assistants (and associates) play in the conduct of the University's core research and teaching activities, The University of Tennessee will provide health insurance to all GTAs and GRAs employed more than 25% time. Non-employee graduate students are urged to avail themselves and their dependents of a comparable insurance plan, as paying for hospital and medical care is the student's responsibility. Health insurance is required for foreign students. The Student Health Service website is <http://web.utk.edu/~shs/>.

FINANCIAL SUPPORT

Graduate students typically have three primary responsibilities related to their pursuit of an advanced degree at the University: coursework, thesis or dissertation research, and assistantship or other employment responsibilities. Commonly, students undertake research that is directly related to the work supported by a research assistantship. However, in some cases, the research or teaching assistantship is not related to the research program. In these cases, it is expected that the student arrange work schedules and responsibilities to successfully meet all their obligations at the University. Consult with the major professor if there are any questions about research or work expectations.

The following types of financial aid are available:

Extra-Departmental Funds

Student loans and scholarships are available from extra-departmental entities. For more information on these types of funding, please contact the Financial Aid Office as listed on the *Contacts* page at the start of this document.

Experiment Station Assistantships

A limited number of graduate research assistantships funded by the Tennessee AgResearch are available. These assistantships provide a basic stipend plus payment of tuition and maintenance fees; however students on assistantship must pay all other applicable University fees, such as the Engineering Differential Tuition and the technology fee. Please indicate in your application if you are interested in an assistantship.

Grant & Contract Supported Assistantships

Many of the faculty in the Department receive competitive grant or contract funds that provide support for graduate assistantships. Specific information is available from the professor receiving the outside funds.

Hourly Work

Part-time work may be available for some of the on-going research projects. Details can be obtained by contacting the Departmental Office.

REGISTRATION AND ADVISING

Registration

Registration for course work each term is the responsibility of the student. Course registration should conform to the student's plan of study, and the minimum and maximum hours of registration as stated in the *Graduate Catalog*; particular attention should be paid by Ph.D. students to the requirement for continuous registration for Dissertation course credit (600). Course selection for each term should be in close consultation with the major professor and conform to the student's Plan of Study.

Dropping Courses

The Graduate School has formal policies on withdrawing from courses (see the *Graduate Catalog*). The Biosystems Engineering & Soil Science Department has no formal withdrawal or drop policy, except that all requests for withdrawing from a course shall be approved by the major professor.

Use of Facilities

Students using university facilities, services or faculty time, including summer term, must be registered. Normally, students are registered for course work or thesis/dissertation credit. Students who are not

taking course work and are not yet eligible to register for thesis or dissertation hours, must register for course 502 (Use of Facilities) if they wish to have borrowing privileges in the University Libraries or to use computer labs, other labs, or other university resources.

Use of 500 Thesis and 600 Dissertation Hours

Students must be registered for course 500 each semester during work on the thesis, including a minimum of 3 hours the semester in which the thesis is accepted by the Graduate School. Six hours of 500 are required for the thesis option. After receiving the master's degree, a student is no longer permitted to register for Thesis 500.

Course 600 is reserved for doctoral research and dissertation hours. Initial registration for 600 is determined by graduate advisor, but generally corresponds to the time at which a student begins dissertation research. From this time on, students are required to register continuously for at least 3 hours of 600 each semester, including summer term. A minimum total of 24 hours of course 600 is required.

When registering for 500 Thesis or 600 Dissertation hours, students must sign up for the section that is designated for the student's major advisor.

A student who will not be using faculty services and/or university facilities for a period of time may request leaves of absence from dissertation research up to a maximum of six terms (including summer terms). The request, approved by the major professor, will be submitted by the student and filed in the Graduate School.

Course Loads

The maximum load for a graduate student is 15 hours and 9 to 12 hours are considered a full load. For the summer term, graduate students may register for a maximum of 12 hours in an entire summer term or for a maximum of 6 hours in a five-week summer session. Students may enroll in only one course during a mini-term session.

Students holding a one-half time assistantship normally should enroll for 6-11 hours. A one-fourth time graduate assistant normally should take 9-13 hours. A student on a one-half time assistantship who takes 6 hours will be considered full time. Refer to the Policy for the Administration of Graduate Assistantships for additional information.

Students receiving financial aid should consult with the department/program head concerning appropriate course loads. Courses audited do not count toward minimum graduate hours required for financial assistance.

Initial Selection of a Faculty Advisor (Major Professor)

Based on your research area of interest and background, needs of the faculty, and source of financial support (if applicable), a major professor will be assigned by the Department Head upon admission into the graduate program. However, it is normal for an applicant to communicate with a faculty member

prior to and during the application process. This communication allows the potential graduate student the opportunity to learn about the interests of the faculty, the potential for inclusion into the faculty member's research program, and the opportunity for financial support. As a result of these interactions, a faculty member has the opportunity to 'champion' an applicant. A natural consequence of this is that the champion will also become the student's major professor.

Right to Major Professor and Advisory Committee

After meeting conditions stipulated by the department or program, a student has the right to participate in the selection of a major professor and a committee. It is the student's responsibility to ascertain the willingness of the major professor, and each committee member, to serve. Final responsibility for determining the major professor and composition of the committee rests with the academic unit and The Graduate School. The right to a committee may be rescinded if the student fails to demonstrate appropriate academic achievement and/or acceptable professional conduct, as determined by the department/program, or by The Graduate School.

Role of the Major Professor

The major professor guides course selection, advisory committee formation, research, and thesis/dissertation preparation. The major professor is the official liaison between the student and the Graduate advisory committee, and between the student and administrative personnel.

Graduate Advisory Committee

In addition to the major professor, the student is required to have a graduate advisory committee consisting of approved faculty members. The student's advisory committee serves: 1) to guide, inform, and counsel the student; 2) to discuss and approve a plan of study; 3) to discuss and approve a thesis, or dissertation, topic and research project proposal; 4) to review progress and provide advice during the student's research; and 5) to conduct the requisite oral and written examinations.

To avoid serious problems at later stages in their programs of study, students are strongly encouraged to develop close working relationships with their advisory committee members. To foster this, students are strongly encouraged to give regular progress reports (written or verbal) to all committee members. Because of the critical role of the advisory committee, M.S. students should establish their committees by the end of the first semester of study, while Ph.D. students should establish theirs by the end of the first year of study.

Master's Committee

The advisory committee for master's students shall consist of a minimum of three members having academic rank of Assistant Professor or above. Two, or more, members, including the major professor, are to be from the Biosystems Engineering & Soil Science Department, with at least one member having some teaching appointment. One, or more, may be from outside the Department. If a student selects a minor, one or more members must be from the minor Department. Because of the diverse nature of the departmental faculty, BsE masters committees must be chaired by a faculty member with disciplinary

training in engineering; ESS masters committees must be chaired or co-chaired by a faculty member with disciplinary training in environmental soil science; BsET masters committees must be chaired or co-chaired by a faculty member with disciplinary training in engineering or engineering technology.

Doctoral Committee

The Doctoral advisory committee shall consist of a minimum of four members having academic rank of Assistant Professor, or above, and all members shall hold a Ph.D. degree. A minimum of three members of the advisory committee, including the major professor, must be approved by the Graduate School to direct doctoral research. Two or more members, including the major professor, are to be from the Biosystems Engineering & Soil Science Department. One or more members are to be from outside the Department. If a student selects a minor, at least one member must be from the minor Department. Because of the diverse nature of the departmental faculty, BsE doctoral committees must be chaired by a faculty member with disciplinary training in engineering, while PSI-Soils doctoral committees must be chaired by a faculty member with disciplinary training in soil science, environmental science, or a closely related discipline.

DEGREE REQUIREMENTS SPECIFIC TO DEPARTMENTAL PROGRAMS

Degrees Offered

The Department offers the following thesis-option M.S. and Ph.D. dissertation degrees:

- Master of Science in Biosystems Engineering (M.S. BsE)
- Master of Science in Biosystems Engineering Technology (M.S. BsET)
- Master of Science in Environmental and Soil Sciences (M.S. ESS)
- Doctor of Philosophy in Biosystems Engineering (Ph.D. BsE)
- Doctor of Philosophy in Plants, Soils, & Insects – Environmental and Soil Sciences
Concentration (Ph.D. PSI-Soils)

Non-thesis option M.S. degrees are also offered for the BsE, BsET, and ESS programs. However, this option is only available to students that are not receiving Experiment Station or Grants & Contract assistantships.

Required Coursework

Master of Science in Biosystems Engineering:

Thesis Option

Applicants accepted into the program must complete at least 30 hours to earn a degree. Of these 30 hours, 20 must be in courses numbered 500 or above (6 hours of thesis plus 14 hours of other courses). ESS 503 must be taken three times during the course of the program, the last of which must be in the student's final semester before graduation.

Other specific requirements for the 30 hours are: 9 hours from BSE 519, BSE 543, and other major subject coursework; 6 hours of coursework in mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department; 6 hours of program electives; and 6 hours of BSE 500 Thesis.

Non-Thesis Option

A non-thesis option in biosystems engineering is available to qualified students. Applicants accepted into the program must complete at least 33 hours to earn a degree. Of these 33 hours, 22 must be in courses numbered above 500. ESS 503 must be taken three times during the course of the program, the last of which must be in the student's final semester before graduation.

Other specific requirements for the 33 hours are 9 hours from BSE 519, BSE 543, and other major subject coursework; 6 hours of coursework in mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department; 6 hours of coursework in a special emphasis area; and 3 hours of a capstone experience (project or report, typically BSE 530).

Other specific requirements for the 33 hours are 9 hours from BSE 519, BSE 543, and other major subject coursework; 6 hours of coursework in mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department; 6 hours of coursework in a special emphasis area; and 3 hours of a capstone experience (project or report, typically BSE 530).

