ENVIRONMENTAL ENGINEERING AND EARTH SCIENCES
STUDENT SURVIVAL GUIDE
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Bookstore
Redfern Health Center
Parking Services
Student ID
Campus Post Office
City of Clemson
Military Leave

ETHICS

FACULTY

EMERITUS FACULTY

ADJUNCT FACULTY

ADMINISTRATIVE STAFF
INTRODUCTION

We, the faculty and staff are glad that you have chosen to pursue your graduate studies here, and we look forward to getting to know you better during your time at Clemson.

The first four sections of this survival guide inform graduate students in Environmental Engineering and Earth Sciences (EEES) of academic affairs and regulations pertaining to the granting of advanced degrees. Students should become familiar with this information, as well as with general Graduate School requirements outlined in the Graduate School Announcements http://gradspace.editme.com/Home. The final chapters discuss graduate assistantships and miscellaneous departmental, university, and laboratory policies.

REGISTRATION

Graduate Program Coordinators
Dr. Cindy M. Lee currently serves as the Graduate Program Coordinator for the Environmental Engineering and Science degrees. Dr. Jim Castle serves as the Graduate Program Coordinator for the Hydrogeology degree program. The Graduate Program Coordinators should be contacted whenever questions or problems occur relative to regulations and procedures pertinent to the graduate programs.

Registration for New Students
Prior to registration for the first semester of study, beginning graduate students must report to their advisor or the Graduate Program Coordinator, who will help them plan their initial program of study and identify suitable major advisors. For students entering in the fall semester, registration is accomplished during the EEES orientation, which occurs the Monday before classes begin.

Registration Procedures
The Office of Registration Services provides an on-line Schedule of Classes that may be referred to for steps to be taken in the registration process. If a student’s questions are not answered by consulting the on-line resources, including this handbook, please contact the appropriate Graduate Program Coordinator or the Student Services Coordinator. The minimum credit requirements for the department are provided below. Students are responsible for checking for additional requirements for full-time status, visa status, insurance, fellowships, or other considerations. Note there are different requirements for students supported by an assistantship.
*Student Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Fall</th>
<th>Spring</th>
<th>May</th>
<th>SSI</th>
<th>SSII</th>
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<tr>
<td>Supported-full or partial</td>
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<td>Full time, class and/or research</td>
<td>9</td>
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<tr>
<td>Full time, thesis writing only</td>
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<tr>
<td>Part-time, class and/or research</td>
<td>not allowed: supported students must be full-time</td>
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<tr>
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<td>not allowed: supported students must be full-time</td>
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<tr>
<td>Off-campus</td>
<td>not allowed: supported students must be full-time</td>
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**Not Supported**

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*INTERNATIONAL STUDENTS SHOULD CHECK WITH THE INTERNATIONAL OFFICE TO CLARIFY THE AMOUNT OF CREDITS REQUIRED FOR THEIR SPECIFIC VISA.

**891-991 Section Assignments**

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<tr>
<td>GEOL</td>
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</table>
Maximum Credit Loads
The university sets upper limits on the number of credits graduate students may earn in a given semester, as specified in the Graduate School Announcements. All requests for permission to exceed these limits must be approved by the Dean of the Graduate School and the Chair of the EEES Department.

POLICIES AND PROCEDURES FOR MASTER'S DEGREES

Introduction

Research Advisors
An advisor should be chosen during the first semester following matriculation if one is not already selected. The advisor will guide the day-to-day research activities and the preparation of the thesis or special project report. The advisor also helps plan the student's curriculum. The selection of the advisor is one of the most important decisions facing the graduate student.

All matriculating students not receiving financial assistance are asked to elect either the thesis or the non-thesis special problem option by the end of the first semester. Those selecting the thesis option must meet with faculty to select a research advisor. Those selecting the non-thesis special problem option will be advised by the appropriate Graduate Program Coordinator initially. Non-thesis students should meet with their advisor at least once a semester.

During each semester, all students receiving financial assistance should meet with their advisor to discuss their research project on a regular basis. Students funded under a teaching assistantship will be contacted by the Department Chair or an instructor regarding their assignment near the beginning of the semester.

Advisory Committee
The Advisory Committee should be chosen during the first semester after matriculation. A master's Advisory Committee shall consist of a minimum of three members who hold faculty appointments at Clemson University. A majority of the committee must hold faculty appointments in the Department of EEES. The chairman of the committee is usually the research advisor and shall hold a faculty appointment
in the Department of EEES. The advisory committee for non-thesis students will be the examining committee for the final oral exam.

The student’s Advisory Committee will perform the following functions:

- specify required co-requisite courses, if deemed necessary;
- approve course work;
- supervise the research program;
- administer the final oral examination;
- approve the M.S. thesis or special project, and
- initiate recommendation to the graduate school for awarding the degree.

**Curriculum Requirements for M.S. and M.Engr. Degrees**

There are four degree programs at the master’s level – 1) M.S. in Environmental Engineering and Science; 2) M.S. in Environmental Engineering and Science, Environmental Health Physics Program; 3) M.Engr. in Environmental Engineering Science and 4) M.S. in Hydrogeology.

- A master’s degree program in EEES shall consist of a minimum of 24 semester hours of graduate credit (exclusive of EE&S 861 or GEOL 851) approved by the student’s Advisory Committee (unless the non-thesis option is chosen - see below). For the Master of Science (M.S.) degree, at least one-half of the total graduate credit hours required by the Advisory Committee, exclusive of thesis research, must be selected from courses numbered 800 or above. For the Master of Engineering degree (M.Engr.) a minimum of 17 semester hours must be at the 700 level or above. **All resident masters’ students must register for the departmental seminar as either EE&S 861, 961 or GEOL 851 each semester. Regular attendance at the weekly seminar is required.**

Prerequisite and co-requisite courses do not count toward the 24 semester hours of graduate credit required for the degree. Prerequisite and co-requisite courses are specified by the faculty to resolve deficiencies in a student’s educational background. Prerequisite courses must be completed before admission as a graduate student, whereas co-requisite courses must be completed before receipt of the master’s degree.

**Required Core in Environmental Engineering and Science**

All M.S. and M.Engr. students pursuing the Environmental Engineering and Science degree will be required to take all three core courses below (unless a similar course was previously taken and accepted by the Graduate Program Coordinator or Chair of EEES), constituting a total of nine credits.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>EE&amp;S 802</td>
<td>Environmental Engineering Principles</td>
</tr>
<tr>
<td>EE&amp;S 843</td>
<td>Environmental Chemistry</td>
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<tr>
<td>EE&amp;S 851</td>
<td>Biological Principles of Environmental Engineering</td>
</tr>
</tbody>
</table>
M.S. in Environmental Engineering and Science

Each student pursuing a M.S. in Environmental Engineering and Science will choose one of the following five focus areas and meet the requirements listed. (M.Engr. students are limited to the Process Engineering focus area.) Substitutions and changes will be allowed upon approval of the student’s Advisory Committee. Filing the GS2 Form will be required by the end of the student’s first semester.

The five focus areas below specify 3 to 9 credits in required courses (typically 9) and typically another 3 from a required list of electives. A program of the three core courses, three required courses in a focus area, and an elective in the focus area could constitute 21 of the minimum 24 credit hours of course work for the thesis M.S. degree or M.Engr.

**Process Engineering Focus Area**

The purpose of the process engineering area is to prepare graduates to design engineered systems for removing contaminants from air, water, and soil - an activity that is central to the field of environmental engineering. Because of the continually evolving nature of the problems faced by environmental engineers, courses in this emphasis area focus on the approach to problem solving rather than on specific solutions to today's problems. This provides the students with a strong foundation in unit operations and the ability to assemble them into process trains capable of solving any pollution control problem, regardless of its complexity or nature.

**Required Courses:**

- EE&S 803  Physicochemical Operations I
- EE&S 806  Process and Facility Design for Environmental Control Systems

**Approved Electives:**

- EE&S 804  Biochemical Operations in Wastewater Treatment Systems
- EE&S 837  Biodegradation and Bioremediation

*Other courses on appropriate subjects may be substituted upon approval of the student’s Advisory Committee.*

**Suggested Electives:**

- EE&S 630  Air Pollution Engineering
- EE&S 684  Municipal Solid Waste Management
- EE&S 805  Environmental Unit Operations Laboratory
- EE&S 845  Environmental Organic Chemistry
- EE&S 847  Advanced Environmental Chemistry
- EE&S 856  Pollution of the Aquatic Environment
- EE&S 880  Environmental Risk Assessment
- CHE 601  Transport Phenomena
- CHE 650  Chemical Reaction Engineering
- CHE 805  Chemical Engineering Kinetics
CHE 814  Applied Numerical Methods in Process Simulation  
MICRO 610  Soil Microbiology  

*NOTE*: The above suggested courses are a sampling of what was available as of 2011. Students are also encouraged to consult current course offerings.

**Suggested Programs of Study within Process Engineering:**

<table>
<thead>
<tr>
<th>Waste/Wastewater Treatment</th>
<th>Biological Treatment</th>
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**Physicochemical Treatment**

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**Hazardous Waste Treatment**

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**Air Pollution Control**

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<tr>
<td>EE&amp;S 851</td>
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<td>Elective 3*</td>
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*These electives would be taken by non-thesis students.

**Environmental Chemistry Focus Area**

The overall goal of the Environmental Chemistry curriculum is to introduce the fundamental concepts important to environmental chemistry. In particular, the focus is on understanding sources of chemicals in the environment and the characteristics of the chemical and the environment that control fate and effects. Also of interest are the physical, chemical and biological processes that affect the behavior of inorganic and organic contaminants in natural and engineered systems and how these properties may be exploited to detect, quantitatively model and control the contaminants in environmental systems.

*Required Courses:*

EE&S 845  Environmental Organic Chemistry  
EE&S 847  Advanced Environmental Chemistry
Approved Electives: (at least one required)
- EE&S 837 Biodegradation and Bioremediation (F)
- EE&S 856 Pollution of the Aquatic Environment (F)
- EE&S 880 Environmental Risk Assessment (SP)
- EE&S 849 Environmental Chemistry Laboratory II (even years)
- ENTOX 841 Procedures and Techniques in Ecological Risk Assessment
- GEOL 685 Environmental Soil Chemistry
- GEOL 809 Subsurface Remediation Modeling

Other courses on appropriate subjects may be substituted upon approval of the student’s Advisory Committee.

Other Suggested Courses:
- EE&S 608 Geohydrology
- EE&S 630 Air Pollution Engineering
- EE&S 684 Municipal Solid Waste Management
- EE&S 685 Hazardous Waste Management
- EE&S 686 Pollution Prevention and Industrial Ecology
- EE&S 803 Physicochemical Operations I
- EE&S 813 Environmental Radiation Protection Laboratory 3 (1,6)
- EE&S 832 Air Pollution Meteorology
- CH 811 Analytical Chemistry
- CH 812 Chemical Spectroscopic Methods
- CH 816 Separation Science
- CH 835 Chemical Kinetics
- CHE 601 Transport Phenomena
- CHE 650 Chemical Reaction Engineering
- CHE 805 Chemical Engineering Kinetics
- CHE 814 Applied Numerical Methods in Process Simulation
- ENTOX 630 Toxicology
- ENTOX 806 Advanced Environmental Toxicology
- ENTOX 852 Ecological Models
- ENTOX 854 Aquatic Toxicology
- EX ST 801 Statistical Methods I 4 (3,3)
- EX ST 804 Sampling
- GEOL 808 Groundwater Modeling
- GEOL 810 Analytical Methods for Hydrogeology
- GEOL 875 Hydrogeology Summer Field Camp
- MICRO 610 Soil Microbiology

NOTE: The above suggested courses are a sampling of what was available at press time. Students are also encouraged to consult current course offerings.

Subsurface and Surface Processes Focus Area
The main objective of the Subsurface and Surface Processes Focus Area is to provide students with the knowledge and training needed to deal with transport and fate processes in engineered and natural systems. Natural systems will include the
atmosphere, surface waters and subsurface waters. The incorporation of the results of transport analyses into management decisions involving monitoring and remediation often requires the quantification and analysis of various real and perceived risks, so an additional objective will be to provide the basic tools needed for risk and decision analysis. A fundamental, quantitative understanding of all these processes will be emphasized, so that students will be able to adapt readily to the ever-changing conditions in the real world.

**Required Courses:**
EE&S (GEOL) 808 Groundwater Modeling
EE&S 880 Environmental Risk Assessment

**Approved Electives (at least two required)**
EE&S (GEOL) 809 Subsurface Remediation Modeling
EE&S 837 Biodegradation and Bioremediation
Advanced chemistry course selected from the following:
GEOL 659 Biogeochemistry
EE&S 842 Actinide Chemistry
EE&S 845 Environmental Organic Chemistry
EE&S 847 Advanced Environmental Chemistry

**Suggested Electives: (at least one required)**
GEOL 608 Geohydrology
GEOL 613 Stratigraphy
GEOL 621 GIS Applications in Geology
GEOL 801 Field Geophysical Techniques
GEOL 803 Geostatistics
GEOL 806 Aquifer Characterization
GEOL 814 Environmental Sedimentology
GEOL 816 Aquifer Systems
GEOL 818 Hydrogeology of Fractured Aquifers
GEOL 875 Hydrogeology Summer Field Camp

*Other courses on appropriate subjects may be substituted upon approval of the student’s Advisory Committee.*

**Sustainable Systems and Environmental Assessment Focus Area**
The Sustainable Systems and Environmental Assessment focus area is designed to challenge students to think about environmental systems in a broader context. The objective of the curriculum is to provide a basis for the analysis of complex interactions between human and natural systems. The core courses cover fundamental principles of systems analysis and risk assessment while the electives allow students to define a path of study that bridges scientific and social inquiry.