Master of Science in Biosystems Engineering Technology:

Thesis Option

Applicants accepted into the program must complete at least 30 hours to earn a degree. Of these 30 hours, 20 must be in courses numbered 500 or above (6 hours of thesis plus 14 hours of other courses). ESS 503 must be taken three times during the course of the program, the last of which must be in the student's final semester before graduation.

Other specific requirements for the 30 hours are 9 hours from BSE 506 and other major subject coursework; 6 hours of coursework in mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department; 6 hours of program electives; and 6 hours of BSE 500 Thesis.

Non-Thesis Option

A non-thesis option in biosystems engineering technology is available to qualified students. Applicants accepted into the program must complete at least 33 hours to earn a degree. Of these 33 hours, 22 must be in courses numbered above 500. ESS 503 must be taken three times during the course of the program, the last of which must be in the student's final semester before graduation. Other specific requirements for the 33 hours are 9 hours from BSET 506 and other major subject coursework; 6 hours

of program electives; 6 hours of coursework in a special emphasis area; and 3 hours of a capstone experience (project or report, typically BSET 508).

Master of Science in Environmental and Soil Sciences:

Thesis Option

A minimum of 24 hours of graduate course work is required in the program of study, exclusive of 6 hours of 500 Thesis. The program of study is subject to the approval of the student's advisory committee, and must meet the following requirements: 3 hours of ESS 503 (must be taken three times during the course of the program, the last of which must be in the student's final semester before graduation); 12 hours from courses numbered above 503; 9 hours from courses within the major (excluding 500-level courses numbered 500, 502, and 503) (include those in environmental and soil sciences, and Environmental Engineering 535).

A student who has started a degree program under the thesis option is not eligible to transfer to the non-thesis option after the end of the first semester of graduate study or after receiving a graduate assistantship stipend for more than one semester.

Non-Thesis Option

A minimum of 33 hours of graduate course work is required. The program of study is subject to the approval of the student's advisory committee and must meet the following requirements: 3 hours of ESS 503 (must be taken three times during the course of the program, the last of which must be in the student's final semester before graduation); 3 hours of ESS 593; 18 hours of courses numbered above 503 (exclusive of ESS 593); and 12 hours of courses from within the major (include those in environmental and soil sciences, Environmental Engineering 535). In lieu of a thesis, students are required to by participating in a single research program for a period of twelve weeks (3 hours of ESS 593). The advisory committee approves the research problem. Satisfactory completion of this requirement requires a written, original research report that is acceptable to the student's committee.

Doctor of Philosophy in Biosystems Engineering:

To earn a degree, each doctoral student must complete at least 75 hours of approved graduate credit (beyond the baccalaureate degree) in biosystems engineering and supporting areas (engineering, computational methods, agricultural and biological sciences, and other related areas). Of the 75 hours, 48 must be in courses numbered greater than 500 (including 24 hours of course BSE 600) and 6 hours of courses at the University of Tennessee, Knoxville, numbered greater than 600. The specific requirements for the minimum 75 hours are: 18 hours BSE 619 and other major subject courses; coursework in computational methods (mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department); 3 hours of ESS 603 (Must be taken three times during the course of the program, the last of which must be in the student's final semester before graduation); and 24 hours of BSE 600 Dissertation.

Doctor of Philosophy, Plant, Soils, and Insects Major, Environmental and Soil Sciences Concentration:

A candidate for the doctoral degree must complete a minimum of 24 hours of graduate course work beyond the master's degree. Candidates not having a master's degree must complete a minimum of 48 hours of graduate course work beyond the baccalaureate degree, 24 hours of which must be numbered 503 or higher. A minimum of 12 of the 24 hours, or 30 of the 48 hours, must be graded A-F. At least 9 hours of the student's course work must be from outside the environmental and soil sciences concentration and a minimum of 6 hours of courses numbered 601 or higher, excluding ESS 603, must be taken at University of Tennessee, Knoxville. In addition, 24 hours of course ESS 600 Doctoral Research and Dissertation are required. Satisfactory preparation of a written dissertation proposal and an oral defense to the student's committee are required. These must be completed during the first two semesters of graduate study and before enrollment in 600. ESS 603 must be taken three times during the course of the program, the last of which must be in the student's final semester before graduation.

Plan of Study

The Plan of Study is a guideline for coursework to be taken during the graduate program. Each Plan of Study is unique and should be developed in consultation with the student's advisory committee, to achieve the educational objectives of the student, and to comply with the requirements of the Graduate School. The Plan of Study should also reflect the research interests of a student. Because of the close relationship between a student's overall educational objectives and research interests, Ph.D. and M.S. thesis-option students should submit a Statement of Research Interests, along with a Statement of Personal Academic Interests and Goals, with the Plan of Study. Non-thesis M.S. students should submit a Statement of Personal Academic Interests and Goals. (Note: A Plan of Study may include provisions for minor requirements. For example, a statistics minor (M.S. or Ph.D.) is available. Consult the *Graduate Catalog* for detailed requirements of various minors.)

A clear timeline for completion of the degree is as important as the Plan of Study. Such a timeline protects the interests of students, faculty members, and the University, by ensuring that resources are directed towards the production of useful scientific and engineering data in a timely manner. Tables 1 - 3 list milestone events for each degree program covered by this handbook, along with suggested dates (relative to starting date), for full time students. As soon as the major professor is selected, the graduate student should prepare a mutually agreed upon table (Tables 1 – 3) with milestone dates appropriate to his or her program. Failure to achieve any milestone by the mutually agreed upon deadline dates may lead to loss of assistantship and/or dismissal from the graduate program. If a graduate student foresees missing a deadline date, immediate consultation with the major professor should occur.

Reasonable Term of Study

The normal maximum time required to complete a full-time graduate program is two calendar years for master's students and three calendar years for doctoral students. Both the graduate student and the graduate advisory committee should strive to keep the reasonable term of study from being unduly exceeded.

Language Requirements

There is no foreign language requirement for any degree; however, due to the international nature of Biosystems Engineering & Soil Science, students are encouraged to take advantage of the language courses offered at the University.

All students are expected to use technical English effectively. Specifically, each student is expected to demonstrate effective oral communication in English as well as technical accuracy at all times. Proficiency will be evaluated during the Comprehensive Exam and defense of the thesis/dissertation examination. Additionally, the student's thesis/dissertation is expected to be an example of fluent written technical English.

Table 1. Milestones in BsE, BsET, and ESS masters programs – Non-thesis option

Milestone	Predecessors	Deadline	Mutually Agreed-Upon Date
1. Selection of Major Professor		2 months after program start	
2. Selection of Committee	(1)	3 months after program start	
3. Plan of Study, Capstone Project, & Admission to Candidacy Approved by Committee†	(2)	5 th week of 2 nd semester	
4. Capstone Project Underway	(3)	12 months after program start	
5. Final Exam Scheduled	(4)	Approximately 15 months after program start (consult Graduate School website)	
6. Capstone Project Completed	(3)	Prior to Final Exam	
7. Final Exam	(5)	Approximately 17 months after program start (consult Graduate School website)	

†See <http://gradschool.utk.edu/gradforms.shtml> or Appendix B for links to appropriate forms.

Table 2. Milestones in BsE, BsET, and ESS masters programs – Thesis Option

Milestone	Predecessors	Deadline	Mutually Agreed-Upon Date
1. Selection of Major Professor		1 month after program start	
2. Selection of Committee	(1)	2 months after program start	
3. Research Proposal and Plan of Study Approved by Committee	(2)	Last day of 1 st Semester	
4. Admission to Candidacy Approved by Committee†	(3)	After 1 st Semester or after nine hours of graduate coursework	
5. Research Project Underway	(3)	Beginning of 2 nd Semester	
6. Coursework Completed	(4)	Typically one semester prior to graduation, but flexible per Graduate Committee	
7. Data Collection and Analysis Completed	(5)	Typically 6 months prior to graduation, but flexible per Graduate Committee	
8. Draft Thesis to Thesis Advisor‡	(7)	1 week prior to submitting to major professor	
9. Draft Thesis to Major Professor	(8)	2 months prior to Final Exam	
10. Final Exam Scheduled	(9)	Approximately 1 month prior to Final Exam (consult Graduate School website)	
11. Revised Thesis to Committee	(9)	2 weeks prior to Final Exam	
12. Final Exam†	(11)	Approximately 23 months after program start (consult Graduate School website)	

† See <http://gradschool.utk.edu/gradforms.shtml> or Appendix B for links to appropriate forms.

‡ The Thesis Advisor is in the Graduate School, and ensures that theses and dissertations meet format requirements.

Table 3. Milestones in BsE and PSI Soils doctoral programs†

Milestone	Predecessors	Deadline	Mutually Agreed-Upon Date
1. Selection of Major Professor		3 months after program start	
2. Selection of Committee	(1)	6 months after program start	
3. Plan of Study Approved by Committee‡	(2)	Last day of 2 nd Semester	
4. Begin Research Relevant to Project (e.g., literature, experimental, modeling)	(1)	Beginning of 2 nd Semester	
5. Research Proposal to Committee	(3), (4)	12 months after program start	
6. Schedule Comprehensive Exam; Provide Updated Research Proposal to Committee	(5)	18 months after program start	
7. Pass Written Comprehensive Exam	(6)	19 months after program start	
8. Pass Oral Comprehensive Exam, including Defense of Proposal; and Submit Admission to Candidacy	(7)	20 months after program start	
9. Begin Intensive Dissertation Research	(5)	23 months after program start	
10. Coursework Completed	(3)	28 months after program start	
11. Draft Dissertation to Major Professor	(9)	2 months prior to Final Exam	
12. Final Exam Scheduled	(10), (11)	Approximately 1 month prior to Final Exam (consult Graduate School website)	
13. Revised Dissertation to Committee	(11)	1 month prior to Final Exam	
14. Final Exam†	(13)	Approximately 35 months after program start (consult Graduate School website)	
15. Dissertation Approved	(14)	Approximately 36 months after program start	

† See <http://gradschool.utk.edu/gradforms.shtml> or Appendix B for links to appropriate forms.

‡ Particular attention must be paid to the requirement for continuous registration for Dissertation course credit (600). See *Graduate Catalog* for details.

Research Proposal

The Research Proposal is the initial and most critical part of every research project, and every graduate student must prepare one (non-thesis M.S. students must prepare an abbreviated proposal of their capstone project). The proposal will provide a justification of specific objectives and define a procedure for achieving each objective. An example of an appropriate Research Proposal is presented in Appendix D.

Graduate students should prepare a draft proposal based on their review of relevant literature, original thought, and discussion with the major professor and committee members. The draft proposal should be submitted to the major professor, and the proposal should be refined to the joint satisfaction of the major professor and graduate student. After this is done, copies should be distributed to the advisory committee for their signatures and approval.

For M.S. students (thesis option), the advisory committee will meet to discuss the merits of the proposed project and decide if it is appropriate for the stated educational objectives. For doctoral students, the advisory committee will incorporate consideration of the Research Proposal into the Comprehensive Examination. Formal approval of the Research Proposal will be coincident with passing the Comprehensive Examination. Thus, the Research Proposal must be submitted to the advisory committee before the Comprehensive Examination is administered because it will be covered in questions that are part of the doctoral Comprehensive Examination.

Writing the Thesis or Dissertation

There are as many ways of writing a thesis or dissertation as there are combinations and permutations of faculty members and students. Keep the following points in mind: (1) Well written proposals generally lead to well written theses and dissertations – spend appropriate effort on the proposal to avoid wasted effort during the write up. (2) Memory fails – keep meticulous notes on the materials and methods employed, the experimental conditions, and the results. (3) Accidents happen – periodically back up all relevant notes (electronic and paper) and store the backup copies in a physically separate location from the originals. (4) Clear technical writing is the result of hard labor by the author – develop good writing skills through written class assignments, so that those skills are available when the thesis or dissertation is being prepared. External review of the thesis or dissertation by an outside peer is suggested. Contact the Thesis/Dissertation Consultant early, so that your thesis or dissertation will meet format requirements.

Thesis/Dissertation Distribution

Besides the final approved copies that are submitted to The Graduate School, hardbound copies of the thesis/dissertation are to be presented to both the major professor and the department head. As a courtesy, a copy should be presented to each member of the advisory committee, and to individuals who made a significant contribution to the research. The student should ask each advisory committee member and contributor about his or her choice of bindings or electronic media.

Publication of Work in Peer-Reviewed Journals

Publication of research in peer-reviewed journals is the final activity of all research projects: it is our product. Peer reviewed publication is the mechanism by which the scientific community vets its activities and transfers technology. It is also the basis upon which members of the scientific community are judged, indicates to potential funding agencies our ability to complete research projects, and is commonly the single most important indicator of productivity and achievement in institutions of higher learning. Simply stated: research that is not published was never done!

Research may not achieve publication for two reasons; either it is not publishable or it is publishable but not submitted for publication. Both reasons are unacceptable outcomes of M.S. and Ph.D. programs. Research that is not publishable either was not justifiable (should not have been conducted) or was not conducted in a manner sufficient to achieve critical evaluation by peers (was poorly conducted). Essentially, if the research is not publishable, it is not worthy of satisfying M.S. or Ph.D. requirements. Graduate students should always plan and conduct their research activities such that the years they toil for the M.S. or Ph.D. degree will result in peer-reviewed publications.

All Thesis-option M.S. students are expected to prepare and submit a manuscript of their research results for publication in a refereed professional journal. All doctoral students are expected to prepare and submit at least two manuscripts of their research results for publication in refereed professional journals. The graduate student shall obtain assistance from the major professor in planning, reviewing, revising, and submitting the manuscript. In cases where students do not submit manuscripts within 3 months of graduation, the major professor may choose to write a manuscript for publication based on the thesis or dissertation, and chose to list him/herself as first author on the manuscript. To facilitate publication of graduate student research, at the advisory committee's discretion, the thesis or dissertation may essentially consist of one or more manuscripts formatted to meet the requirements of The Graduate School. All manuscripts originating within the Department must be reviewed on several levels prior to submission.

Normally, a graduate student who prepares a publication resulting from his/her thesis research will have senior authorship with the major professor listed as second author. However, first authorship should lie with the individual who made the greatest intellectual contribution to a particular manuscript. Thus, in cases where the graduate student has played a lesser role in the development of the research questions, or in intellectual development of the manuscript as a whole, the major professor may justifiably be listed as first author. As stated earlier, if the graduate student does not take the primary initiative in writing or revising a manuscript within 3 months of leaving the University, the major professor may publish results from the student's project and be listed as the senior author, even if the previously stated criteria are not met.

When publishing thesis or dissertation research, it is suggested that any persons meeting the following criteria be considered for authorship (Guidelines are based in part upon the American Medical Association's Guidelines for Authors):

All authors must have:

1. Given final approval of the submitted manuscript.
2. Participated sufficiently in the work to take public responsibility for part or all of the content.
3. Made substantial contributions to the intellectual content of the paper, as follow:

At least one of the following three:

- Conception and design
- Acquisition of data
- Analysis and interpretation of data

AND

At least one of the following two:

- Drafting of the manuscript
- Critical revision of the manuscript for important intellectual content

Research Data, Software, and Designs

All research data, patents, software, designs, manuscripts, creations, etc. obtained and/or created by graduate students on University financial support are property of the State of Tennessee. All research data and other requested research findings must be submitted on a CD to the major professor before the student leaves the University. If any patents or publications are obtained directly from the student's thesis, both the student and major contributing advisor(s) are credited and may receive a percentage of the profits or royalties realized. The University of Tennessee Research Corporation (UTRC) establishes policies governing patents.

Participation in Departmental Research Projects

All degree recipients (thesis option) are required to submit a thesis or dissertation containing the results of original research. In addition to thesis or dissertation research, students are expected to participate in other research projects of their major professor, advisory committee members, and fellow graduate students, as approved by the major professor. Many of the routine and specialized methods and techniques used in research are not taught in classrooms. Exposure to, and participation in, as much of the overall departmental research program as possible is considered an essential part of graduate education. Thus, to receive the greatest benefit from their program, each graduate student should provide substantial assistance in other research projects, and should solicit collaboration in their own research.

Graduate Student Teaching Policy

All graduate students are encouraged to assist the teaching faculty in conducting classes. Exposure to leading all aspects of classroom activities will be highly beneficial to individuals throughout their careers. Graduate course credit is available to those students wishing to become highly involved in the teaching program (e.g., AGNR 512). Please contact a member of the teaching faculty for more information.

Seminar Participation

A significant aspect of graduate education beyond formal courses and thesis/dissertation projects is active participation in the professional community that exists within academic departments at universities. Student/faculty seminars are one of the professionally rewarding activities of this community. Accordingly, all graduate students are encouraged to participate in each Biosystems

Engineering & Soil Science Department seminar regardless of whether they are registered for seminar credit.

It is expected that all students enrolled in seminar 503 and 603 will participate fully in all aspects of the course. However, situations do arise for non-thesis option students who are satisfying their degree requirements through distance education options. For these students, the Department's Graduate Seminar Committee has developed an on-line section that contains a set of expectations that will allow the seminar 503 requirements to be met off-site. Specifically, students must be non-supported, in one of the non-thesis options, and must be able to show hardship in meeting the attendance requirements for the standard 503 course. For example, non-thesis option students who are not employed in the Knoxville area would have difficulty meeting the course attendance requirements; thus, they would meet the hardship requirement. For additional information about the seminar 503 expectations for non-thesis students, contact the chair of the Graduate Seminar Committee.

Attendance at Professional Meetings

Graduate students are encouraged to attend at least one national or regional professional meeting during their study program. They are strongly encouraged to present the results of their own research at these meetings.

EXAMINATIONS

Comprehensive Exams (Doctoral)

Timing: The Comprehensive Examination will be given after the student has completed approximately three-fourths of graduate course work and prior to admission to candidacy. This examination is preliminary to the student's dissertation research; it should be taken late enough in a student's academic program to permit most of the graduate work to be covered on the exam, and early enough to permit modification of the student's program based on the results of the exam.

Prerequisite: A written research project proposal, approved by the major professor, must be submitted to each member of the student's Doctoral advisory committee at least two weeks before the scheduled date of the written portion of the Comprehensive Examination.

Format: The Comprehensive Examination will consist of two parts:

1. A written examination, administered over a period of one to three weeks, will be given at an agreed upon date. This examination will be prepared by the members of the Doctoral advisory committee at the request of the major professor. Individual committee members will prepare a set of questions and specify conditions (e.g., time limits, environment, etc.) under which the student must work while preparing answers. Individual committee members may request assistance from other faculty members in preparing the portion of the examination for which they are responsible. The exam will cover fundamental knowledge of the discipline. Parts of the exam may be in the context of the proposed research. The major professor will administer the exam

with the response to each question graded by the committee member responsible for the question.

2. If the student passes all written examination sections, the Chair will then schedule an oral examination at a time agreeable to all concerned, typically one week after completion of the written examination. On the exam, the student will be tested on subject matter similar to that covered on the written exam as he/she defends the proposed dissertation research. Typically, this exam takes no longer than three hours. The Advisory Committee will serve as the examining committee. If the student passes the oral examination, he/she is then eligible for admission to candidacy for the Ph.D. degree.