**Required Courses:**
EE&S 686 Pollution Prevention and Industrial Ecology
EE&S 820 Environmental Systems Analysis
Approved Electives:

**Group A: (at least 6 credits required)**

- BIOSC 641 Ecology
- BE 882 Systems Engineering
- CP SC 830 Systems Modeling
- EE&S 820 Environmental Systems Analysis
- EE&S 880 Environmental Risk Assessment
- ENR 613 Restoration Ecology
- ENTOX 630 Toxicology
- ENTOX 854 Aquatic Toxicology
- ENTOX 841 Procedures and Techniques in Ecological Risk Assessment
- ENTOX 852 Ecological Models
- GEOL 813 Environmental Geochemistry
- IE 685 Industrial Systems Engineering
- IE 687 Industrial Safety
- GEOL 621 GIS Application in Geology
- CRP 834 Spatial Modeling Using GIS
- EX ST 801 Statistical Methods
- MTHSC 603 Introduction to Statistical Theory
- MTHSC 634 Advanced Engineering Mathematics
- MTHSC 641 Stochastic Models
- ECON 640 Game Theory

**Group B: (at least one of the following courses or related course approved by Advisory Committee required)**

- APEC 657 Natural Resource Economic Theory and Policy
- APEC 810 Natural Resources Management and Policy
- APEC 811 Economics of Environmental Quality
- CRP 806 Urban Systems and Growth Management
- ENR 650 Conservation Issues
- ME 620 Energy Sources and Their Utilization
- SOC 836 Environmental Sociology
- PO ST 870 Seminar in Sustainable Development

*Other courses on appropriate subjects may be substituted upon approval of the student’s Advisory Committee.*

**Suggested Electives:**

- APEC 658 Economics of Risk Management
- APEC 809 Advanced Natural Resource Economics
- BE 644 Non-point Source Management in Engineering Ecosystems
- CE 612 Urban Transportation Planning
Nuclear Environmental Engineering and Science (NEES) Focus Area

The Nuclear Environmental Engineering and Science (NEES) program offers a combination of laboratory and lecture courses on topics such as environmental health physics, risk assessment, actinide chemistry, radiation detection and measurement, and radioactive waste management. The research efforts primarily focus on radiation detection and measurements, environmental radiochemistry, risk assessment, radionuclide fate and transport, and radioactive waste processing. Students within the NEES program may follow either the Environmental Radiochemistry program or the Accreditation Board for Engineering and Technology (ABET) Applied Science Accreditation Commission (ASAC) accredited Environmental Health Physics program. Specific coursework for each program is listed below.

NEES - Environmental Radiochemistry Program

The Environmental Radiochemistry program curriculum is designed to introduce the fundamental concepts associated with quantification of radionuclide concentrations and behavior in natural and engineered systems. Emphasis is placed on actinide environmental chemistry, radionuclide fate and transport in the environment, radionuclide speciation, analytical radiochemical methods, and chemical separations important in the nuclear fuel cycle. The objective of the curriculum is to provide students with knowledge and training in such areas as radionuclide/actinide speciation, fate and transport in subsurface environments, radioanalytical chemical separations, nuclear waste management, spent nuclear fuel processing and isotope production.

Required Courses:
- EE&S 610 Environmental Radiation Protection
- EE&S 813 Environmental Radiation Protection Laboratory*
  OR
- EE&S 842 Actinide Chemistry

*Note: EE&S 611 is a prerequisite for EE&S 813.

At least 9 hrs of the following are required, 3 hrs of which must be from an approved elective:
Approved Electives:
- EE&S 611 Ionizing Radiation Detection and Measurement
- EE&S 812 Environmental Nuclear Engr. (Radioactive Waste Mgt.)
- EE&S 813 Environmental Radiation Protection Laboratory
- EE&S 842 Actinide Chemistry
- EE&S 845 Environmental Engineering Chemistry II
- EE&S 847 Advanced Environmental Chemistry
- EE&S 880 Environmental Risk Assessment

Other Suggested Courses:
- EE&S 608 Geohydrology
- EE&S 630 Air Pollution Engineering
- EE&S 682 Groundwater and Contaminant Transport
- EE&S 685 Hazardous Waste Management
- EE&S 832 Air Pollution Meteorology
- EE&S 833 Air Pollution Control Systems
- EE&S 837 Bioremediation
- EE&S 844 Environmental Engineering Chemistry Laboratory I
- EE&S 855 Surface and Subsurface Transport
- EE&S 856 Pollution of the Aquatic Environment
- CSENV 485/685: Environmental Soil Chemistry
- CH 805 Theoretical Inorganic Chemistry
- CH 811 Analytical Chemistry
- CH 812 Chemical Spectroscopic Methods
- CH 813 Electrochemical Science
- CH 831 Chemical Thermodynamics
- CH 835 Chemical Kinetics
- EX ST 801 Statistical Methods
- EX ST 804 Sampling
- GEOL 459/659 Biogeochemistry
- GEOL 808 Groundwater Modeling
- GEOL 809 Subsurface Remediation Modeling
- GEOL 810 Analytical Methods for Hydrogeology
- GEOL 813 Environmental Geochemistry
- MTHSC 634 Advanced Engineering Mathematics
- MTHSC 805 Data Analysis
- MICRO 610 Soil Microbiology
- PHYS 852 Radiation Physics

NOTE: The above-suggested courses are a sampling of what was available at press time. Students are also encouraged to consult current course offerings.

NEES - Environmental Health Physics Program
Environmental Health Physics (EHP) is designed to address broad environmental issues associated with anthropogenic and natural radioactivity. The objective of the curriculum is to provide students with knowledge and
training needed to protect human health and the environment from ionizing radiation. Integral to this program is assessing risk associated with the radiation. Research areas include low-level radiation detection, analytical techniques to quantify stable elements utilizing radiation, environmental monitoring, radionuclide transport, radioactive waste management, and risk assessment.

**Educational Objectives**

The educational objectives of the EHP are for its alumni to demonstrate the following within 3 to 5 years post-graduation:

- the ability to address contemporary problems in environmental health physics and/or environmental engineering science in industry, government, and academia
- the ability to do independent research, project leadership, and/or professional leadership.

**Environmental Health Physics Specific Outcomes**

- an ability to apply knowledge of environmental engineering science to the solution of environmental problems
- an ability to apply knowledge of health physics to the solution of health physics problems
- an ability to integrate knowledge of environmental engineering science and health physics to solve contemporary problems in environmental health physics

**NOTE:** the Environmental Health Physics program is accredited by the Applied Science Accreditation commission of ABET, [http://www.abet.org](http://www.abet.org).

**Required Courses:**

- EE&S 610 Environmental Radiation Protection
- EE&S 611 Ionizing Radiation Detection and Measurement
- EE&S 812 Environmental Nuclear Engr. (Radioactive Waste Mgt.)
- EE&S 880 Environmental Risk Assessment

**Approved Elective Courses:**

- EE&S 630 Air Pollution Engineering
- EE&S 685 Hazardous Waste Management
- EE&S 803 Physicochemical Operations I
- EE&S 813 Environmental Radiation Protection Laboratory
- EE&S 832 Air Pollution Meteorology
- EE&S 833 Air Pollution Control Systems
EE&S 842 Actinide Chemistry
EE&S 844 Environmental Engineering Chemistry Laboratory I
EE&S 845 Environmental Engineering Chemistry II
EE&S 855 Surface and Subsurface Transport
EX ST 801 Statistical Methods
EX ST 804 Sampling
ME 620 Energy Sources and Their Utilization
MTHSC 634 Advanced Engineering Mathematics
MTHSC 805: Data Analysis

NOTE: The above-suggested courses are a sampling of what was available at press time. Students are also encouraged to consult current course offerings.

M.Engr. in Environmental Engineering and Science
The M.Engr. Program is designed to build on an ABET-accredited engineering baccalaureate background. The M.Engr. is usually considered a terminal degree leading to a professional position in engineering. The course information is the same as for the process engineering focus area. The M.Engr. Candidate completes a special project report rather than a thesis.

M.S. in Hydrogeology
All Hydrogeology students must take a field course (GEOL 875 is recommended) and a modeling course (GEOL 808 is recommended). They must take a minimum of three additional 800-level geology courses, to be selected from the following.

GEOL 801 Field Geophysical Techniques
GEOL 803 Geostatistics
GEOL 805 Advanced Stratigraphy
GEOL 806 Aquifer Characterization
GEOL 809 Subsurface Remediation Modeling
GEOL 810 Analytical Methods for Hydrogeology
GEOL 811 Rock Physics
GEOL 813 Environmental Geochemistry
GEOL 814 Environmental Sedimentology
GEOL 816 Aquifer Systems
GEOL 818 Hydrogeology of Fractured Aquifers

Non-Thesis Option—EE&S MS and Hydrogeology MS
A non-thesis option is available to EEES M.S. students upon approval by the EEES faculty. Requirements for the non-thesis masters can be completed within a continuous 12-month period with full-time study or over a longer time period with part-time study. The non-thesis option consists of a minimum of 30 semester hours of graduate coursework approved by the student’s Advisory Committee, and students must pass a comprehensive oral exam. Coursework by students in the non-thesis
option must normally include the courses required for the EE&S or Hydrogeology master’s degree, and a minimum of 21 hours must be at the 800-level. For the EE&S master’s degree courses must include EE&S 881 (Special Problems, 3 hours) or GEOL 875 (Hydrogeology Summer Field Camp, 6 hours). Courses must include GEOL 875 for the Hydrogeology master’s degree. Students in the non-thesis option are not eligible for research or teaching assistantship appointments, but are eligible for graduate internships. A student who has received assistantship support at any time while a graduate student in the EEES department is not eligible for the non-thesis option except under extremely rare and unusual circumstances.

Curriculum Development - GS2 Form
All students are expected to develop an area of study consisting of one of the areas of specialization above with the advice and consent of their Advisory Committee. Special programs may be approved by the Advisory Committee.

The planned course of study, once approved, must be presented to the Graduate School in the GS2 Form. The GS2 should be completed as soon as the student talks with their advisor and determines the course of study they will pursue; but no later than the end of their first semester.

The GS2 is a form that serves to appoint the Graduate Advisory Committee and notifies the Graduate school of all the classes the student will take to fulfill their degree requirements. It is important to note that any class listed on one’s GS2 must be completed before graduation. If changes are necessary, a revised GS2 must be filed.

NOTE: The GS2 Form is located at:
http://www.grad.clemson.edu/forms/forms_current.php

Thesis Proposal
The proposal is a persuasive document intended to document the worthiness of the proposed research. It should be a brief, concise document that is 5 to 15 pages when double-spaced, not including references. Master’s students should complete the final draft of their proposal by May of their first year; doctoral students by the end of their second year. See section below for guidelines.

The proposal is developed with the help of the advisor and committee. The approach and procedure vary somewhat from advisor to advisor, so students should discuss the process with their research advisor early. The purpose of the proposal is to create a research plan. Actual activities may vary as conditions and initial results dictate. The research proposed should be worthwhile and tractable. At the center of the proposal, there should be a clear hypothesis to be tested and/or a set of objectives. The material before the objectives should give the necessary background and lead to why the hypotheses/objectives are worth pursuing. After the objectives are stated, a research plan should be presented aimed at attaining the objectives. Students should
review the central parts of the proposal, especially the objectives, with their advisor, and then produce an initial draft.

The student’s advisor will review the first draft and offer suggestions for changes. Upon approval of the advisor, electronic or hard copies will be distributed to the other committee members for their comments. Generally, committee members do not retain a copy, but you should check on their preference. A signed hard copy must be given to the Student Services Coordinator.

**Approval of Research Proposal**
Before the end of their second semester, Master’s students should have a research proposal approved unless they are in the non-thesis option. The proposal is developed with and approved by the Research Advisor and Advisory Committee. Guidance can be found in the section “Preparation of Research Proposal”.

**Admission to Candidacy - GS4 Form**
Admission to the Graduate School does not automatically establish the candidacy of a student for an advanced degree. Such candidacy depends on the acceptance of a written request for admission to candidacy by the Dean of the Graduate School. No later than four weeks following the beginning of the final semester or first summer session prior to the date on which the degree is to be conferred, the student should file the Candidacy Request Form (GS4) with the Graduate School along with a nominal fee. A $25 late fee will be assessed a student whose Form GS4 is submitted after the deadline dates specified in the Graduate School Announcements. The request for candidacy should be signed by the chairman of the Advisory Committee and the EEES Department Chair. The GS4 Form notifies the Graduate School of the date the student plans to graduate. The Graduate School also uses this form to order the diploma.

**Thesis or Special Topic Report**
The first draft of the thesis should be completed at least eight weeks before the date of the final oral examination. Refer to the section below for details for preparing the thesis.

**Final Oral Examination**
The final oral examination is given no later than approximately three weeks before graduation, under the authority of the student's Advisory Committee in accordance with Graduate School deadlines (website below). Except for non-thesis students, the committee should receive final draft copies of the thesis or special problem report at least 10 working days before the scheduled defense.

http://www.grad.clemson.edu/Deadlines.php

This oral examination is comprehensive in nature and must provide convincing evidence of the student's intellectual mastery of required coursework. M.S. thesis students and M.Engr. students also will be examined on their research area.
The student is responsible for scheduling the examination, in consultation with the chair of the committee and its members, and with the Student Services Coordinator who will notify Graduate School. During the examination, M.S. and M.Engr. students will be expected to orally present the findings of the research, support various aspects thereof, and be questioned on integrated knowledge of related coursework. The Graduate School will be notified of the time and place of the examination at least ten days prior to the time scheduled. Members of the EEES faculty, members of the Graduate Curriculum Committee, the Deans of the College of Engineering and Science and the Graduate School, and EEES graduate students are invited to attend the examination. Procedurally, the examination consists of a 30- to 45-minute presentation made by the student followed by questions posed first by non-members of the Graduate Advisory Committee and then by the members of the student's Graduate Advisory Committee.

The final oral examination for non-thesis M.S. students consists of a short (15-20 minute) technical presentation and questions on material from five courses that are selected by the student and the advisory committee chair. The examining committee is the same as the advisory committee listed on the student GS2. The non-thesis exam will take place in a closed session.

Satisfactory performance on the final examination will result in a favorable report to the Deans of Engineering & Science and the Graduate School. This report, available from the Student Services Coordinator and filed by the advisor, is called the GS7 Form.

Unsatisfactory performance on the final examination, as determined by the Advisory Committee, will result in at least one of the following actions: (a) additional work on the thesis or special project report and resubmission of the thesis or report to the Advisory Committee for further review; (b) additional study in the environmental engineering & science field and reexamination; or c) failure on the exam. In the case of failure, the Advisory Committee is required to submit a written report to the Deans of the College of Engineering and Science and the Graduate School that the student failed the final examination. The Advisory Committee may specify the nature of the reexamination. A second failure on the final examination may, at the discretion of the examining committee, result in the student being declared ineligible for a Master's degree in EE&S at Clemson University.

**Jurisdiction/Authority**
This document is subject to periodic review and revision by the EEES faculty. Each Master's student is subject to the policies in effect at the time of matriculation in the Master's program. If policies change, a student may petition in writing the EEES faculty for approval, or disapproval, of changing to the new policies.
Exceptions to Policy
A student may be granted an exception to this policy for the M.S. degree if they petition the faculty of EEES in writing and receive a favorable action.

Master's Student Checklist
Table 1 provides a checklist for milestones in the Master of Science or Master of Engineering degree program.

Table 1. Checklist for Master’s Students

<table>
<thead>
<tr>
<th>What</th>
<th>When</th>
<th>How/Who</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Selection of major advisor</td>
<td>Before end of 1st semester</td>
<td>Notify Graduate Program Coordinator of choice</td>
</tr>
<tr>
<td>2. Appointment of Advisory Committee</td>
<td>Before end of 1st semester</td>
<td>In consultation with advisor and committee</td>
</tr>
<tr>
<td>3. Preparation of study program</td>
<td>Before end of 1st semester</td>
<td>In consultation with major advisor</td>
</tr>
<tr>
<td>4. Filing of study plan</td>
<td>Before end of 1st semester</td>
<td>GS2 Form by student</td>
</tr>
<tr>
<td>5. Approval of thesis or project proposal</td>
<td>Before end of 2nd semester</td>
<td>Signed thesis or project proposal submitted to graduate student file</td>
</tr>
<tr>
<td>6. Admission to candidacy for degree and diploma application</td>
<td>After completion of at least 15 hours of course work and early in the semester during which degree is expected</td>
<td>GS4 Form by student</td>
</tr>
<tr>
<td>7. Submittal of thesis or project report</td>
<td>1st draft at least 8 weeks before date of final examination; final (advisor approved) copies at least 10 days before final examination</td>
<td>By student</td>
</tr>
<tr>
<td>8. Final examination (oral)</td>
<td>At least 3 weeks prior to graduation (see Graduate School schedule for date)</td>
<td>GS7 Form to be filed by advisor after examination is completed</td>
</tr>
<tr>
<td>9. Cap and gown rental</td>
<td>Early during semester in which degree is to be conferred</td>
<td>By student</td>
</tr>
<tr>
<td>10. Final Checkout</td>
<td>At least one week prior to graduation</td>
<td>Obtain all required signatures on checkout form and make appoint with Department chair for exit interview</td>
</tr>
</tbody>
</table>


9/12/2011
POLICIES AND PROCEDURES FOR THE Ph.D. DEGREE

Introduction

Advisory Committee
The student, working with their research advisor, selects an Advisory Committee. A Ph.D. Advisory Committee shall consist of a minimum of four members who hold professorial appointments at Clemson University. A majority of the committee shall hold professorial appointments in the Department of EEES. Students and advisors are encouraged to select at least one member from a department other than EEES. If a minor is declared, this area must be represented on the committee. The chairman of the committee shall hold a professorial appointment in EEES.

The Advisory Committee will perform the following functions for students:

• approve their plan of study;
• supervise their graduate program and dissertation research;
• administer the comprehensive and final examinations; and,
• initiate recommendations to the Graduate School for awarding the Ph.D. degree.

Curriculum Development - GS2 Form
A plan of course work is developed by the student with the assistance of the research advisor and input from the Advisory Committee. This is normally done before the end of the second semester after matriculation. This plan is formally submitted to the Graduate School on the GS2 Form. Work in a minor field, if declared, normally requires 12 to 24 hours in courses carrying graduate credit. A minimum of 18 hours of doctoral research is required. The combination of coursework must represent at least 30 hours beyond the MS degree. Courses listed on the GS2 Form must be completed prior to graduation. If changes are necessary, a revised GS2 must be submitted.

All resident Ph.D. students must register for EE&S 961 (seminar) each term that it is offered.

NOTE: The GS2 Form is located at: http://www.grad.clemson.edu/f_general.html
Qualifying Examination
The qualifying examination will serve to examine the ability of a student to apply the knowledge normally assimilated in a Master's program in EE&S at Clemson University to problems in an area of specialization. Examination questions will be prepared by the faculty of EEES and will normally be selected from material covered in courses typically included in a Master's plan of study in EE&S.

The area of specialization in which students are to be examined shall be selected by the students, with the advice and consent of their faculty advisor, from the following list:

- Process Engineering
- Environmental Chemistry
- Subsurface and Surface Processes
- Nuclear Environmental Engineering and Science
- Sustainable Systems and Environmental Assessment

This one-day written examination should be taken before the beginning of classes in the student's first semester and not later than 13 months after a student matriculates in the Ph.D. program. Part-time students may request a variance on the timing of the exam. The qualifying exam will be offered as necessary three times a year: January, May and August. Students who earned a grade of “A” in an EE&S course at Clemson University no more than three years before matriculating in the Ph.D. program are exempt from this examination on that course provided two conditions are met: (a) favorable action is received on petitioning the faculty of EEES, and (b) the intended area of specialization for Ph.D. study is consistent with the area of specialization for the master's program. - Material covered on the qualifying exam includes the three EE&S Core Courses plus another 2-3 courses in the area of specialization, at the discretion of the Advisory Committee. Once the examination coverage has been determined, the Major Advisor will inform the student. The instructor who typically teaches the course will make up the exam on that course. If the instructor is not available, a substitute may be designated by the Major Advisor. The nature of the questions is similar to course tests and is written such that a prepared candidate can answer in less than 1.5 hours/course. Faculty making up the exam will grade the exam within two weeks of the examination and report the results to the Major Advisor who coordinates all aspects of the qualifying exam.

Satisfactory performance on the qualification examination will result in a student being approved for continuance in the Ph.D. program in EE&S.

Unsatisfactory performance on the qualification examination will result in the student: (a) taking the course, if the student has not taken the course at Clemson University, (b) a subsequent supplementary oral examination; or (c) undergoing complete or partial re-examination at the next available offering (a second failure shall result in a student being declared ineligible for the Ph.D. degree in EE&S at Clemson University).
Comprehensive Examinations
The purpose of the comprehensive examinations is to obtain convincing evidence of a student's intellectual mastery of their Ph.D. coursework. They are prepared by and are given under the authority of the student's Ph.D. Advisory Committee. The student is expected to take this examination upon successful completion of the qualification examination and essentially the entire plan of coursework in his/her major and any minor fields. This examination shall be given in two parts by the student's Advisory Committee and is organized by the Major Advisor.

Part I of Comprehensive Examination - Written
The timing of this exam shall be at the discretion of the Major Advisor, but will typically be four four-hour sessions, typically on four successive days, and one eight-hour session, typically spanning five days. The first four sessions will be devoted to examining the student in his/her area of study. The last eight-hour session consists of a critical review of a major article in a scholarly journal in the student's area of specialization. The exam will be written by the Advisory Committee and tailored to the area of study and research topic of the student. The student may discuss the expected areas and format of the exam with the Advisory Committee members. The Major Advisor selects the article for review.

Satisfactory performance on Part I of the comprehensive examination will result in the student being declared eligible to take Part II. A student must pass Part I of the comprehensive examination to be eligible to take Part II.

Unsatisfactory performance on this portion of the comprehensive examination will be determined at the sole discretion of the Advisory Committee with the student either: a) being allowed to be reexamined on all or part of the exam, in oral and/or written format, or b) being declared ineligible for the Ph.D. degree in the department.

In either case, the Advisory Committee may impose requirements for additional coursework.

Part II of Comprehensive Examination–Defense of Research Proposal
Before the end of the second year, the student should have developed a research proposal with the assistance of their research advisor and committee. Doctoral students must orally defend their proposal before their committee. The signed original is kept in a departmental file, which is maintained by the Student Services Coordinator. Guidance on the preparation of the research proposal can be found in the later section “Preparation of Research Proposal”.

During this oral examination, the student will present their dissertation research proposal. The written proposal will be distributed to the Advisory Committee prior to the examination. (See later section of “Preparation of Research Proposal”). The proposal should:
- introduce the project;
- clearly state the research hypothesis and/or objectives;
- establish uniqueness and originality through literature citations;
- describe the methodology to be employed;
- provide preliminary data; and
- establish the environmental significance of the proposed work.

Satisfactory performance on Part II of the comprehensive examination will result in a recommendation to the Graduate School of acceptance of a student's application for admission to candidacy.

Unsatisfactory performance on Part II of the comprehensive examination will be determined at the sole discretion of the Advisory Committee, the student either: a) being allowed to be reexamined on all or part of the exam, in oral and/or written format, or b) being declared ineligible for the Ph.D. degree in the department.

A second failure of the defense of the Research Proposal shall result in a student being declared ineligible for the Ph.D. degree in EE&S at Clemson University.

**Results of the Doctoral Comprehensive Examination, GS5 Form**

The GS5 Form is filed after successful completion of the comprehensive examinations. Satisfactory completion of the comprehensive examination will result in a change of status from Ph.D. student to Ph.D. candidate. Once achieving the status of Ph.D. candidate, an annual stipend increase of $1,500 will follow. It is the student’s responsibility to see that the paperwork is filed for this increase.

*En Route Master’s Degree*

Eligible students for the “en route” MS include students who are accepted to the PhD program without a Master’s degree. The students must make a request to the faculty that they be considered as a candidate for an “en route” MS degree.

The students must fulfill the following to qualify for an “en route” MS degree.

- Complete at least 24 hours of coursework and 6 hours of research.
- Maintain a >3.0 GPA.
- Complete the comprehensive exam by passing the written exams, successfully defending a proposal, and has a proposal signed by all committee members.

Upon meeting all of the above requirements, the student’s advisor will notify the Graduate Coordinator who will complete the GS2-14 form and submit it to the Graduate School. Note the normal university deadlines apply.
Application for Graduation and Diploma Order
Early in the semester that the student plans to defend his/her dissertation and expect to graduate, the GS4 Form must be submitted to the Graduate School.

Dissertation
The first draft of the dissertation should be completed at least eight weeks before the date of the final oral examination. Refer to the later section “Preparation of Proposal, Special Report, Thesis or Dissertation.”

Final Oral Examination
An oral examination given at least three weeks before graduation will serve to examine the students on their dissertation research. (See deadlines set by the Graduate School for the specific date for each term at the address shown below. A broad and penetrating interpretation of the research project and conclusions is required of the student. The committee members should receive a final draft copy of the dissertation at least 10 working days before the examination. This examination will be conducted under the authority of the Ph.D. Advisory Committee. All EEES faculty members will be invited to participate in the examination and to provide advisory comments to the committee.

http://www.grad.clemson.edu/Deadlines.php

Successful completion of this examination will result in a recommendation (GS7 Form) by the Advisory Committee to the Graduate School that the Ph.D. degree be awarded.

Unsatisfactory performance on the final examination will result in a requirement for complete re-examination (with or without recommendations for additional work) or dismissal.

Dissertation Approval
After the dissertation has been approved by the Advisory Committee, the dissertation must be submitted to the Manuscript Review Office (E-106 Martin Hall) to obtain format approval.

After format approval, the student is responsible for submitting an electronic copy of the dissertation to the Graduate School. One electronic copy is required for the department. The student should check with their advisor about whether the advisor would like a bound copy.

Jurisdiction/Authority
Each Ph.D. student is subject to the policies in effect at the time of matriculation in the Ph.D. program. If policies change, students may petition in writing the EEES faculty for approval or disapproval of changing to the new policies.
Exceptions to Policy
A student may be granted an exception to this policy for the Ph.D. degree if they petition the faculty of EEES in writing and receive a favorable action.