After passing the Comprehensive Examination, the student should file for, and be admitted to, candidacy. This must occur at least one semester prior to graduation.

2nd Examinations and Appeals: If the student fails one or more of the written examinations, the Chair will convene the Advisory Committee to discuss an appropriate course of action. Among the alternatives to be considered are to administer another written examination in the area failed after giving the student additional time for preparation; to require additional coursework prior to administering an additional written examination in each of the areas failed; or to proceed with the oral examination with the understanding that appropriate remedial action will be required before admission to candidacy. If the student fails any of the written examination(s) for a second time, the student will be dropped from the graduate program. Likewise, if the student fails the oral examination twice, the student will be dropped from the program.

If a student feels he/she has been treated unfairly during any stage of the examination process, he/she has the right to appeal to the Department Head. The Department Head will review the examinations in question, seek advice from other departmental members and meet with the Advisory Committee to discuss the student's problems. The department head can suggest a re-examination or uphold the decision of the committee. Further appeal procedures are provided by The Graduate School.

Final Defense of Thesis/Dissertation

A candidate presenting a thesis or dissertation must pass a final oral examination on all work offered for the degree. The candidate may also be required to pass a written portion of the final examination at the discretion of the major professor, or the advisory committee. The examination(s) is not merely a re-examination covering course material, but is a test of the candidate's ability to integrate material in the major and related fields, including the work presented in the thesis or dissertation. This examination must be scheduled in accordance with deadlines specified in The Graduate School website. The completed thesis or dissertation, in a form approved by the major professor, shall be distributed to all advisory committee members at least two weeks before the date of the final oral examination. The student's advisory committee will conduct this examination. Members of the University faculty may attend the examination. In case of failure of the final examination, the candidate may not appear for reexamination until the following semester. The result of the second examination is final.

Final Examinations for Non-Thesis Students

A non-thesis student must pass a final written examination, developed by the student's advisory committee, and on all work offered for the degree. The examination is not merely a re-examination of course work, but is a test of the candidate's ability to integrate material in the major and related fields. This written examination will be followed by an oral examination (at the option of the advisory committee) and a presentation of the problem solved in lieu of a thesis. A report on the problem completed in lieu of a thesis must be made available to each committee member at least one week prior to the oral examination date. The oral examination must be scheduled through The Graduate School in accordance with the deadlines specified in The Graduate School website. The student's advisory committee will conduct this examination. Members of the University faculty may attend the examination. In case of failure of the written or oral part of the final examination, the candidate may not appear for re-examination until the following semester. The result of the second examination is final.

STANDARDS, PROBLEMS, AND APPEALS

Rights and Responsibilities

A graduate student at The University of Tennessee, Knoxville, is a person officially admitted to and currently enrolled in The Graduate School. The programs, policies, courses, procedures, and minimum requirements of The Graduate School are described in the *Graduate Catalog* of The University of Tennessee, Knoxville, which is published annually. Other information, including deadline dates for change of registration and submission of material to meet graduation requirements, is published each term in The Graduate School website. In addition, many departments and programs have brochures describing their own policies and procedures, which may be more restrictive than the general regulations of The Graduate School. It is the responsibility of each student to be thoroughly familiar with the regulations of The Graduate School, and of the appropriate department or program, so as to avoid complications and delay. It is the responsibility of The Graduate School and the Department or program to keep the related information as current as possible. Changes in overall policies are processed through the Graduate Council. General rights and responsibilities applying to all students, both graduate and undergraduate, are discussed in *Hilltopics*, (<http://web.utk.edu/~homepage/hilltopics/>), and available from the Dean of Students Office. The following statement, included with each applicant's admission letter, covers specific rights and responsibilities pertaining to graduate students.

Annual Evaluation

An annual evaluation may be conducted by the Director of Graduate Studies to determine progress and performance of the graduate program. Graduate students will be evaluated according to basic requirements of the program under which they enter. When either the student or major professor becomes concerned that a program is not progressing satisfactorily, a conference will be held to review the program and progress of the student. Departments or colleges may change program requirements and apply them to students already admitted, provided adequate notice is given and the requirements are not made retroactive to parts of the program already completed by the student.

Graduate Students will be notified by the Director of Graduate Studies prior to the annual evaluation. Students will then be required to contact the Graduate Coordinator and update their respective files.

Normally, the evaluation consists of checking the student files for evidence of the timely completion of the tasks detailed in Tables 1 – 3. The Graduate Director will also review the Plan of Study and Grade Reports to insure that the student will meet the course and credit requirements for graduation.

Grounds for Dismissal

Failure to meet deadline dates in a degree program sequence (as described in *Plan of Study* section of this handbook) may be grounds for dismissal from the graduate program. Furthermore, a student who has less than a 3.0 GPA after the first 9 graduate credit hours (or any subsequent semester) of graduate study will be placed on academic probation. If the student has not made satisfactory progress (as specified in the student's probationary agreement approved by the advisory committee) toward developing an overall 3.0 GPA by the end of the second semester following probation, the student will be dismissed from graduate study in the Department. The faculty may vote to dismiss a student from graduate study in the Department in cases of the student's intentional academic dishonesty; racial, religious, or sexual harassment; theft; workplace use of illegal drugs or alcohol; or other actions detrimental to the University.

Grounds for Withdrawing Financial Support

Failure to meet deadline dates in a degree program sequence (as described in *Plan of Study* section of this handbook) may be grounds for loss of financial support. Students on work-related assistantships may be evaluated in writing by their faculty work supervisor at the middle and end of each semester. The student may be notified in writing of their work performance, and may respond to this evaluation. The student may be placed on financial-support probation at the mid-point or end of any semester for poor work performance, poor academic performance, or excessive dropping of courses. If after 6 weeks, satisfactory work performance has not been achieved, financial support will be withdrawn.

Termination

It is the responsibility of the student to meet the retention standards as set forth by The Graduate School and the program. Failure to maintain acceptable academic standards or appropriate professional behavior may result in termination from the program and/or from The Graduate School.

Experiment Station Research Assistantships

Graduate students supported by assistantships that are funded by the department may take up to nine hours of course work per semester, but not more than 24 hours per year. The appointments are salaried and classified as 12-month (i.e., year round). The graduate student will be assigned a work supervisor (who may or may not be the major professor). Graduate students are expected to conduct and complete their work assignments in a professional manner.

There will be differences in work assignments. Some students will have what appear to be easier job assignments while others will appear to have more difficult job assignments. While gross inequities in job assignments are avoided, strict equality is typically not possible. Students on the Department's

payroll must report any other University employment to the department head. Specific procedures on reporting the hours worked are to be obtained from the Departmental Bookkeeper.

Contracts and Grants

Graduate assistantships and/or fellowships funded through outside contracts and grants are sometimes available. Guidelines for these special assistantships may differ greatly from other departmental assistantships or employment. Specific information regarding work guidelines and benefits are available from the department head.

Professionalism

A major objective of the graduate research and teaching program in the Biosystems Engineering & Soil Science Department is to instill professionalism in each student. A professional is a person who accepts responsibility, can direct the efforts of other people, and is self-motivated. Graduate student employees may be asked to work on projects unrelated to their thesis topic, or at times provide limited non-academic work assistance to the staff of the Department. Graduate students must depend upon their own personal productivity and dedication to acquire the sense of pride and duty needed to succeed as a professional. Graduate students are directly accountable to their major professor, or work supervisor, for their work habits, and will be treated as fellow professionals whose ideas, concepts, and approaches are integrated into the final product.

Office Hours, Holidays, Sick Days, and Vacations

At the start of each semester, the graduate student employee should establish working hours with the work supervisor. For the graduate student, flexible work hours are both a necessity and a privilege, and should not be abused. Graduate students do not punch a time clock and are expected to be highly task-oriented. The terms one-half, three-quarter, and full-time graduate assistantships designate a minimum of 20-, 30-, or 40-hour workweeks, respectively. A reality of graduate studies is that at times, all students work more than the minimum time. They also work at night, on holidays, and on weekends to effectively conduct a research project.

As part-time employees, students are not eligible for benefits such as accrual of annual (vacation) or sick leave. Thus, excused sick and personal absences are a departmental courtesy. Personnel management policies include the granting of time for graduate student recreational and personal activities, provided this does not interfere with the student's academic and/or research responsibilities. Graduate students should schedule any absences with their major professor and/or work supervisor to ensure that their absence will not conflict with their research activities. Holidays are established and annually published by the administration. Student employees on salary may observe the same holidays as other University personnel. Graduate student employees are to notify the Department Office when they are required to be absent due to illness or personal tragedy.

University Mission

The University of Tennessee has a three- fold purpose: Teaching, Research, and Public Service. Each of these relates to graduate students, who are essential components in the implementation of University objectives. No student has the right to interfere with the learning process, another's research, or a public service program (as determined by the University).

Professional and Academic Standards

Graduate students have the right to be informed of departmental, professional, and academic policies and procedures that affect them. Students should be informed of these policies during the initial term in which they enroll in a program. It is the responsibility of the student to be familiar with the college policies and procedures of The Graduate School, as described in the *Graduate Catalog*, and those of the college and department program. Students are expected to ask questions if any information is unclear, or not provided.

Academic Governance

The right to establish policies pertaining to academic programs is vested with the faculty. Students contribute in the decision-making process through representation on the Graduate Council, participation in committee efforts, and through contributions of their own initiative.

Confidentiality of Records

Some records are confidential. Information concerning confidentiality may be found in the current edition of *Hilltopics*.

Academic Integrity

University guidelines concerning Student Academic Conduct are published in the current edition of *Hilltopics*.