Ph.D. Student Checklist
Table 2 provides a checklist of milestones for the Ph.D. degree program.
### Table 2. Checklist for Ph.D. Students

<table>
<thead>
<tr>
<th>What</th>
<th>When</th>
<th>How/Who</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Selection of major advisor</td>
<td>Before end of 1st semester</td>
<td>By student... Notify Dept. Chair</td>
</tr>
<tr>
<td>2. Appointment of Advisory Committee</td>
<td>Before end of 2nd semester</td>
<td>In consultation with major advisor</td>
</tr>
<tr>
<td>3. Preparation of curriculum</td>
<td>Before end of 2nd semester</td>
<td>In consultation with major advisor and Advisory Committee</td>
</tr>
<tr>
<td>4. Filing of curriculum, GS2</td>
<td>Before beginning of 3rd semester</td>
<td>GS2 Form by student</td>
</tr>
<tr>
<td>5. Qualifying Exam</td>
<td>Not later than 1½ yrs after entering</td>
<td>Advisory Committee</td>
</tr>
<tr>
<td>6. Comprehensive Exam Part 1 Written</td>
<td>Upon completion of course work</td>
<td>Advisory Committee</td>
</tr>
<tr>
<td>7. Comprehensive Exam Part 2 Approval of research proposal Oral</td>
<td>After Part 1</td>
<td>Advisory Committee... Signed research proposal submitted to Student Services Coordinator</td>
</tr>
<tr>
<td>8. Admission to Doctoral Candidacy GS5 Form</td>
<td>After completion of Comprehensive Exam</td>
<td>Research Advisor GS5 Form to be completed by committee.</td>
</tr>
<tr>
<td>9. Application for Graduation &amp; Diploma; GS4 Form</td>
<td>Early in the semester during which degree is to be expected</td>
<td>By student</td>
</tr>
<tr>
<td>10. Cap &amp; Gown</td>
<td>Early during semester during which degree is to be expected</td>
<td>By student</td>
</tr>
<tr>
<td>11. Completion of draft of dissertation</td>
<td>1st draft at least 8 wks before date of final examination; final (advisor approved) copies at least 2 wks before final examination</td>
<td>By student with review by research advisor</td>
</tr>
<tr>
<td>12. Final oral exam</td>
<td>At least 3 weeks prior to date on which degree is expected (see Graduate School schedule for last possible date)</td>
<td>GS7 Form to be filed by major advisor after examination is completed</td>
</tr>
<tr>
<td>13. Approval of dissertation by Graduate School</td>
<td>About 2 wks before graduation (consult Graduate School Schedule for exact deadline)</td>
<td>By student</td>
</tr>
<tr>
<td>14. Final Check Out</td>
<td>At least one week prior to graduation</td>
<td>Student obtains all required signatures; makes appointment with Chair for exit interview</td>
</tr>
</tbody>
</table>

These are guidelines and may change for students who enter the doctoral program without completing the Master’s Degree
PREPARATION OF PROPOSAL, SPECIAL PROJECT REPORT, THESIS, OR DISSERTATION

General Guidelines
All special problem reports, theses, and dissertations shall be prepared in accordance with the Graduate School and is posted at the web address shown below. This guide provides advice on preparing acceptable and effective reports, theses, and dissertations. EEES students should consult this guide before beginning the writing phase of their graduate research. Pay particular attention to formatting requirements.

http://www.grad.clemson.edu/Manuscript/format.php

For further guidance on writing reports, papers, or theses, see copies of manuals available in the departmental library. (The following books are recommended: How to Publish a Scientific Paper by Robert A. Day; Scientific English: A Guide for Scientists and Other Professionals by Robert A. Day; and The ACS Style Guide: A Manual for Authors and Editors edited by Janet S. Dodd.

Planning
Task planning is a very important part of any research program. The deadlines for the tasks depend on the date of anticipated graduation and are presented in the Graduate School Announcements. A list of the deadlines is also available from the Graduate School web site, http://www.grad.clemson.edu/. Failure to meet any of these deadlines will result in postponement of graduation.

Sufficient time must be allotted for writing the thesis, special project report, or dissertation. It is highly recommended that the student fully complete their thesis before leaving the university. Many former students who left without completing their thesis still have not completed their degree requirements. Experience shows it is very difficult to complete a thesis or dissertation after leaving the university.

Thesis Proposal
The proposal is a persuasive document intended to document the worthiness of the student’s research. It should be a brief, concise document that is 5 to 15 pages for MS students when double-spaced, not including references. The proposal for the dissertation has no set length requirements. Ph.D. students should discuss the proposal in depth with their Major Advisor. A final draft of the proposal should be completed by May of the first year as a Master’s student and by the end of the second year as a Doctoral student.

The proposal is developed with the help of the student’s advisor and committee. The approach and procedure vary somewhat from advisor to advisor, so students should discuss the process with their research advisor early. The purpose of the proposal is to create a research plan. Actual activities may vary as conditions and initial results
dictate. The research proposed should be worthwhile and tractable. At the center of the proposal, there should be a clear hypothesis to be tested and/or a set of objectives. The material before the hypotheses/objectives should give the necessary background and lead to why the objectives are worth pursuing. After the objectives are stated, a research plan should be presented aimed at attaining the objectives. Students should go over the central parts of the proposal, especially the objectives, with their advisor, and then produce an initial draft.

The advisor will review the first draft and offer suggestions for changes. Upon approval of the advisor, electronic or hard copies will be distributed to the other committee members for their comments. Generally, committee members do not retain a copy, but the student should check on their preference. The document must have a cover page. (H drive, student information, Forms)

**Proposal Text – Introduction**
The introduction should include some brief introductory remarks and a review of the literature that is relevant to the research objectives. The literature review should be current and should be organized to support those objectives. For the dissertation proposal, the literature review may be a separate section of the proposal.

**Research Hypotheses/Objectives**
This section should be written first (in conjunction with the student advisor for a master’s thesis). Begin this section with a paragraph summarizing the major goal of the research. The major objective whenever possible should be stated as a hypothesis with tasks outlined for testing the hypothesis. For example:

Hypothesis: The rate of alkaline hydrolysis of carbaryl is inhibited in the presence of dissolved natural organic matter (NOM).

**Tasks**
- Measure the rate constant of the hydrolysis of carbaryl in deionized, distilled water within the pH range of 6 to 10.
- Measure the rate constant of the hydrolysis of carbaryl within the pH range of 6 to 10 and vary the concentration of dissolved NOM from 1 mgC/L to 45 mgC/L.
- Identify reaction products from the above tasks to confirm hydrolysis as the major degradation pathway.
- Analyze data with appropriate models to evaluate the effect of pH and NOM on hydrolysis of carbaryl.

For proposals of Ph.D. work, three potential manuscripts are described with results from the hypotheses/objectives to be examined.
Experimental Plan and Methodology
This section should lay out the experimental approach that will be used to accomplish the tasks listed in the Objectives section. The approach should include the experimental design and a matrix of experiments to be conducted. The methodology should include procedures and analytical protocol or information about the development of those procedures. Information about the data to be collected and the use of the data should be provided, as well as final evaluation approaches.

Preliminary Results
Proposals for Ph.D. work will include results from scoping and preliminary experiments that indicate the approach is working.

Significance of the Proposed Work
This section should be a brief summary of why it is important to conduct the proposed research. What are the expected results and how will they benefit the environmental engineering and science community?

Helpful Hints
Students should check with their advisor on the desired format for references, font, and other formatting items.

Whenever possible, use the active voice. For example:

*The reaction produced 1-naphthol, carbon dioxide, and methylamine.*

Avoid: 1-Naphthol, carbon dioxide, and methylamine were produced in the reaction.

Avoid starting sentences with numbers. For example:

*I added 125 mL of methylene chloride to the solution before mixing.* or, *Before mixing, 125 mL of methylene chloride were added to the solution.*

**AVOID:** 125 mL of methylene chloride were added to the solution before mixing.

Numbers less than or equal to ten should be spelled out. Numbers of 11 or more can be represented by Arabic numerals. However, if you are referring to an exact amount from a measurement, such as 1.0 mL, use numerals. For example:

*Five aliquots of 2.0 mL were added to each sample.*

Remember that effect is a noun and affect is a verb. Other words that are often confused are there and their; site (location), sight, and cite (reference); loose (adjective), lose (verb), and loss (noun); choose (present tense) and chose (past tense).
Avoid the use of reduce to mean decrease because reduce has a very specific chemical meaning.

For additional information on technical writing, the student is referred to book in the EE&S library. Especially recommended are:

- *How to Publish a Scientific Paper* by Robert A. Day;
- *Scientific English: A Guide for Scientists and Other Professionals* by Robert A. Day; and

**Writing the Special Project Report, Thesis or Dissertation**
The writing process usually begins toward the end of the research period. The document must be written in a format that is acceptable to the Graduate School (M.S. or Ph.D.) or the College of Engineering and Science (M.Engr.). The Graduate School offers guidelines for formatting the thesis or dissertation at:

[http://www.grad.clemson.edu/Manuscript/format.php](http://www.grad.clemson.edu/Manuscript/format.php).

**Review and Approval**
M.S. Candidates - As a result of the final oral examination and review of the written document by the Advisory Committee, a student may be required to do more work. After a successful final oral examination, the committee members will provide any comments or corrections that must be made to the thesis or dissertation. It usually takes less than a week to make the needed corrections. The advisor and members of the Advisory Committee must sign the GS7 form. Then visit the Thesis and Dissertation web page of the Graduate School shown below. Follow the directions for uploading your manuscript as a pdf file. The Graduate School will review the formatting and send you an email within one or two business days indicating the manuscript has been accepted or needs more attention.

[http://www.grad.clemson.edu/Manuscript.php](http://www.grad.clemson.edu/Manuscript.php)

M.Engr. candidates need to call Carolyn Douglass in the College of Engineering and Science at 656-3200 to arrange a review of their special report. Dr. Larry Dooley, Associate Dean, is the official who approves the special report. The College of Engineering and Science may not be as rigid as the Graduate School, but the College of Engineering and Science can and will reject a thesis if it is not formatted correctly.

NOTE: Before the thesis can be up-loaded, all signatures (advisor, committee members, and Graduate School or The College of Engineering and Science) must be present on the form.
TOP 5 STEPS FOR OBTAINING GRADUATE SCHOOL APPROVAL OF THESIS/DISSERTATION

1. Be enrolled! Students meeting with advisors/faculty, taking comprehensive or final examinations, using library, computer facilities or laboratories must be officially enrolled in at least one credit hour.

2. Follow Graduate School format specifications listed at

   http://www.grad.clemson.edu/Manuscript/format.php.

3. Avoid Common Format Problems

4. MARGINS: All margins must be 1.25 inches.

5. TABLE OF CONTENTS:
   - All headings must be identical in content to those in the body of the document.
   - Every entry must have a page number.
   - All major sections (first-level headings) must be included. Lower-level headings can be included, but they're not required.
   - Alignment and spacing of entries must be consistent.
   - The page number for each entry must be right-justified at the right margin.
   - There must be ellipses between the entry and the page number. The ellipses may NOT be created with individually typed periods. Note: you can use the ellipses instructions to help format your Table of Contents.
   - You should not list "Table of Contents" within your table of contents.

Send an electronic copy of the manuscript to the Graduate School and to the Student Services Coordinator. See their web shown below page for deadlines. The Graduate School Representative will check the format of the manuscript and provide an email response.

   http://www.grad.clemson.edu/e_deadlines.html

NOTE: The Graduate School Representative will check the thesis/dissertation for adherence to format requirements. Contents and grammar should be reviewed by the faculty committee. However, documents submitted to the Graduate School with significant problems in content and/or grammar will not be approved.

Make any corrections noted by the Graduate School Representative, and any final revisions required by committee members.
FINANCIAL INFORMATION

Financial Assistance
Graduate students are eligible for financial assistance if they are (a) enrolled in full-time graduate studies and (b) in good academic standing; i.e., not on probation. Tuition is paid directly to the University by the department for TAs and by the research grant for RAs. Fees are paid by the students receiving financial assistance are at a flat reduced rate. EEES is not permitted to pay fees directly to the university; therefore, return of fees to graduate assistants is spread over the entire year and included in stipend checks. To receive the reduced fees for a particular semester, a qualified student must be on the department payroll prior to the beginning of that semester.

Financial support is awarded based on academic merit, educational and employment discipline as well as on the research interests of the student. If students change their interest area after support has been extended, support eligibility is reviewed. Only Ph.D. students and master's students pursuing research are eligible for financial support. Non-thesis master's students are not eligible for financial support but are eligible for internships.

Assistantship Award Policy
Assistantships are awarded by the graduate faculty based on many factors, including GPR, GRE scores, recommendations, previous schools, area of study, essay, English language ability, and (in some cases) American citizenship.

Assistantship Funding
The EEES Department uses two different sources for funding graduate students: State of South Carolina monies, and funds from contracts, grants and donations. Students supported by state funds normally are assigned teaching assistant duties while those supported by research contract funds are assigned research duties. All assistantships may be subject to time limits as described below (depending upon the degree being pursued) and are contingent upon satisfactory performance and progress toward the degree by the student.

Assistantships for M.S. or M.Eng. students will normally extend for a maximum of two years. The same time limit applies to fellowships awarded by the EEES Department.

Assistantships for Ph.D. students will normally extend for three years beyond the M.S. degree. The same applies to fellowships awarded by the Department.

Continuation of assistantships and fellowships is contingent upon satisfactory academic performance, as well as satisfactory performance of assigned duties associated with the assistantship.
All research contract and grant supported graduate assistantships are subject to continued funding by the contracting agency. If a research contract or grant is terminated before a student has completed their degree program, the department will endeavor (on an individual basis) to provide financial support to allow continuation of the students' program. This might involve teaching assistants responsibilities, where appropriate. The foregoing statement should not be construed as an assurance of funding. The student is expected to complete their degree program in a timely fashion.

All graduate students holding a teaching, research, or graduate assistantship appointment at Clemson University shall be compensated based on a standard full-time equivalent (FTE rate) (12-month basis) established by the faculty of EEES. This rate shall also serve as the basis for all rate adjustments described in the section below. Three standard FTE rates shall be established; one for Master’s students, one for Ph.D. students and another for Ph.D. candidates.

Compensation at a rate exceeding the standard FTE rate is allowed according to the following guidelines:

- Funds for such additional compensation may be derived from a fellowship, traineeship, or similar form of award (e.g. NSF, EPA and NRC fellowships) in which the awardee is selected competitively from a group of applicants on the basis of scholarly excellence. In this case, such additional compensation is limited to a maximum of 25% of the standard FTE rate. In the event that such an award exceeds this limit, the assistantship appointment shall be diminished in like proportion such that the total compensation does not exceed 75% of the standard FTE rate.

- Funds for such additional compensation may also be derived from a research grant or contract provided the student had a significant intellectual role in preparing the research proposal leading to the grant or contract, as judged by the student's research advisor. In this case, such additional compensation is limited to a maximum of $5,000.

- Upon each anniversary of a student's matriculation, a faculty advisor may, at his discretion, reward a student for exceptional performance by increasing their present pay rate in an amount not to exceed 15% of the standard FTE rate using either incentive, research contract, or other funds derived from a similar source.

- The maximum compensation limitation does not apply to students who do not hold a teaching, research, or graduate assistantship appointment at Clemson University.

*NOTE: The student is responsible for submitting the required paperwork to initiate the raise.*
Fellowships
There are internal and external sources of fellowship funding. EEES has fellowships that have been established by alumni and other supporters of the department that are used as supplements. The awards are made by faculty and are based on student performance in academics, teaching, and research as well as service to the department and university. Advisors may nominate their students for these awards on an annual basis.

External sources of fellowships include federal agencies, professional societies, and companies. Federal agencies such as the National Science Foundation, the Environmental Protection Agency, National Oceanic and Atmospheric Administration, the Department of Defense, and others have annual competitions for support for graduate study that includes full tuition and a significant stipend. Professional societies also have competitions for financial assistance; usually these awards are supplemental rather than full support. Some of the societies that hold such competitions include the Geological Society of America, American Association of Petroleum Geologists, Society for Sedimentary Geology, Sigma Xi, Society of Environmental Toxicology and Chemistry, American Water Works Association, Air and Waste Management Association, and others. Companies that offer fellowships include Brown and Caldwell, BMW Group, and others. Information about these sources can be found on the H drive/Everyone/Fellowship Information. Contact the Graduate Program Coordinators for more information and advice.

Internships
Another opportunity for financial assistance that is often available is an internship. The U.S. Geological Survey and the U.S. Department of Energy are two examples of organizations that commonly sponsor internships. The U.S. EPA sponsors the National Network for Environmental Management Studies (NNEMS) program, which provides internship opportunities at EPA regional offices and at the national headquarters. Consulting firms in the area also may have opportunities. Students are encouraged to check with the Graduate Program Coordinators and the Student Services Coordinator about possibilities. Internship announcements are posted on the board in the back of 322 Brackett and in the Cantina in Rich Lab.

Work Load
The normal graduate assistantship workload is 20 hours per week (average). Students are sometimes hired for 12.5% (5 hrs), 25% (10 hrs), 37.5% (15 hrs) and 75% (30 hrs) of full-time work, under appropriate circumstances. Students should be aware of both their academic and work obligations, and are encouraged to discuss any problems with faculty.

Research Assistant Responsibilities
The responsibilities of RAs vary according to the specific grant project(s) from which they are being paid, and are established at the discretion of the principal investigator. The work performed by an RA does not necessarily correlate with their
thesis research.

Teaching Assistant Responsibilities
Teaching assistants play an important role in the department by teaching the laboratories that parallel the introductory courses in geology and physical science, serving between 500 and 600 students per semester. TAs may also be assigned to the graduate laboratory classes or as graders for specific classes. In general, TAs are required to work approximately 20 hours per week. Specific TA duties and time requirements are described below. New TAs are required to participate in training classes by the university and the department.

Teaching
The primary duty for a TA assigned to geology or physical science laboratories is to teach three laboratory sections per week. Different types of labs vary in length and in the number of meetings per week. But, in general, TAs will spend between six and eight hours each week in the classroom. The TA is the instructor of these labs. Therefore, the normal responsibilities and rewards of teaching come with the job. Each year an award is presented to the most outstanding graduate teaching assistant in the department; the recipient is chosen by the faculty based on nominations received from students and faculty involved in teaching introductory courses.

Lab Preparation and Clean-Up
Teaching assistants must prepare for each lab session in two ways. First, they must work through the material ahead of time to develop their lesson plans. This should be done in conjunction with their Lab Supervisor. Weekly meetings with the Lab Supervisor are held to keep labs on track and in step with other similar lab sections. Our goal is to give students a consistent experience no matter which lab TA they have. Second, materials and equipment must be set up for lab and put away afterwards, and the lab room must also be cleaned after each lab session. The TAs will spend between two and four hours per week with this preparation and clean-up.

Grading, Test Preparation, and Record Keeping
TAs grade all assignments, large and small, given in their labs. Some grading will be required almost every week. More significant grading will occur after major tests. In general, TAs create their own quizzes and homework assignments; major tests will be created cooperatively by all TAs with the guidance of the Lab Supervisor. Accurate and up-to-date records of grades and attendance must be kept by the TAs in a location and format determined by the Lab Supervisor. Time required for these duties varies greatly throughout the semester; a broad range is probably between one and six hours per week.

Office Hours
TAs must hold one office hour for each lab session taught (typically this amounts
to three office hours per week). These hours are held in the Department's Learning Resource Center (LRC) in 427 Brackett, so as to staff this room throughout the week. This room is dedicated to undergraduate instruction. And, while each TAs office hours are primarily for the benefit of his or her own students, the TA is also responsible for helping, insofar as possible, all students who come to the LRC. This duty requires an additional up-front investment of time by TAs to familiarize themselves with the resources in the LRC.

**Other Required Assistance**
From time to time TAs or lecture instructors will be asked to assist other TAs with activities such as field trips and proctoring examinations. Additionally, because of planned or unplanned absences, a TA may occasionally have to take another TA’s labs or office hours. It is the responsibility of the TA to make coverage arrangements with the approval of the Lab Supervisor. These cases are not common and rarely exceed one to two hours per week.

In addition to these weekly duties, new TAs are required to attend university TA training before the semester begins. This normally lasts several days. The Department also holds a required one-day training session during the first week of the fall semester.

**Graduate Laboratory TAs**

TAs assigned to the graduate laboratories will work closely with the laboratory instructor(s). Typical duties may include preparing chemicals for the laboratory exercise, assembling apparatus, operating analytical instrumentation, troubleshooting instrumentation, instructing student about use of instrumentation, and supervising clean-up after the laboratory exercise. Specific duties will be assigned by the course instructor.

**Graders**

Graders will work with the course instructor. Typical duties may include preparing homework assignments, preparing and posting homework keys, grading homework, grading quizzes, grading exams, keeping records of grades, and holding office hours. Often courses with assigned graders have weekly homework and/or quizzes. Specific duties will be assigned by the course instructor.

**Start of Pay**
Students are appointed to a graduate assistantship at the beginning of the first semester if the student is present and available for a work assignment at that time. Otherwise, pay will begin when the student is available for work. Students with continuing research assignments should report to their research advisor. All other students should report to the Graduate Program Coordinator.
New graduate assistants must report to the departmental staff, to make an appointment with the College Human Resources staff to complete hiring paperwork. International students will need an Employment Verification Letter signed before going for their Social Security card.

International students should have their offer letter with them upon arrival. They will need to check in at the International Office (301 Martin Hall). After the student has been in the US for 10 days they should then go to the Social Security Administration in Anderson, SC, for a Social Security Number or SS letter or they should meet with the Social Security Administration representative in Martin Hall on the dates indicated by the Graduate School. Then an appointment must be made with the Foreign National Payment Coordinator in the International Office in E-301 Martin who will complete the necessary paperwork to assist the student with getting on the payroll. International students should be sure to bring the following:

- U. S. Visa
- Unexpired foreign passport
- I94
- IAP66/I20

It is mandatory to call for an appointment before going to the Foreign National Payments Coordinator’s office. The telephone number is 656-5589.

**Termination of Pay**
Pay for any session will end when the student leaves Clemson or is no longer available for work assignments. Normal termination dates for the Spring and Fall semesters for students not continuing into the next session is Graduation Day. Any deviations from these dates must be approved by the student's research advisor or the Department Chair.

**Reduction of Pay**
Normally, 20 hours per week will be submitted on each payroll for each half-time graduate assistant. However, less than 20 hours may be submitted for a student, with the pay reduced accordingly, if the amount of time worked by the student consistently deviates from the required 20 hours per week average. Due to the procedure in which time sheets are currently used, it may be necessary to implement any pay reductions in the pay period following the one in which the work deficiency actually occurred. Pay also may be withheld from students who violate the vacation policy, as stated below in the section on "Vacations."

**Summer Enrollment**
Students receiving any assistantship or fellowship must enroll in three credit hours for both the first and second Summer Sessions. Any student not on an assistantship but using faculty time and/or university facilities must register for a minimum of three credit hours each session (including any student actively working on a thesis,
dissertation, non-thesis special project, or Master of Engineering special topic). Only students not active and not physically present as a student at Clemson need not register (See Table below).

**Students without Assistantships**
Students who enter a graduate program in the EEES Department without an assistantship can apply for future consideration with the Department Chair. The probability of receiving financial assistance in such cases is not high (See Table below).

*Student Status*  | Fall | Spring | May | SSI | SSII |
---|---|---|---|---|---|
**Supported-full or partial**  | | | | | |
Full time, class and/or research | 9 | 9 | 0 | 3 | 3 |
Full time, thesis writing only  | 9 | 9 | 0 | 3 | 3 |
Part-time, class and/or research  | not allowed: supported students must be full-time |
Part-time, thesis writing  | not allowed: supported students must be full-time |
Off-campus  | not allowed: supported students must be full-time |
**Not Supported**  | | | | | |
Full-time, class and/or research  | 9 | 9 | 0 | 3 | 3 |
Full-time, thesis writing only  | 9 | 9 | 0 | 3 | 3 |
Part-time, classes only  | credits of classes taken |
Part-time, class & research or just research  | 3 | 3 | 0 | 1 | 1 |
Part-time, thesis writing, on-campus  | 3 | 3 | 0 | 1 | 1 |
Off-campus, thesis writing  | 1 | 1 | 0 | 1 | 1 |

*INTERNATIONAL STUDENTS SHOULD CHECK WITH THE INTERNATIONAL OFFICE TO CLARIFY THE AMOUNT OF CREDITS REQUIRED FOR THEIR SPECIFIC VISA.*

**Deferment of Graduate Fees**
Graduate assistants may choose to defer tuition and fees. This is accomplished easily on the day of registration. Persons in the fee assessment area will have a list of all graduate assistants. Anyone listed may sign a note to defer these costs and they will be deducted from the first six full paychecks of the semester. It is not possible to defer fees for summer sessions. These must be paid by the student for each summer session. EEES is not permitted to pay fees directly to the university; therefore, return of fees to graduate assistants is spread over the entire year and included in stipend checks.
GENERAL DEPARTMENTAL INFORMATION

Information
Students should not hesitate to ask questions concerning departmental policies and procedures. The Graduate Program Coordinators’ task is to assist students with such questions.

Notices
 Notices of interest to graduate students will be placed on the departmental bulletin boards and, on occasion, e-mailed directly to students. To ensure receipt of departmental mailings, each student should have a current address and telephone number on file with the department. The department maintains a mail slot for each graduate student in the mail room in Brackett Hall and/or the Computer Lab (Room 144) of the Rich Laboratory.

Vacations
Student vacation time can vary, but the following schedule is typical: two days at Thanksgiving and two weeks at Christmas. Students supported by an assistantship must consult with their advisor about scheduling of other vacation time.

Stipend Pay
New students going on the payroll for the first time will have a two-week lag before they will be paid. This “lag pay” is paid out after the student’s termination from the University. Paydays are alternate Fridays.

Keys
Key requests for Rich Laboratory should be directed to Anne Cummings, EEES Laboratory Director (Rich Lab 130B). For Brackett Hall, requests for keys to the graduate office should be directed to Cindy Gravely (Brackett 340-A). The key issued for Brackett Hall also opens the mailroom (340A Brackett), the computer room (333 Brackett), the learning resources center (427 Brackett), and the introductory teaching labs (424 and 425 Brackett). The key(s) issued to a student are for their use exclusively. Keys must never be loaned to anyone else, not even another graduate student. Failure to observe this rule may result in the key privilege being withdrawn.

Building Security
Rich Laboratory: During normal working hours only the doors in the reception area will be kept unlocked. At all other times all outside doors will remain locked and will not be propped open. (Vestibule door to picnic area may be unlocked at noon.) All students entering or leaving the building should ensure that the outside doors remain locked. The computer room should always be locked when unoccupied.

Brackett Hall: At present, Brackett Hall is open 24 hours a day, 7 days a week, so students may enter the building at any time without a key; this is subject to change,
however. Because of the unlimited access, security is a major concern to all. **Always lock the graduate office when leaving after 4:30 PM and on weekends! This applies to the mail room, computer room, etc. as well.** The laboratories located in Brackett such as the Geochemistry, Thin Section Preparations, Petrophysics Labs are locked and require permission from the various faculty responsible (see information below in Facilities and Equipment for details about the labs).