Appeal

A graduate student at The University of Tennessee has the right to appeal any judgment or decision made within the University. The appeal procedure depends on the nature of the decision. The appeal procedure for disciplinary actions, for misconduct and professional, college, or university penalties associated with academic dishonesty (plagiarism, cheating, etc.) is outlined in *The Graduate Council Appeal Procedure*, available at the Office of Graduate Student Services. Questions regarding the appropriate appeal procedure should be addressed to The Graduate School (865.974.2475).

Use of Facilities and Resources

Facilities and resources under the stewardship of the Biosystems Engineering & Soil Science Department are for support of the Department's teaching, extension, and research missions. Some

departmental facilities and resources are, therefore, generally not placed at the disposal of any individual. The department head and/or faculty members establish policies governing facilities and resources.

Secretaries

Graduate students are not assigned personal secretaries. The secretarial staff is not permitted to do typing of a personal nature, which includes typing of personal course work, theses, resumes, or dissertations. If a graduate student needs secretarial assistance for a work-related assignment, the student should submit the work through the major professor.

Photocopying

Graduate student use of the Department's photocopier for course work, term papers, thesis preparation, or personal use is expressly prohibited. If approved by the student's major professor, the photocopier may be used only for direct support of departmental work-related assignments, or for professional meeting presentations.

Photocopiers for personal use are available in the Agriculture-Veterinary Medicine Library, in Ellington Plant Sciences Building, and at numerous nearby business locations.

Computers

All graduate students must abide by the University of Tennessee Information Technology Policy, available at <http://oit.utk.edu/itp/>. Failure to abide by these guidelines is grounds for loss of assistantship and/or dismissal from the graduate program.

The Department makes computers available to graduate students as necessary to support their research program. However, the Department does not provide a computer for each student, and sharing of computers is normally necessary. Specific computer requirements related to research activities should be discussed with the faculty member directing that research. Depending upon needs and resources available, computers may sometimes be provided specifically for support of a particular program. Because these needs and resources may differ among research projects within the Department, all students may not have equal access to computers.

Some research activities may require storage of large data files. A departmental server is available for storage of such files. Disk space on this server is allocated to each faculty member in the Department; the faculty member is then responsible for authorizing access to the disk and maintaining the information stored therein. Students needing access to such file storage should contact their major professor.

The College of Agricultural Sciences and Natural Resources computer laboratory is located in Rooms 276 and 270 of the Biosystems Engineering & Soil Science Lab Building. It is available to undergraduate and graduate students for work related to their academic programs. Demand for this resource sometimes exceeds its availability, thus a priority list for access to the laboratory equipment is posted in the laboratory. Note that this is a college laboratory and is available for e-mail, access to the

Internet, course work (including printing of assignments, laboratory reports, etc), and other academic activities. It may also be used, on an “as available basis” for research related activities. However, it should not be used to print theses, manuscripts, and similar documents.

Theses, research-based manuscripts, and similar documents should normally be printed on BESS departmental printers, such as are provided in room 107 and elsewhere, but only after confirming with the major professor that printing the particular document is approved. Commonly acceptable uses of departmental printers are listed below:

- Preliminary copies of a thesis or dissertation, such as would be distributed to a committee
- One final copy of a thesis or dissertation, to be copied later at the students own expense
- Preliminary copies of a research-based manuscript, for distribution to co-authors
- “Final” copies of a research-based manuscript for distribution to internal reviewers
- Final copies of research-based manuscript for submission to a peer-reviewed scientific journal

Students are encouraged to use electronic media, where appropriate, to communicate with their committee and with external peers. For example, in many cases, it is possible to circulate manuscripts in pdf format; check with the major professor or departmental computer support specialist for assistance in converting manuscripts to pdf format.

The major professor or department head may withdraw access to departmental printers, if the privilege has been abused. Abuse includes printing of non-research-related documents, or irresponsible printer use, such as reprinting entire large manuscripts when only a few pages needed revision.

Office and Desk Assignments

The Department assigns available office and desk space to graduate students. When new students arrive, they should meet with the student records secretary and request a desk and office space. Any special needs for office space should be requested through the major professor to the student records secretary. Priority of office space is generally given in the following order: 1) full- time Ph.D. students, 2) full-time master's students, and 3) part-time graduate students.

Office Supplies

Graduate student use of the Departmental office supplies for course work or for personal use is prohibited. Office supplies required for direct support of departmental work-related assignments may be obtained from the student's major professor.

Analytical Services

The department houses an array of analytical tools, most of which are available for student training and use. Each instrument is administered by a faculty member, and normally maintained and operated by a professional research staff member. With suitable training, graduate students have direct access to many of the departmental instruments. Students may obtain access and training by consulting with the faculty member that administers the specific instrument.

A small number of departmental instruments require extensive operator training. For these instruments, the department has assigned a professional research staff member to operate and maintain the instrument. One such instrument is the inductively couple argon plasma (ICP) spectrometer. This instrument can simultaneously analyze aqueous solutions for more than 30 elements. Sample submission protocol may be obtained at: <http://bioengr.ag.utk.edu/Facilities/ICAP.pdf>, or by consulting with the instrument operator or with the faculty member that administers the instrument.

Access to Professional Research Staff

The Department employs several technical research staff members. Although most are tied to specific research projects and supported by grant and contract funds, research associates may be available to aid graduate students in performing laboratory research activities. For example, research associates may be available to train graduate students in experimental design and set-up, in the operation of laboratory instruments, and in analytical methods. Research associates, when given supervisor approval, may perform analytical services, particularly if the specific instrumentation is not accessible to graduate students. However as a general rule, research associates will not perform the actual Thesis or Dissertation lab work: these activities are the student's responsibility. Graduate students may obtain the aid of a research associate by consulting with the supervising faculty member.

Shop

To use the workshop facilities, graduate students must obtain the permission of the shop supervisor. Each student must demonstrate to the shop supervisor the ability to proficiently and safely operate a particular machine before permission for use will be granted, however only shop personnel may operate certain machines.

Shop personnel are available to assist with construction of research apparatus. For a large project, plans (including detailed drawings) and a work request must be prepared and submitted to and approved by the major professor prior to submitting it to the shop supervisor. For small projects, or short-term assistance, requests are to be made directly to the shop supervisor.

Statistical Consulting Services

The Statistical Consulting Center provides a variety of research support for graduate students at The University of Tennessee. For details on services offered, see their website: <http://oit.utk.edu/scc/>.

Research Space

The department head determines laboratory space assignments. Graduate students should request research or laboratory space through the major professor.

Telephone

All graduate student offices have been equipped with telephones. No long distance calls may be placed on these telephones. Students should check with their major professor if they need to place a work-related long-distance call.

Keys

Requests for keys must be made through the department for building and office entry and for cubicle drawer locks. If a student is required to have lab keys, the major professor will initiate the key request, which must be approved by the department head. A University-issued ID number is required for the request. Students are responsible for picking up keys at the Key Shop after requests have been processed. Keys must be returned to the Key Shop prior to graduation.

Lockers

Lockers are also available in the Men's and Women's locker rooms for students who wish to use those facilities. In either case, locker users should tell the Front Office which locker they have selected. (Locks and stored items that appear to be abandoned in lockers are periodically removed.)

Parking

All personal vehicles on campus at any time must be registered with University Parking Services. Parking of personal vehicles in the area immediately behind the Biosystems Engineering & Soil Science Buildings is not permitted during normal work hours.

Purchases

Permission, as well as an account number, must be obtained from the major professor before any purchases for a project are made with University funds. All receipts should be given to the Departmental Bookkeeper for accounting, and should include a chargeable account number (available from the major professor), the graduate student's name (legibly), and, if not provided by the vendor, a brief description of the item(s) purchased.

Mail Service

The mailroom is located in Room 107 and is open from 8:00 AM to 5:00 PM. Mailboxes are provided for all graduate students, staff, and faculty members. Students should check their mailbox regularly. Much University and departmental communication is done through e-mail. It is the student's responsibility to obtain a UT e-mail account upon arrival at the Department. This can be done by going to: <https://tmail.utk.edu/uact/register.asp>, and following the instructions there.

University Vehicles

The University maintains a motor pool for official local, in-state, or out-of-state travel. The Department also has several vehicles for local and in-state travel. Vehicles from either source may be reserved on an “as available” basis, but the major professor must approve all use of university vehicles. Furthermore, use of university vehicles is a privilege afforded graduate students who (1) possess a valid driver's license, and (2) are employed by the University. It is expected that the driver will observe all traffic rules and regulations. Fines and penalties resulting from violation of traffic rules will be at the offender's expense and will precipitate a strong reprimand, which may include suspension of driving privileges. Graduate students must demonstrate the ability to handle certain vehicles to the major professor before being allowed to operate those vehicles. The State Board of Claims will not receive or consider claims for injuries sustained in state-owned vehicles by unauthorized passengers or drivers, or during unauthorized vehicle use. Student employees who drive state-owned vehicles and are concerned with their personal risk exposure in this area are advised to contact their insurance agent regarding the procedures for including the desired non-owned automobile liability coverage in their existing private automobile insurance.

Travel Authorization

The driver and all passengers traveling out of state or overnight must have approved travel authorization granted by the department head. If a travel notice is submitted through the departmental office and is placed on the central calendar, blanket authorization exists for in-state travel. Out-of-state travel authorization must be requested ten business days in advance of the departure date. Anyone traveling on University-related business in a private vehicle must also have approved travel authorization from the department head. Request travel authorization electronically – students should check with the major professor or with the front office for details. International travel requires approval from the Vice-President, and should be coordinated through the major professor and department head.