**Parking**

Ample parking is available at the Rich Laboratory. The semi-circular parking area between the two buildings is for visitors only. Parking on campus requires a permit that can be purchased at Parking Services (656-2270). The university has shuttle service available hourly between Rich Laboratory and the Hendrix Center on campus.

**Emergencies**

The Clemson University Police Department (656-2222) is to be called for all major emergencies: fire, medical, police. They will ensure that the proper authorities are dispatched.

In case of tornado warning, take shelter in the auditorium of **Rich Laboratory**. Use stairwells; do not use the elevator.

Go immediately to the first floor of **Brackett Hall** via the back corner stairwell.

Meet in the first floor hallway at the back side of the building outside of rooms 130-135.

In case a fire, exit the building immediately. Use stairwells; do not use the elevator.

**Campus Shuttle Bus**

Clemson University supplies a shuttle bus to transport students between the main campus and the Rich Laboratory during Fall, Spring and summer semesters. Trips are scheduled from 7:00 a.m. until 6:00 p.m. Monday through Friday (except during holidays and Fall Break). The shuttle makes one trip per hour from The Hendrix Center to the Research Park. The shuttle leaves the Hendrix Center on the hour and arrives at the Research Park at approximately 20 minutes after the hour. Stops are at AMRL, Rich Lab and Ceramic and Materials. The return shuttle to campus leaves on the half-hour.

**Desks**

It is the goal of the EEES Department to provide a desk for each graduate student. However, due to the limited available space, it may not be possible to accommodate each student. Therefore, a priority system is used which first assigns a desk to each graduate assistant and graduate fellow, then to each unsupported M.S. thesis student, and then allocates desks to all other students on a temporary use basis. For
Rich Laboratory, new students should see Jan Young and for Brackett Hall, Cindy Gravely concerning a desk assignment.

NOTE: Study facilities for graduate students are intended solely for studying and interacting with students. They are not to be used for socializing or temporary housing. Students abusing these privileges will forfeit them.

Students based in Rich Laboratory needing desk space on campus can be assigned a desk in Brackett Hall and students based in Brackett Hall can be assigned a desk in Rich Laboratory. See Jan Young.

**Room Use Policies**
The following rooms are to be used by reservation only: in Rich Laboratory: auditorium, classrooms, conference room and the VIP office and in Brackett Hall: conference room. Reservations may be made by any of the administrative staff. No food or drink is to be taken into or consumed in the auditorium.

**Computer Laboratory**
The department maintains well-equipped computer laboratories for student use in Brackett 333 and Rich 144. The labs contain desktop computers with associated printers and peripherals. The computers are connected to the Internet and can be used to access the university mainframe. Doors are to be locked if the labs are unoccupied. Any problems with the machines should be reported to Betty Cowans in Rich Lab and Cindy Gravely in Brackett Hall.

There are several campus computer labs where both PC and Unix-based machines are available to all students at Clemson. The labs are operated by CCIT, the university-wide computer support group. The labs are scattered at various locations across campus, including one on the first floor of Brackett Hall. You need an university username and password to access computers in those labs.

**Computer Center Account**
Each graduate student is automatically assigned a unique computer I.D. providing access to the centralized computer facilities upon acceptance to the University. Notification of this assignment should have been received prior to orientation via U.S. postal service. This UserID is also published in the university telephone directory.

Student on assistantship will receive two computer I.D.s, student and employee.

You must either check both of these I.D. or forward one to the other to make sure that you receive important information sent to you.

The Division of Computing and Information Technology (CCIT) offers numerous instructional short courses. Visit the website below for details.
Office Supplies
The department does not furnish office supplies to graduate students for personal use. All research contract-related use of office supplies, including letterhead stationery, must be authorized by the faculty advisor.

Student Advisory Council
EEES graduate students have a Student Advisory Council comprised of students representing each of the research groups. A chair is elected from the members of the Council. The Council meets periodically to discuss issues of mutual concern. It also meets with the EEES Department Chair to jointly consider opportunities for quality improvements.

Student Hosts
An EEES student has been assigned to each new student to act as a host in helping answer questions concerning graduate studies, housing, roommate matching, what there is to do in Clemson, finances, registration, classes, professors, etc. Contact the Student Services Coordinator at 656-3278 for your host's name and number.

Mail
All personal mail is to be directed to a student's home address. The department is not to be used as one's mailing address. Outgoing mail, both U.S. and campus mail, can be placed in the appropriate receptacles in the reception area of Rich Laboratory and in the mailroom in Brackett Hall. Each student is assigned a mailbox in the computer laboratories in their respective building.

Departmental Copy Machines
Graduate students may use the copy machine located in the Rich Laboratory reception area and in the Brackett mailroom in accordance with the following guidelines. The copier located in the Rich Lab copy/work room is for faculty, staff and TA use only.

The copier machine in the Brackett mailroom is available for work-related copying. For duplication of lab exercises, class handouts, tests, articles, reports, book excerpts, etc. relevant to project or thesis research being conducted by graduate research assistants.

FAX
Students may use the department's facsimile machine for official EE&S business purposes with authorization from their advisor. Personal transmissions may be sent using a personal calling card (AT&T, MCI, et al.). Instructions for using a personal calling card are provided above the fax machine in the copy/work room. Personal transmissions may also be sent at the Student Union or other locations in downtown Clemson.
Departmental Seminars
During the fall and spring semesters, the EEES Department sponsors a weekly seminar on Friday at 2:30 p.m. EEES students and faculty give presentations about their research or other topics of interest to the department. Invited speakers from industry, government, and other academic departments are also included. Seminar is held in the Rich Laboratory auditorium in the Fall and on campus in Spring. Suggestions for speakers are always welcome. Please send ideas to Jan Young. All students and faculty are expected to attend. If a student cannot attend a particular seminar, he/she should inform their advisor ahead of time. The EEES curriculum requires that all resident students enroll for seminar credit for each semester. Attendance and other criteria for receiving credit will be given at the beginning of seminar each semester. Master’s students enroll in EE&S 861 or GEOL 851 and doctoral students in EE&S 961. Doctoral students are required to give at least one seminar each year. EE&S961 is offered both summer sessions in Rich 150 to provide opportunity for all doctoral students to present.

At some point during the semester, most students are responsible for providing refreshments for a department seminar. Paper products (i.e. plates, cups, napkins, etc.) are available from the department supply. We encourage students to purchase these supplies at the Bi-Lo in Pendleton. When you enter the store, go directly to the service desk and let them know you are purchasing for the Department of Environmental Engineering and Earth Sciences. They will give you a charge slip. Hand that to the cashier before he/she begins to ring up your purchase. He/she will enter the charges on that slip and should also give you a receipt. If he/she does not, PLEASE request one. The charge slip with the receipt should be given to Patsy Ellis in Rich 152 or Cindy Gravely in Brackett 340-A. The food purchase should not exceed $20. If you purchase supplies elsewhere, you may request reimbursement of this expense through Patsy Ellis; however, you must supply her with a detailed cash register receipt, your name and social security number. Also, please note that purchase of bake ware/containers is not reimbursable.

Departmental Telephones
Three telephones are located in the Rich Laboratory for student use. Those are 656-3275, 656-5478, and 656-1001. In Brackett Hall, a telephone (656-6989) is available in both graduate offices (with an extension in 427 Brackett) for student use. Incoming calls, including those from prospective employers, should be directed to these telephones. Graduate students making research-related long distance calls at the request of an advisor should use the advisor's nine-digit authorization code. Students are authorized to place long distance telephone calls only with the permission of the appropriate advisor or with their own personal calling card.

Telephone Numbers to Know
Graduate School Office (E-108 Martin Hall).................................656-4172
Michelin Career Center (316 Hendrix Center) .............................656-0440
Grad Student Government (704 University Union)......................656-2697
Computer Center (88 Poole Ag. Center, a.k.a. P&A Building)...........656-2720
Departmental telephone numbers and room numbers are given in the last section of the handbook.

**Departmental Files**
Departmental files should not be accessed by graduate students. Students should contact the Student Services Coordinator should they need information from a departmental file.

**Photos**
At the beginning of each semester, photos of matriculating students are taken not only for the department directory, but also, more importantly, for the recommendations you'll want later in life. This is the means by which we remember you (as if we could forget).

**Student Travel**
Department-specific travel information and guidelines from the Clemson University Travel Guidelines Index have been incorporated into this section. The complete Guidelines Index, including authority references and guidelines specific to university administration, is available at [http://www.clemson.edu/procurement](http://www.clemson.edu/procurement) (CU Dept Info, Travel Guidelines). Any questions regarding travel should be directed to Patsy Ellis in Rich 152. Summarized departmental procedures are as follows:

1. Complete **Request to Travel form**, obtain appropriate signatures (PI or faculty member responsible for the account number to which it will be charged) and submit to Patsy Ellis or Cindy Gravely.
2. Enter travel status according to guidelines outlined herein.
3. Upon completion of travel, complete **Travel Worksheet**, obtain appropriate signatures, and submit to Patsy Ellis or Cindy Gravely for reimbursement.

*NOTE: Hardcopies of all travel forms are located in the copy/work room next to the fax machine. Most forms are also available on our web site. If you have trouble using the electronic forms, please see one of the staff for assistance.*

**Traveler's Responsibilities**
- When individuals file for reimbursement of travel expenses they are stating:
  - They have followed the University's travel policies;
They have not nor will not receive reimbursement for these expenses from any other entity outside the University;

None of the expenses are of a personal nature; and,

All supporting documentation is on file with their department or business officer.

**Under the Progressive Discipline Policy of the University, any employee who falsifies records or documents or willfully violates written rules, regulations or policies can be suspended or terminated from their job.**

Travel reimbursements must be filed as soon as the trip is completed and within the same fiscal year in which the trip occurred. Travel reimbursement requests must be filed within 60 calendar days of the completion of the trip. Multiple trip reimbursements requests for trips of a repetitive nature should be claimed on a travel log form. These requests should be submitted at least quarterly. Any reimbursement request that is not submitted within 60 days or quarterly will require the traveler to submit and receive approval of a written request stating the reason for the delay with approval by the Dean/Department Chair or the Business Officer and the Directory of Procurement Services. Reimbursement will be made upon completion of the travel.

All travel vouchers submitted for reimbursement are required to have the signature of the traveler and one other person authorized to spend funds from the account numbers that appear on the travel voucher. All signatures must be original. No stamped signatures will be accepted.

Travelers are expected to exercise the same judgment when making travel arrangements and expenditures that a prudent person would exercise if traveling on personal business and expending personal funds.

Excess costs, circuitous routes, delays or luxury accommodations unnecessary or unjustified in the performance of an assignment are not considered exercising prudence.

Travel by commercial airlines will be in coach or tourist class, except where exigencies require otherwise.

**Transportation to or from points of arrival and departure will be by the most economical method.**

**Expenses for Spouses**

Reimbursements to an individual may cover only those expenses pertaining to that individual. It may not include expenses pertaining to other individuals, regardless of who paid the expense. *Travel expenses for spouses, friends, or other individuals not traveling on official University business are not reimbursable.*
Unauthorized Costs
Employees will be responsible for unauthorized costs and any additional expenses incurred for personal preference or convenience. No reimbursement for reduced fare advance purchase tickets will be made directly to employees prior to the completion of travel if charged on a personal credit card, since direct payment by the University is available using the Departmental Purchase Card.

Meals
While on official travel within the State of South Carolina, actual expenses incurred in obtaining meals up to a maximum of $25 per day will be reimbursed.

While on official travel outside the State of South Carolina, actual expenses incurred in obtaining meals up to a maximum of $32 per day will be reimbursed.

<table>
<thead>
<tr>
<th></th>
<th>If you depart Before</th>
<th>If you return After</th>
<th>In State</th>
<th>Out of State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>6:30 a.m.</td>
<td>11:00 a.m.</td>
<td>$6</td>
<td>$7</td>
</tr>
<tr>
<td>Lunch</td>
<td>11:00 a.m.</td>
<td>1:30 a.m.</td>
<td>$7</td>
<td>$9</td>
</tr>
<tr>
<td>Dinner</td>
<td>5:15 p.m.</td>
<td>8:30 a.m.</td>
<td>$12</td>
<td>$16</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>$25</td>
<td>$32</td>
</tr>
</tbody>
</table>

If an individual on non-overnight travel receives reimbursements for meals, this amount could be considered income and be reported on their W-2 tax form. For instance, meals on day trips are subject to tax withholding except when a business purpose for the meal can be documented. If you are claiming reimbursement for such business meals, documentation should include the name and affiliation of the person sharing the meal and the nature of the business discussed.

An individual must be in travel status (more than 10 miles from their residence or official headquarters) to be eligible for reimbursement of meals.

Lodging
Lodging expenses will be allowed subject to the following limitations, provided an original, itemized receipt is furnished. Lodging arrangements and any required deposits are the responsibility of the traveler and will be reimbursed as part of the lodging expenses upon completion of the trip.
Actual lodging expenses will be reimbursed, however the more moderately priced accommodations must be requested when a choice is available. Employees should request a state or government rate when available.

No reimbursement will be made for overnight lodging within 50 miles of the employee's official headquarters or residence.

The expense for shared lodging may be reimbursed to one employee if only one original itemized receipt is obtained. If the room is shared with other than a University employee, the single room rate will apply.

All necessary and reasonable tips for baggage handling will be reimbursed.

**Miscellaneous Expenses**
Movies, bar bills, laundry, room service, safes and security insurance, health or spa fees, etc. will not be subject to reimbursement on the travel expense report. These are considered personal in nature and should be paid by the traveler.

Employees are allowed one personal call, of short duration, per day. Charges for long distance telephone calls, telegrams, or fax charges made on official business will be allowed. A fixed charge by a hotel for telephone service may be reimbursed as part of lodging. It is the responsibility of the traveler and the department to substantiate whether calls are of a business or personal nature and whether they will be reimbursed. Charges for internet will be reimbursed.

**Foreign Travel**
Travel outside the continental United States, Alaska, Hawaii, Canada, Puerto Rico or the Virgin Islands require approval prior to departure. Foreign travel funded from sponsored program activities must be approved in advance by Sponsored Programs Accounting.

While on foreign travel, actual lodging expenses will be reimbursed. Fees for the purchase of traveler’s checks, passports and visas will be reimbursed provided a receipt is furnished. All expenses claimed must be converted to U.S. dollars and the conversion rate and computation should be shown on each receipt.

When an employee is on foreign travel, meal expenses not exceeding federal rates will be reimbursed. These rates are listed at the following website:

http://www.state.gov/m/a/als/prdm.

The Provost Advisory Council approved a risk management recommendation to require all Clemson students to obtain international travel insurance when traveling abroad. This applies to both faculty led and semester abroad programs.
The cost is $31 per month and includes $100,000 basic medical (no deductible), medical evacuation/repatriation and up to $2,000 to transport a family member to a patient hospitalized for more than six days.

**Faculty and staff traveling with the student groups may also be covered under the student policy at this cost.**

**Contact Linda Rice in the Office of Risk Management at 656-3354 for additional information.**

**Travel by Automobile**

Automobile transportation may be used when common carrier transportation cannot be arranged satisfactorily, or to reduce expenses when two or more University employees are traveling together.

When planning to travel by car, see Betty Cowans or Cindy Gravely. They will then contact Enterprises in advance to rent a vehicle. Please provide the following information.

- Account number to be charged
- Name of driver
- Type of vehicle (car, minivan, 12-or 15-passenger van)
- Destination of trip
- Purpose of trip
- Date and time of pick-up (must be between 7:30 AM and 4:30 PM, Monday-Friday)
- Date and time of return

You must give at least three-days’ notice to request a vehicle. (NOTE: you should request well in advance in order to secure a van.) Should you need to cancel the request, please notify Betty or Cindy so that they can cancel the order for you. Otherwise, we could be charged for the vehicle even if it is not used.

University employees may use their own automobile for official travel provided the University would incur no added expenses above that of other forms of transportation available. Reimbursement for personal automobiles is as follows:

- $.50 per mile for travel to and from nearby airports or train depots when official travel is by airplane or train.
- $.46 per mile when an employee wishes to use his or her own automobile.
- Taxi fares and reasonable tolls will be reimbursed to the individual. **Receipts must be furnished if claiming airport, hotel or parking garage parking of more than $5.00.**
• **No reimbursement will be made to operators of state owned vehicles who must pay fines for moving or non-moving violations.**

**Rental Cars**
Enterprise is the state contract for car rentals. If you have questions see one of the staff for help.

**Registration Fees**
Registration fees in the amount necessary to qualify individuals to attend conventions, meetings, conferences, etc. are allowed. See Patsy for help with this.

**Receipts**
Student travelers must submit a receipt for each expense of $5.00 or more, except for meals, taxi fare, tolls and portage. All receipts and paid bills should be originals. If originals are not available, a memorandum, approved at the next level in the approval process, must accompany the travel voucher when it is submitted.

**Departmental Library**
The departmental library (Rich160) is available for use by all students (during the hours of 8:00 am to 4:30 pm), staff and faculty of the Department of EEES. Please see Betty Cowans for the key. Also, please read the instructions for using materials available in the EEES Library posted in Rich 160.

**Departmental Laboratory and Field Equipment**

*Teaching Lab (Rich 113)*
With permission from Anne Cummings (Rich 130B) the Teaching Lab is available for use during the summer when no classes are offered. The lab must be cleaned and available for instructional use at least one week before classes begin. Equipment and supplies from the Teaching Lab may be used if prior permission is obtained from the Anne Cummings. A log book is available for check out of equipment. All equipment must be returned in good working order. Supplies must be replaced.

*Instrumentation Lab (Rich 114)*
The Instrument Lab is a joint use facility. All users must comply with procedures to record instrument use in log books (electronic or paper) and keep the common areas clean. Instrument use requires prior approval by the instrument care taker or Anne Cummings (Rich 130B).

*Geochemistry Lab (Brackett 331)*
The departmental geochemistry lab is located in 331 Brackett. A Perkin Elmer Zeeman/5100 PC Atomic Absorption Spectrophotometer is the major piece of
equipment housed in the lab. This instrument has both flame and graphite furnace atomic absorption capabilities and is available for analysis of inorganic constituents in ground water. In addition, the room contains a fume hood, an ultrapure water system, and assorted equipment for bench-top analyses of water chemistry and sample preparation. Ask Dr. Warner about the use of this equipment.

A wide range of other equipment for chemical analysis is available on campus. Much of the analytical equipment in other departments can be used for thesis research by students in the Hydrogeology program by making arrangements through their advisor.

**Petrophysics Lab (Brackett 428)**
The department maintains a petrophysics lab in 428 Brackett. The purpose of this lab is to measure hydraulic properties of aquifer samples and soils. The lab contains a suite of flexible wall permeameters for measuring saturated permeability. In addition, the lab contains a Hassler cell for making permeability measurements under confining pressure and a Boyle’s Law helium porosimeter. A capillary pressure vessel is also available. Ask Dr. Castle about using this lab.

**Thin Section Preparation Lab (Brackett B04)**
This laboratory is located in the basement of Brackett Hall (Room B04). It contains several rock saws, a trim saw, a thin-section cutoff saw, and a thin-section grinder. Laps are available for final polishing of samples. These instruments allow the complete preparation of standard thin sections for petrographic study, or polished sections for microprobe analysis.

The lab also contains two sieve shakers and associated sieve pans for grain-size distribution analyses. See Dr. Warner about using the saws or polisher or Dr. Castle if you need to use a sieve shaker.

Petrographic microscopes are located next door in Room B05. One microscope has a 35 mm camera for taking photomicrographs, and another has a video camera linked to a TV monitor to display images from the microscope. An automated Swift Model F point-counting stage is also available for obtaining modal analyses. The department also owns a digital camera with a special microscope adapter. Consult Dr. Warner or Dr. Castle before using the microscope equipment.

**Field Equipment**
The department has a variety of field equipment that can be used for geophysical and hydrogeological studies. The equipment is stored at various locations in the department and elsewhere on campus. Some of the
equipment is used in the Hydrogeology Summer Field Camp. Ask Dr. Moysey if you are interested in using the geophysical instruments and Dr. Murdoch about the hydrogeology field equipment.

Geophysical instruments
- Pulse Ekko 100 low frequency ground penetrating radar
- Pulse Ekko 1000 high frequency GPR
- GR-110 Exploranium portable gamma ray scintillometer
- EM-34 electromagnetic ground conductivity meter
- Surface electrical resistivity instrument
- Fluxgate magnetometer

Drilling Rig
- CME 45 drill rig
- Augers (4” solid stem; 8” hollow stem)
- Diamond bit core barrel
- Hydraulic hammer
- Geoprobe sampling equipment

Well Pumping Test Equipment
- 5 Parascientific precision transducers
- Druck portable transducer
- 5 In situ Troll water level data recorders
- 15 kw Kubota generator, Honda generator
- 25, 7.5, 5, 3, and 1/3 Hp submersible pumps
- 2 Campbell Scientific CR10X data acquisition systems
- 2 Grunfos variable rate sampling pumps

Vadose Zone Equipment
- Portable mini-Permeameter
- 2 Guelph permeameters
- 7502B time domain reflectometry soil moisture device

Water Chemistry
- Water quality meters (pH, DO, conductivity, turbidity, temperature, ORP)

Stream Gauging
- Swoffer current meter
- Ohio current meters
- Pygmy meter

Borehole Geophysics
- Logging instrument with caliper tool and capabilities for measuring
  - Single point resistance
  - Gamma ray
  - Temperature
Hydraulic Fracturing Equipment
A specially designed system for creating and monitoring shallow hydraulic fractures is available. This system consists of a slurry mixer and pump with related equipment for controlling the fracturing process and monitoring associated ground deformation. Dr. Murdoch is in charge of this equipment.

Bob Campbell Geology Museum
The Bob Campbell Geology Museum is located in the South Carolina Botanical Gardens adjacent to the Heritage Corridor Visitor’s Center. Dr. Carolyn Rebbert is Director of the Geology Museum (see Appendix A). The museum contains displays of natural mineral and fossil specimens and faceted gemstones with a combined worth exceeding $2,000,000.00. The Bob and Betsy Campbell Geological Collection, which includes a splendid fluorescent mineral display, and the Paul H. Benson, Jr. Collection of gemstones and cabochons, are the two most prominent exhibits.

The chief purpose of the Bob Campbell Geology Museum is to acquire and display geological materials of scientific, historic, aesthetic, and educational value. It serves also to stimulate interest in the study and research of geological materials through providing access to specimens for observation and analysis. The museum contributes to the University’s public outreach programs by developing educational exhibits and offering guided tours. Each year thousands of K-12 students visit the museum on class field trips.

Departmental Shop
The EEES Department maintains a well-equipped machine shop staffed by Ken Dunn. Any request for services of the departmental technician must be made in writing. Under no circumstances is anyone to use any of the department’s machine shop equipment without prior authorization and instruction from Mr. Dunn as to proper use of the equipment.

Receiving Supplies
Supplies will normally be delivered to the receiving room in the Rich Laboratory or to room 340 in Brackett Hall. When they are checked in, a copy of the packing list will be placed in the package and your name will be placed on the outside. If the contents do not match the packing list, notify Anne Cummings or Cindy Gravely ASAP.

NOTE: Do not pick up any box that has not been checked in.

Rich Laboratory Cantina Policy
At the start of the month, the "Cantina Keepers" for the month will be notified via a posting in the Cantina and a note in their mailbox. They shall function as a team and perform the tasks listed at the end of this section, “Cantina Duties.”

Every Cantina user should abide by the following rules: (a) rinse all recyclable materials before throwing them in the container and (b) do not leave dirty dishes by or in the sink (all dishes should be dried and stored in the cabinet).
Recycling and Resource Recovery
EEES faculty, staff, and students, out of a spirit of environmental sensitivity, collect and recycle aluminum, glass, two kinds of plastic, newspaper, white paper, and cardboard. The Cantina in Rich Lab has recycle containers. In Brackett recycle containers are located in the hallways of each floor. All large recycle containers for collection, except the white paper recycle container, are located in the wooden corral in the loading dock area. White paper waste is stored in marked containers in the shipping/receiving area.

Recyclable aluminum is transported about once per month (based on our rate of aluminum can generation). Ken Dunn handles this task.

The recycling corral is to be checked several times monthly to ensure that all is well and to determine whether the storage containers have filled faster than normal.

Sign up to check out the department truck several days in advance. A trip to the University Recycling Center at Kite Hill (Intersection of Hwy. 76 and Perimeter Road) should take no longer than one hour (maybe a little longer if the truck requires refueling). Students may use their own vehicle if they prefer. If the truck needs gas (is 1/4 tank or less), take the truck to the Motor Pool Center on campus (located on Klugh Avenue behind Fike Recreation Center). They will fill it up and check all fluids for us.

Upon return, please rinse out the recycling storage containers and leave them inside the corral upside down to drain. Ask Ken Dunn for the hose and hose key.

Professional Memberships
Application forms for membership in various professional organizations may be obtained from appropriate faculty. A professional organization provides networking opportunities for future employment, and as a student member, usually a reduced membership fee. Membership also gives opportunities for attending conferences and presenting research results to a regional, national, or international audience. Students are encouraged to be active members of the joint student chapter of the American Water Works Association (AWWA) and Water Environment Federation (WEF). See Dr. David Ladner for more information. Graduate students are welcome to be involved in the Geology Club (see Dr. Alan Coulson), Engineers Without Borders (see Dr. Mark Schlautman), and other student organizations.

Policy on Alcohol
Alcoholic beverages are prohibited for any activity held in The College of Engineering and Science facility including the L. G. Rich Environmental Research Laboratory and Brackett Hall.

Final Checkout
Graduate students leaving for any reason should do as follows:
• Get a departure checklist from the Student Services Coordinator
• Turn in all keys to Anne Cummings or Cindy Gravely
• Return all equipment and supplies to appropriate locations
• Clean assigned laboratory space
• Submit an electronic copy of your thesis or dissertation
• Return all books and journals to the department library
• Inform the Department Chair of the impending departure and schedule an exit interview
• Complete the departmental Graduate Student Final Checkout Form and return to the Student Services Coordinator. Also you must make an appointment with the Chair for your exit interview. You will need to take the completed Interview Form with you. This form can be obtained from the H drive, web site and the Student Services Coordinator. No student will be cleared with the Graduate School for graduation until the Checkout Forms has been completed.

GENERAL SAFETY AND HEALTH POLICIES

Chemical Hygiene Plan
The Chemical Hygiene Plan details EEES policy and regulations concerning heath and safety. This plan is required reading for all Rich Laboratory personnel. A copy of the Chemical Hygiene Plan is located in each laboratory area. Direct any questions on safety to your research advisor, the Laboratory Director, Anne Cummings, or the Chemical Hygiene Officer (CHO), Bobby Clark. New students will attend a safety seminar at the beginning of the fall semester each year. This will be conducted at EE&S.