Right to Know Program

All employees and students of the University of Tennessee must be protected from exposures to hazardous chemicals through a combination of safety training and safe practices in the work place. A hazardous chemical is defined as any chemical that poses a physical hazard (fire, explosion, corrosion, reaction, etc.) or health hazard (toxin, irritant, carcinogen, mutagen, etc.) as defined in the OSHA Right-to-Know Law. Three laws govern the use of hazardous chemicals in University work places: The **Right-to-Know Law** applies to all uses of hazardous chemicals that are not on a laboratory scale. Areas covered by the Right-to-Know Law include shops and manufacturing facilities. All persons in the work place must be trained regarding all hazardous chemicals in the work place prior to assignment, and at least annually thereafter. A material safety data sheet (MSDS) must be on file for each hazardous chemical and all containers must be labeled. All necessary safety equipment must be provided and used. Refer to Sections 3 and 9 of the Institute of Agriculture Health and Safety Manual (<http://bioengr.ag.utk.edu/safety/safetyplan/toc.htm>).

The **Laboratory Safety Standard** applies to chemical manipulations carried out on a “laboratory scale” as defined in the OSHA regulations, which includes most University laboratories. A Chemical Hygiene Plan must be developed for each procedure, material safety data sheets (MSDS) must be on file for all hazardous chemicals, all persons conducting the procedure must be trained to do the job properly and

safely prior to performing the procedure, and all necessary safety equipment must be provided and used. Refer to Sections 3 and 9 of the Institute of Agriculture Health and Safety Manual.

The **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)** regulates the use of all pesticides. The Institute of Agriculture Pesticide Management Policy specifies the training and pesticide use requirements that apply to all employees and students of the Institute of Agriculture. All pesticide use must be conducted by, or under the direct supervision of, a certified applicator. All necessary safety equipment must be provided and used. Refer to Section 40 of the Institute of Agriculture Health and Safety Manual. For more information, contact the work supervisor, department head, or the Institute of Agriculture safety officer (865.974.1153). Students may also visit the Safety Office website: <http://safety.ag.utk.edu/>

Accident and Incident Reporting

All accidents and incidents must be reported immediately in accordance with University policies and procedures. Failure to report an accident may result in loss of Workers Compensation benefits. Failure to report unsafe conditions may result in future injuries and/or property damage. To report an accident, incident, or unsafe condition, contact the work supervisor, department head, or the Institute of Agriculture safety officer. Refer to the following sections of the Institute of Agriculture Health and Safety Manual: the accident reporting guidelines inside the front cover and Section 10.

Graduate Student Organizations

Graduate students are encouraged to continue their professional development by becoming student members and participating in the activities of relevant professional societies. Several potential organizations are listed alphabetically below; one or more faculty members in the Department belong to each of the organizations listed:

ASABE – The Society for Engineering in Agricultural, Food, and Biological Systems: There is an active student branch of the ASABE at the Department. Annual membership dues are approximately \$20.00. Student members receive the national ASABE newsletter and magazine as well as discounts on national meeting registrations. Graduate students regularly present posters and papers pertinent to their work at national meetings organized by ASABE.

ASCE – The American Society of Civil Engineers: Students focusing in the area of irrigation, structures, and other civil-engineering-related subjects may be well served by joining ASCE and attending its annual meetings.

ASEE – The Society for Engineering Education: Degree candidates who intend to pursue careers in engineering education are encouraged to join this organization. Annual national meetings – typically held in mid-summer – are clearinghouses for new approaches to engineering education. The annual regional meetings – typically held in late spring – are an excellent opportunity to meet engineering educators from around the southeast region.

IBE – Institute of Biological Engineering: Students focusing in the area of biosensors, bioprocessing, and other broadly related biological engineering subjects may be well served by joining IBE and attending its annual meetings.

IEEE – The Institute of Electrical and Electronics Engineers, Inc.: Students focusing in the area of sensor and control system design may be well served by joining IEEE and attending its meetings.

SAE – The Engineering Society for Advancing Mobility in Land, Sea, Air, and Space: Students focusing in the area of power and machinery may be well served by joining SAE and attending its meetings.

Sigma Xi – The Scientific Research Society: Several members of the faculty are members of this honorary organization – students may be nominated to membership upon demonstration of excellence in research.

SSSA – The Soil Science Society of America: Students in the ESS and PSI-Soils degree programs can benefit greatly from membership in the SSSA. The primary purpose of the Society is to advance the discipline and practice of soil science by acquiring and disseminating information about soils in relation to crop production, environmental quality, ecosystem sustainability, bioremediation, waste management and recycling, and wise land use.

APPENDIX A: Pertinent Graduate Student Web Pages

Best Practices in Teaching

http://gradschool.utk.edu/files/2009-10_BPIT-Flyer.pdf

Biosystems Engineering & Soil Science Department

<http://bioengr.ag.utk.edu/>

Center for International Education

<http://web.utk.edu/~globe/index.php>

College of Agricultural Sciences and Natural Resources

<http://www.casnr.utk.edu/>

Counseling Center

www.utk.edu/counselingcenter

Funding, Fellowships, Assistantships for Graduate Students

<http://gradschool.utk.edu>

Graduate School

<http://gradschool.utk.edu>

Graduate Catalog

<http://gradschool.utk.edu>

Graduate Student Appeals Procedure

<http://gradschool.utk.edu/GradAppealHbook.pdf>

Graduate Student Senate

<http://web.utk.edu/~gss>

Graduate and International Admissions

<http://admissions.utk.edu/graduate/>

Institute of Agriculture

<http://agriculture.tennessee.edu/>

International House

<http://web.utk.edu/~ihouse>

Judicial Affairs

<http://web.utk.edu/~osja/>

Office of Equity and Diversity

<http://oed.utk.edu>

Office of Minority Student Affairs/Black Cultural Center

<http://omsa.utk.edu>

Research Compliance/Research with Human Subjects

<http://research.utk.edu/compliance/>

SPEAK Testing Program

<http://gradschool.utk.edu/speaktest.shtml>

Thesis/Dissertation Website

<http://web.utk.edu/~thesis/>

VolAware

<http://volaware.utk.edu>

Library Website for Graduate Students

<http://www.lib.utk.edu/refs/gradservices.html>

OIT

<http://oit.utk.edu/>

Housing

<http://uthousing.utk.edu/sutherland/sutherlandresources.htm>

APPENDIX B: Forms and Additional Resources

Copies of all applicable forms may be obtained from the Graduate School Website (<http://gradschool.utk.edu/gradforms.shtml>). Specific web locations are indicated below:

BESS Graduate Student [Data Form](#)

Three letters of reference on the [Graduate Rating Form](#)

Graduate Student Deadline Dates for:

M.S. Non-Thesis: <http://gradschool.utk.edu/ddates/nonthesis-fall10.pdf>

M.S. Thesis: http://gradschool.utk.edu/ddates/thesis_fall10.pdf

Ph.D.: http://gradschool.utk.edu/ddates/diss_fall10.pdf

Admission to Candidacy Application – Master’s Degree

http://gradschool.utk.edu/forms/Master_Adm_Cand.pdf

Doctoral Committee Appointment Form

http://gradschool.utk.edu/forms/Doc_Comm_Appoint.pdf

Admission to Candidacy Application – Doctoral Degree

http://gradschool.utk.edu/forms/Adm_Candidacy_Docs.pdf

Scheduling Defense of Dissertation Form

<http://gradschool.utk.edu/forms/SchedDissDef.pdf>

The University of Tennessee
Biosystems Engineering & Soil Science
2506 EJ Chapman Drive
Knoxville, Tennessee 37996-4531

Graduate Student Data Form

Last 4 digits of SSN (if known):

Applicant Name:

Last, First, M.I.

Present Address:

Street Address

City, State, Zip

Permanent Address:

If Same as above, state

Street Address

"Same"

City, State, Zip

() _____

Present Telephone Number

() _____

Permanent Telephone Number

Email Address

Present Occupation:

Employer:

Name and Address of Employer

Degree Sought:

___ M.S. - Biosystems Engineering

___ M.S. - Biosystems Engineering Technology

___ M.S. - Environmental Soil Sciences

___ Ph.D. - Biosystems Engineering

___ Ph.D. - Plants, Soils, & Insects

Anticipated Dates:

Graduation from current school

Entry to UT

Career Goals: *

Area(s) of Interest:

(Please specify area(s) of interest within the degree. Examples: Environmental Quality/Resource Conservation, Soil Science, Environmental Science, Bioprocessing, Instrumentation and Automatic Controls, Power and Machinery.)

(1) _____

(2) _____

Topic(s) of interest for Thesis or Dissertation Research (or state "Non-thesis"):

Experience: *

Experience/background relevant to degree you plan to pursue:

Other work experience (describe general nature):

Selection: *

Please state your reasons for selecting the Biosystems Engineering & Soil Science Department at The University of Tennessee for graduate work:

Signature

Date

* Use reverse side and/or attach additional pages if more space required.

**THE UNIVERSITY OF TENNESSEE
GRADUATE RATING FORM**

TO THE APPLICANT:

Distribute 3 copies of this form to persons familiar with your academic qualifications and with your plans for graduate study. Provide a stamped envelope, addressed to:

S. Marine
Biosystems Engineering & Soil Science
2506 EJ Chapman Drive
Knoxville, TN 37996-4531

TYPE OR PRINT THE FOLLOWING INFORMATION:

Applicant Name _____ Student ID# _____
Last First Middle

Mailing Address _____
Email _____

Present Occupation _____ Employer/Institution _____

Degree Sought _____ Major _____

Expected Date of Entry _____ Concentration within Major _____

Name of Evaluator _____

I hereby waive do not waive the right to examine this evaluation.

Applicant's Signature _____ Date _____

TO THE EVALUATOR: The person named above has applied for admission to graduate study at the University of Tennessee and has asked you to evaluate his/her ability to do graduate work. If the applicant has not waived the right to review this rating form, you should consider it non-confidential, and you may return the form uncompleted.

1. How long have you known the applicant and in what capacity? (Give dates, if possible.)

2. Estimate of Potential: (Use Outstanding, Above Average, Average, or Below Average)

As a Degree Candidate _____; as a Teacher _____; as a Researcher _____

3. Recommendation concerning admission (check one):

_____ I recommend the applicant with confidence.

_____ I recommend the applicant with reservation. (Please explain in Item #6.)

_____ I do not recommend the applicant. (Please explain in Item #6.)

Next Page



4. (For teachers of applicant only.) I would rank this applicant in the top _____ % of approximately _____ undergraduates or _____ graduate students I have taught in the past _____ years.

5. Please rate the applicant in each area listed below in comparison with others you have known:

	UPPER 5%	UPPER 10%	UPPER 25%	UPPER 50%	LOWER 50%	NO BASIS TO JUDGE
Intellectual Ability						
Oral Expression						
Written Expression						
Motivation/Initiative						
Cooperation						
Emotional Maturity						
Dependability						
Creativity						
Ability to Work with Others						
Ability to Reason						
Overall Potential						

6. Please provide an additional assessment of the applicant's potential for success in graduate school. Include any particular strengths and/or weaknesses. We will appreciate your candid appraisal. Attach another sheet, if necessary.

(Please Print or Type)

Signature: _____ Name: _____

Position: _____ Date: _____

Company or Institution: _____ Phone: _____

THANK YOU.

**ADMISSION TO CANDIDACY APPLICATION
MASTER'S OR SPECIALIST DEGREE**

**The University of Tennessee
The Graduate School**

<p align="center">Submit Form by Deadline to: The Graduate School 111 Student Services Building Knoxville, TN 37996-0211</p>

Name: _____
Last First Middle

Student ID #: _____

Street: _____

City State Zip

<p>To be completed by the Graduate School</p> <p>Admitted to Candidacy: _____</p> <p><i>Time Limit</i> Your degree must be granted by the _____ Term _____</p> <p align="center">_____ <i>Dean of the Graduate School</i></p>

Major: _____ Email Address: _____

Concentration: _____ Degree: _____

Choose One: Thesis Non-Thesis Program

<p>X</p> <p>_____ <i>Signature of the Applicant</i></p> <p>_____ <i>Date</i></p>
--

List **ONLY** graduate-level courses to be counted toward the degree. Include those completed and those planned to be used for requirements:

Year/Term	Department	Course #	Course Title	Hours	Grade

Please complete requirement statements on next page

Name: _____

Year/Term	Department	Course #	Course Title	Hours	Grade

Minor:

Year/Term	Department	Course #	Course Title	Hours	Grade

Transfer Credit (A majority of the total hours required for a master's degree must be taken at the University of Tennessee, Knoxville.)

Institution Name: _____

Year/Term	Department	Course #	Course Title	Hours	Grade

(Two-thirds of program, including not more than six (6) hours of thesis credit, must be numbered 500 or above, taken at the University of Tennessee.)

Departmental Approval *(To be completed with the assistance of the academic department)*

We certify that the above program, when successfully completed, meets all coursework requirements for this degree. We also certify that all University regulations regarding research compliances (use of human subjects, animal care, radiation, legend drugs, recombinant DNA, or handling of hazardous materials) have been appropriately approved prior to the initiation of the research if approval is relevant to the applicant's research.

Faculty Committee Signatures
(Print Name)

(Department)

(Signature)

_____ X
(Major Professor)

_____ X
(Minor Professor or Committee Member)

_____ X
(Committee Member)

X

Graduate Program Director Signature

Important: This form will not be accepted by the Graduate School without original signatures of the three committee members and the Graduate Program Director in your department. If you have a minor, one of the three professors must be from the minor department.

**INSTRUCTIONS
FOR COMPLETION OF
REPORT OF FINAL EXAMINATION/DEFENSE OF THESIS
MASTER'S OR SPECIALIST IN EDUCATION DEGREES**

**The University of Tennessee
The Graduate School**

Purpose of Form:

This form is to be completed by the Master's or Educational Specialist Committee when the graduate student has completed the final examination for the degree or has defended the thesis. This form is used to communicate the results of the final examination/defense of thesis from the Master's Committee to the Graduate School.

Deadline:

The completed form, signed by all Master's Committee members, must be filed in the Graduate School by the Deadline posted in the "Graduate Student Deadline Dates" in the semester in which the student has applied to receive the degree. <http://gradschool.utk.edu/ddategraduation.shtml>

Responsibility for Filing:

In the semester in which graduation is expected, the graduate student must file the form with the Graduate School or confirm with the Graduate School that the form was filed by the academic department.

Steps to Completion:

1. The major professor completes the information on the form related to the student (name, identification number, degree, date of examination, results of examination).
2. The major professor and the other members of the committee sign the form, indicating the decision of the committee about the results of the examination.
3. The form is filed with the Graduate School in 111 Student Services Building.

Notes:

- Only original signatures of the approved Master's Committee members, as noted on the Admission to Candidacy form, will be accepted.
- The original form with original signatures must be filed. Faxed copies will not be accepted.
- No signatures will be accepted from an individual other than the approved Master's Committee members, including the academic department head's signature for an absent committee member.
- The form should be dated with the date of the examination, including month, day, and year.
- This form is not to be used by doctoral students. The Graduate School sends the Report of Defense of Dissertation to the major professor for doctoral students.

<p>Submit Exam Results by Deadline to: The Graduate School 111 Student Services Building Knoxville, TN 37996-0211</p>
--

Updated January 5, 2009

**REPORT OF FINAL EXAMINATION/ DEFENSE OF THESIS
MASTER'S OR SPECIALIST IN EDUCATION DEGREES**

**The University of Tennessee
The Graduate School**

This is to certify that

(student name)

a candidate for the _____ degree,

(passed or failed)

the final examination in partial fulfillment of the requirements.

Date: _____

Student ID #: _____

Committee Names and Signatures

_____ Name (Major Professor)	_____ Signature
_____ Name	_____ Signature
_____ Name	_____ Signature
_____ Name	_____ Signature
_____ Name	_____ Signature

Submit Exam Results by Deadline to:
The Graduate School
111 Student Services Building
Knoxville, TN 37996-0211

Last Updated : September 25, 2009

DOCTORAL COMMITTEE APPOINTMENT FORM

**The University of Tennessee
The Graduate School**

Submit Form by Deadline to:
The Graduate School
111 Student Services Building
Knoxville, TN 37996-0211

Name: _____
 Last First Middle

Student ID #: _____

E-mail address: _____

Street: _____

City State Zip

TO BE COMPLETED BY GRADUATE SCHOOL
_____ <i>Dean of the Graduate School</i>
_____ <i>Date</i>

Committee Recommended:

Type or print name and department. Signature indicates both acknowledgment of request and willingness to serve.

Name (Please print)	Department	Signature
_____ (Major Professor)	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Change in Previously Appointed Committee:

Indicate above the recommended membership of the Committee. Signatures are needed for new members and those being removed.

* A statement indicating the reason for the proposed change must be provided below by the department head.

Add to the Committee:

_____	_____	_____
_____	_____	_____

Remove from the Committee:

_____	_____	_____
_____	_____	_____

Reason for Changes:

* Signatures are not required to remove persons whose UT faculty appointments have been terminated or who are absent from the campus for an extended period.

TO BE COMPLETED BY THE DEPARTMENT:	
_____ <i>Department Head (Approval)</i>	_____ <i>Date</i>

**ADMISSION TO CANDIDACY APPLICATION
DOCTORAL DEGREE**

**The University of Tennessee
The Graduate School**

Submit Form by Deadline to:
The Graduate School
111 Student Services Building
Knoxville, TN 37996-0211

Name: _____
Last First Middle

Student ID #: _____

Street: _____

_____ City State Zip

Email Address: _____

Major: _____

Concentration: _____

To be completed by the Graduate School

Admitted to Candidacy: _____

Met Residence Requirements? YES NO

Time Limit
Your degree must be granted by the _____
Term.

Dean of the Graduate School

X _____
Signature of Applicant Date

List all graduate courses to be counted toward the doctoral degree in chronological order of courses taken. Must include a minimum of six (6) hours of 600-level courses and 24 hours of 600 dissertation, taken at the University of Tennessee.
If using Master's degree coursework to meet part of the 48 hour requirement, list those courses on next page.

Year/Term	Department	Course #	Course Title	Hours	Grade

Please complete requirement statements on next page

Name: _____

List Coursework from Master's degree to fulfill part of requirement for doctoral degree.

Master's Institution Name: _____ Date Awarded: _____

Year/Term	Department	Course #	Course Title	Hours	Grade

Residence Requirement

List the two terms of full-time enrollment used to meet the residence requirement:

* Residence is defined as a minimum of two consecutive terms of full-time enrollment. Individual programs may have additional residence requirements. If using 6-hours enrollment per semester while holding a half-time graduate assistantship, attach a letter of appointment from the department.

Examination and Other Requirements

Comprehensive Examination Passed: _____
Date

Doctoral Language Examination in _____ was passed on _____
(if required) Language Date

Committee Approval and Endorsement

We certify that the above program, when successfully completed, meets all coursework requirements for this degree. We also certify that all University regulations regarding research compliances (use of human subjects, animal care, radiation, legend drugs, recombinant DNA, or handling of hazardous materials) have been appropriately approved prior to the initiation of the research if approval is relevant to the applicant's research.

<i>(Print Name)</i>	<i>(Department)</i>	<i>(Signature)</i>
_____	_____	X
(Major Professor)		
_____	_____	X
(Committee Member)		
_____	_____	X
(Committee Member)		
_____	_____	X
(Committee Member)		
_____	_____	X
(Committee Member)		

X

Graduate Program Director Signature

Important: This form will not be accepted by the Graduate School without original signatures of the four committee members and the Graduate Program Director.

SCHEDULING DEFENSE OF DISSERTATION

**The University of Tennessee
The Graduate School**

**Submit completed form to:
Graduation Specialists
The Graduate School
111 Student Services Building
Knoxville, TN 37996-0211
Fax: (865)946-1090**

So that arrangements can be made for the defense of dissertation, please submit the completed form to the Graduate School at least one week before the date of the defense.

_____	_____	_____	_____
Last Name	First Name	Middle	Student ID Number
_____			_____
Street Address			E-mail Address
_____	_____	_____	_____
City	State	Zip	Phone Number
_____			_____
Major			Term Graduating (Semester / Year)

DEFENSE	
_____	_____
Date/Time	Building / Room Number
Dissertation Title: _____	

List Defense Committee: (NO SIGNATURES ARE REQUIRED.)	
_____	_____
Name (Major Professor)	Department
_____	_____
Name	Department
_____	_____
Name	Department
_____	_____
Name	Department
_____	_____
Name	Department

APPENDIX C: Statistics Minor

A statistics minor (M.S. or Ph.D.) is available for graduate students in Biosystems Engineering & Soil Science graduate programs. Please refer to (<http://bus.utk.edu/stat/igsp/index.htm>) and associated links for details on this program.

APPENDIX D: Example Research Proposal

Groundwater Monitoring Well Network Design Using Fractional Factorial and Kriging Techniques

ABSTRACT

A comparison of two groundwater monitoring well network design procedures is proposed. A fractional factorial design technique will be applied to historical tracer tests. Information from the initially placed wells will be used to continue with the fractional factorial design and to gain spatial variability knowledge, which will subsequently be used with kriging techniques to develop a parallel design. Data from the historic densely monitored tracer tests will be used in conjunction with moment analysis to quantify the efficacy of the designs.

KEYWORDS: tracers, spatial-variability, moment-analysis

OBJECTIVES

The goal to which this study will contribute is identification of a groundwater monitoring network design procedure that will yield maximum information about contaminant plume characteristics with a minimum number of sampling points. The specific objectives for this study are to evaluate and compare two network design procedures. One procedure requires a minimum of *a priori* information and is based upon fractional factorial concepts. This procedure has been named E4, (E4, 1991) by its developers. The second network design method to be evaluated is a kriging technique. Historic groundwater tracer tests data sets will be used to evaluate the two procedures. Data are available from several injected tracer tests on moderate to large (tens to hundreds of meters) scales. Use of such historic data will help assess validity of the procedures for application to any spatially varying groundwater parameters (e.g., groundwater constituent concentrations or groundwater elevations) on a small to regional scale.

JUSTIFICATION

Groundwater quality degradation has been of increasing concern over the past few years. Roughly 330,000 tons of pesticide, 10.6 million tons of nitrogen fertilizer, and 10 million tons of nitrogen through manures are applied to agricultural crops annually in the U.S. (Asmussen, 1984). Regional concern is present in the coastal plain area of the Southeast where sandy soils exacerbate the problem due to high rainfall intensity and leaching. Computer models such as GLEAMS (Groundwater Loading Effects of Agricultural Management Systems) have been developed in response to this concern (Leonard et al., 1987). Non-agricultural practices have resulted in contamination due to hydrocarbons, radionuclides, and leachate from landfills. These situations, whether concerning well defined pollutant plumes or general regional degradation, call for an assessment of the extent (both aerially and in terms of concentration) of the problem. To understand the migration of pollutants in groundwater, tracer tests have been performed. These tests seek to gain knowledge into aquifer parameters that dictate how a pollutant plume behaves. In these tests a tracer is injected into an aquifer and the resultant plume is monitored. This requires the design of a monitoring well network. Both of the above situations (pollutant monitoring and assessment, and experimental design) illustrate the need for groundwater monitoring well networks and their design. Historically, the design of groundwater monitoring well networks has followed no procedure in general. Generally, common sense of geohydrologists has been the guide (LaBlanc, 1991). More defined approaches have used numerical models, sequential techniques, (multi)objective functions and kriging to aid in network design. All of these methods require some form of *a priori* information. Geohydrologic data may be unavailable or sparse and the acquisition of information can be costly. Need for a method that requires minimal information to design a network is evident. Fractional factorial concepts can be applied to monitoring well network design. Traditionally, fractional factorial designs were constructed so as to ensure orthogonality among the factors. A method has been developed that performs nearly as efficiently without the constraint of orthogonality (E4, 1991). Use of this method requires only knowledge about the range (or design space) of interest and an idea of the response curve (e.g., spatial concentration surface in this proposed application) to determine the minimum number of levels per factor necessary. Information gained from a monitoring well network designed using this method could be used to site subsequent wells either with the same procedure or with kriging.

LITERATURE

Various monitoring network design methodologies have been used historically. Perhaps the most frequently used approach has been the collection of hydrogeologic data to facilitate design. Most often, parameters such as hydraulic conductivity, groundwater gradient, and porosity have been estimated from data and used in Darcy's law to predict mean groundwater

velocity (Garabedian, 1987; MADE, 1985). These parameters have also been used in two and three-dimensional analytical solute transport models whose purpose was to predict plume migration (Garabedian, 1987; MADE, 1985). Most designs have used a sequential approach in locating monitoring wells. Typically, monitoring wells are densely located near the origin of the injection. This provides for maximum information by which a larger scale or appended design can be made (Killey and Molyaner, 1988). Knowledge gained from data from the initial pulse are usually mean velocity, plume bounds, and ideas of dispersivity.

Other methodologies have used (multi)objective functions to site monitoring wells. In reality, all designs either explicitly or implicitly use some sort of objective function, often related to economics. A multi-objective monitoring network design for air pollution has been proposed (Trujillo-Ventura and Ellis, 1991). This could be transferred to groundwater applications. The objectives in this design are spatial coverage, probability of standard violation, data validity, and network cost. This method is fairly complex and presupposes knowledge of spatial and temporal distribution of pollutants. Kriging uses this idea of spatial distribution to interpolate data. Kriging is an exact interpolator and has its origins in the mining industry where it has been used to estimate ore quality from limited samples (Journel and Huijbregts, 1981). It has been adapted to the hydro sciences (Delhomme, 1978) and has been suggested for use in environmental monitoring (Zirschky, 1985). The use of kriging for monitoring constituent concentration has been illustrated in a program for monitoring sediments in lakes (Lin and Roesler, 1988).

As mentioned earlier, kriging as with other monitoring well network design techniques assumes existing information. An algorithm (DETMAX) for the construction of fractional factorial experimental designs has been proposed (Mitchell, 1972). However, this procedure requires a model, which again presupposes *a priori* knowledge. A recently developed design tool, E4 (E4, 1991), which is also based on fractional factorial concepts, offers potential for efficient design of groundwater monitoring networks. This modification of the traditional fractional factorial design requires a minimum of information for use. This algorithm provides highly efficient if not optimal designs for a variety of experimental conditions.

It is apparent that there is no consensus on a method by which to design monitoring well networks. With the increasing need to monitor groundwater quality and pollutant migration and fate, it is apparent that more research needs to be done on methods which can be applied with a minimum of information.

PROCEDURES

Testing monitoring well network design procedures will be achieved by the use of data from historic tracer tests. Data sets are available from the Stanford/Waterloo natural gradient tracer test at Borden Air Force Base, Canada (Mackay et al., 1986), Twin Lake tracer tests (Killey and Molyaner, 1988), the MADE-1 experiment in Mississippi (Boggs, 1991), the USGS Cape Code tracer test (Garabedian, 1987), and the Savannah River Labs in South Carolina (Haselow, 1991). Data from the above sources represent conservative tracers such as bromide, fluorinated benzoic acid tracers, as well as radioactive isotopes and halogenated hydrocarbons.

The basic approach will be to use the E4 method and the kriging method to select a small subset of monitoring wells from those in the existing data sets. Data associated with each well in the selected subset will be used to predict the boundaries and movement rate of the tracer plume. With the kriging approach, estimates of all the existing data will be made from the selected subset. The E4 approach will use only data from the subset of wells. Multiple trials will be made, each starting with a different number of specified sampling points. Each method will be evaluated on the basis of its ability to use a reduced number of wells and/or sampling frequency to produce the same information obtained from all wells in the existing data sets. For each data set the E4 method will be used to select initial sampling points in two or possibly three dimensions. These points will correspond to sampling points available in the existing data sets from densely sampled tests. Information gathered from this first round will be average plume velocity and extent, and concentration data. Spatial concentration data from the selected subset of sampling points will allow for the initiation of a kriging method for subsequent design by enabling the construction of a variogram. Both the E4 method and the kriging method will be used to select additional monitoring points. At each snapshot, information gathered from both techniques will be compared with actual data.

Comparison will be made by comparing concentration surfaces developed from all wells in the actual data versus that obtained from the wells selected by the two methods. This will either be done from horizontal planes or from vertically averaged data. Error will be quantified in terms of integrated residuals between the concentration surfaces. With both methods, successively larger sampling points will be withheld and re-analysis made. With the E4 method, interpolation of the concentration surface will be linear, while the kriging method will allow for non-linear interpolation. By withholding various numbers of sampling points, an error versus number-of-sampling-point function will be constructed. A final comparison of

the E4 and kriging methods will be made. It must be noted that in this procedure, the E4 method is needed initially to gather information for the kriging design method.

FACILITIES AND EQUIPMENT

Facilities and equipment are housed at the University of Tennessee. Computer hardware includes PC's, and VAX and IBM minicomputers. Computer software that is, or will be, available include the E4 fractional factorial design package, universal kriging software, two and three dimensional graphic packages, SAS, and spreadsheet software. FORTRAN and BASIC compilers are also available.

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