Rich Laboratory Operating Policies
The following laboratory operating policies are designed to ensure a safe and secure working environment, and to provide a research environment that nurtures the acquisition of experimental results of the highest quality.

• No food or drink is to be brought into or consumed in any laboratory.
• To facilitate cleaning, nothing is to be stored on laboratory floors.
• Only scientific charts and similar educational or reference materials are to be hung from laboratory ceilings or walls.
• Nothing is to be affixed to the glass of the laboratory doors.
• No laboratory doors including the exterior doors are to be propped open.
• Nothing, including carts, is to be stored or left in the hallways.
The instrument room is to be used exclusively for sample analysis. Samples, standards, etc. are to be prepared in a student's assigned laboratory and transported to the instrument room for analysis using a laboratory cart. In addition, samples are not to be left in the instrument room for any reason. Carts are to be used to transport samples back to the laboratory of origin.

All laboratory benches are to be cleaned at least weekly; more frequently if needed.

All laboratories are to be left clean and orderly prior to departing for the day.

When conducting wet research in the laboratories, plastic containment trays are to be used, insofar as possible, to capture spills.

All samples, bottles, standards, etc. are to be dated and identified as to contents and person responsible. The contents are to be properly disposed of and the bottles cleaned when no longer needed.

A record of use is to be maintained for all hazardous chemicals used.

All analytical balances are to be left clean after each use.

Lights are to be turned off whenever vacating a room.

All memos, notices, etc. are to be posted on the official bulletin board in the Cantina at Rich Lab or in the computer room (333) in Brackett Hall.

Suitably sized posters or photos may be affixed to student carrel walls using non-damaging tape or hangers.

Student carrels are to be maintained clean and free of refuse.

All refuse that cannot easily be placed in a trash receptacle is to be carried to and placed in the dumpster located by the parking lot opposite the loading dock.

Both university vehicles are to be parked in their assigned spaces near the loading dock. Loading and unloading of field and other equipment is to be done at the loading dock.

The key code to the exterior doors is to be kept strictly confidential within the EEES community. Any hint of a breach in confidentiality is to be reported to Anne Cummings immediately.

Recycle paper and cans are to be placed in the appropriate containers in the shipping/receiving room in the basement or in containers in the loading dock area.

**Personal Protective Equipment**

**Eye and Face Protection**

Eye and face protection devices which meet OSHA requirements and American National Standards for industrial eye protection should be the minimum eye
protection used for activities where there may be flying or falling particles or chemical splashes. **Either safety or prescription glasses with side shields must be worn in any laboratory at all times, unless an exception has been made by the departmental representative.** Visitors to any laboratory must wear safety or prescription glasses, preferably with side shields.

The wearing of contact lenses is strongly discouraged. Soft contact lenses are susceptible to absorption of vapors and may aggravate some chemical exposures, particularly if they are worn for extended periods. Manufacturers of soft lenses generally recommend they not be used in certain atmospheres.

**Body Protection**
Protection of the body from contact with solid and liquid contaminants will require some protective clothing. Such protective clothing may include boots, gloves, pants, coats, and head covers. Complete protection of the skin from contact with gases and vapors requires full-body protection such as an encapsulating suit.

Whenever in a laboratory, all EEES students, faculty, and staff must ensure that arms, legs, and torso are covered at all times. For example, one can wear either (a) long pants and a long-sleeved shirt, (b) a knee-length, long-sleeved laboratory coat, or (c) long pants and a waist-length laboratory coat. In addition, rubber and plastic aprons must be used whenever corrosive or irritating chemicals are handled. Because plastic aprons can accumulate static electricity, their use must be avoided in areas where flammable solvents could be ignited. Protective clothing will have to be discarded and replaced if they cannot be effectively decontaminated.

Clothing materials should be selected for resistance to the chemicals to which they will be exposed, and for appropriate resistance to permeations. Glove materials are discussed in Appendix H of the Chemical Hygiene Plan.

**Footwear**
Closed-toed shoes must be worn at all times (e.g. sandals, thongs, and bare feet are not permitted). Shoes made of impermeable material such as leather are strongly recommended. Sneakers offer little protection against falling objects or chemical spills. High-heeled shoes pose a hazard and are not to be worn when working in laboratories.

**Hazardous Waste Management**
The concern for safe disposal of chemical wastes has increased dramatically in recent years. Legal and regulatory requirements, reinforced by public opinion, spurred the handling of hazardous wastes in a responsible way. Even laboratory personnel who work with relatively small amounts of chemicals have
begun to recognize that the chemical wastes generated during their experiments are their responsibility and that waste management systems are necessary.

The Resource Conservation and Recovery Act (RCRA) of 1976 mandated a system for managing hazardous waste. Regulations adopted by the Environmental Protection Agency (EPA) carry out that mandate and now extend through South Carolina State Law to those who generate, store, transport, treat, and dispose of hazardous waste. The South Carolina agency responsible for enforcing EPA regulations is the Department of Health and Environmental Control (DHEC).

The Linvil G. Rich Environmental Research Laboratory, like most research laboratories, generates and stores small quantities of hazardous waste. EE&S has a Hazardous Waste Management Plan for ensuring that laboratory wastes are managed to prevent harm to public health and the environment and to conform to the public's expectations and the government's requirements for proper waste management. The Hazardous Waste Management Plan is a separate part of the Student Handbook. It is located at our web site at http://www.clemson.edu/ces/eees. All laboratory students are required to adhere to these regulations. Direct any questions you may have concerning this to your faculty advisor or the CHO.

In Brackett Hall, the most likely areas where exposure to hazardous chemicals may occur are:

1) Geochemistry Lab, 331 Brackett (as a student or as an RA)
2) Introductory Geology/Physical Science Labs, 424/425 Brackett (as a TA)

The geochemistry lab contains concentrated acids and standards used to calibrate the atomic absorption (AA) instrument as well as cylinders of compressed gases, some of which are flammable. Exposure to the acids and standards should be minimized through use of protective gear such as lab coats, eye wear and gloves. The tanks should not be handled without supervision. If a leak in a tank is suspected, leave the lab and seek help.

In the introductory geology labs, dilute Hydrochloric Acid is used to test for carbonate rocks. Although this is a very dilute solution, it is used by all the students and should be treated carefully. The location and accessibility of eyewashes in each lab should be ascertained. The physical science labs use several chemicals as well; although some are household chemicals, they should not be treated casually.

**Radiological Materials Procedures**

The South Carolina Department of Health and Environmental Control through a Radioactive Materials License regulate the use of radioactive materials in the department. The provisions of the license are implemented through the Clemson University Radiation Safety and Waste Management Manual. This manual is a
separate part of the Student Handbook and is located on the EE&S web site at http://www.clemson.edu/ces/eees. It contains detailed information on the acquisition, use, and disposal of radioactive materials.

**Other Hazards**
The department maintains several items of laboratory equipment for which safety is a concern with regard to their operation. Most notable are the rock saws and sieve shakers in the thin section preparation lab located in the basement of Brackett Hall (room B04). These should not be operated without prior instruction.

In the field, pumps and generators used in aquifer performance tests constitute a potential hazard. Students may also be in close proximity to drilling rigs. Hard hats are required to be worn at all times when a drill rig is being operated.

The use of geologic hammers is another source of accidents. Protective eyewear and clothing should be worn when attempting to break rocks or to collect samples, as rock chips may fly off and strike the user or other persons standing nearby.

**LABORATORY QUALITY ASSURANCE**

A laboratory quality assurance plan is a system of procedures and guidelines which when followed, assures the accuracy and precision of laboratory results so that they will be repeatable and defensible. Such a plan has been developed commensurate with the needs and resources of our faculty, staff, and students in EE&S. This plan is described in the EE&S Quality Assurance Manual that is part of the EE&S Handbook available to all personnel. All incoming students are expected to familiarize themselves with this plan and agree to abide by the procedures and guidelines stated therein.

The EE&S Quality Control Coordinator, Cindy Lee, will be responsible for monitoring the quality control activities of the laboratory in order to determine conformance with authorized department policies, and to make appropriate recommendations for corrections and improvements.

**It is departmental policy that this quality assurance plan be applied to all laboratory activities.** Furthermore, the written procedures in the EE&S Quality Assurance Manual are binding on all students, staff, and faculty and shall be adhered to implicitly. Without this cooperation, quality assurance cannot be maintained, and the high standards of excellence we seek cannot be achieved. All personnel are required to sign the "Statement of Agreement" included at the front of the EE&S Handbook.
PURCHASING

The procedure all students will follow for processing chemicals and supplies is described below:

Introduction
Anne Cummings orders all research supplies and equipment required by Rich Laboratory personnel and Cindy Gravely orders supplies required for Brackett Hall personnel. General office supplies, books, etc. are ordered by the administrative staff. Students may contact vendors in order to obtain prices, availability, technical help, or other information but may not place the order unless they have been approved and trained for BuyWays. Purchase requisitions; i.e., orders placed over the telephone, are limited to under $1,500 including freight and special handling, but excluding sales tax of 5%. Any order that exceeds $1,501 must be put on a Purchase Order (P.O.) and sent to the University Purchasing Department. All chemicals or supplies are to be ordered from primary vendors, if possible.

Primary Vendors
The State of South Carolina has awarded contracts for laboratory equipment and supplies to the following:

- VWR Scientific Products; and
- Fisher Scientific Company (limited items).

Purchase Requisitions
Any student wishing to order laboratory supplies, equipment, etc. must first obtain an EEES order form. Hardcopies of this form are located in the Computer Lab (Rich Lab Rm. 144), mail room in Brackett, and the electronic version on the H drive at H:\GRADS\FORMS\EEES Order Form. This form is to be completed in full by the student prior to obtaining the signature of the appropriate faculty member. Several items have an asterisk next to them. These items will be filled out when the order is placed. The following information must be provided on the form:

- Prices - Prices in catalogs are rarely correct. The "total amount" column is to provide an approximate cost. The "total amount" column will be filled out with the correct price at the time of ordering by Anne or Cindy.
- Signature - The EE&S order form will be retained as the official document authorizing the purchase of any item. As such, the Principal Investigator or his authorized representative must sign the form. **No copied or rubber stamp signatures will be accepted.** After completion, the form is to be returned to Anne or Cindy.
- Quantity and Size - It is necessary to determine how the item being ordered has been packaged. This will usually be designated as each (ea), pack (pk),
etc. If you want ten of an item and it comes "each", then you order ten "ea." If, however, it comes in a "pack" of five, then you order two "pks." It has been confusing when forms are filled out to order 12 packs and the individual only wanted 12 each.

- Catalog Number and Description - Put the catalog number and a short description in this column.
- Catalog Date and Catalog Page Number - Please include this information to assist Anne in case a discrepancy arises.

Purchase Orders
ALL PURCHASE ORDERS SHOULD BE CLEARED THROUGH ANNE FIRST. The procedure for a Purchase Order is the same as for a Purchase Requisition. After the EEES order form has been completed and turned in, the necessary information will be transferred to a university purchase order by Anne and submitted through the proper channels. If the order is being sent to one of the primary vendors, there will be no delay in processing the order.

GENERAL UNIVERSITY INFORMATION

Graduate Student Association (GSA)
The GSA is a university-wide organization of all graduate students for promoting graduate student interests. At the start of the fall semester, departmental GSA representatives are elected. The biweekly senate meetings are open to all graduate students. See the Graduate Student Handbook for more information, or contact the GSA office at 656-2697.

Main Library
Located on campus adjacent to the reflecting pool, the main library (R.M. Cooper Library) holds more than 700,000 books and periodicals plus has access to numerous on-line resources. Periodicals can be checked out by graduate students for a maximum of three days ($1/day late fee) while books can be checked out for a maximum of six weeks ($0.25/day late fee). The card catalog is on-line and can be accessed from any computer with access to the Internet. The library offers instruction and assistance for on-line searchers and use of RefWorks (bibliographic software used for organizing references for theses and dissertations, which is available to all registered students). Reference librarians also are available to answer questions about resources and their use. Check the library web site at http://www.lib.clemson.edu/.

Fike Recreation Center
Exercise equipment, gymnasiums, racquetball/handball courts, swimming and diving pools, locker rooms, and other athletic facilities in Fike Recreation Center are available for students with a yearly membership. Graduate assistants may join for
an annual fee. Fike is located across the street from the football stadium.

**Sporting Events**

Graduate students may purchase season tickets for Clemson football and basketball games. If interested, students should report to the ticket office in IPTAY/ticket office complex (Gate 9, Memorial Stadium) to complete an application. Further information can be obtained from the ticket office, 656-2118. Baseball games are free with university I.D. Tickets for soccer games may be purchased at the gate (usually $3 with university I.D.).

**Bookstore**

The campus bookstore is located on the lower level of the Hendrix Student Center. Books may be purchased at any time before or after the start of classes each semester. Textbooks are listed by department and course number. If a course is cross-listed between two different departments, the textbook may be located in either department’s section. Many books are available in new and in used form. Prices may vary drastically between the two, so be sure you know which you have selected. Supplies are also available in the bookstore, along with a wide variety of Clemson University paraphernalia, computer software, and household items. Purchases can be made using your Tiger Stripe debit account, or any other traditionally accepted form of payment.

**Redfern Health Center**

Redfern Health Center is open during regular business hours to serve the needs of all students. The health fee you pay each semester will cover the cost of any care you receive at Redfern. However, payment for prescriptions and lab work is extra, and will be expected before you leave the premises. If you should choose to make an appointment, simply call the number listed in Appendix D and speak with a representative. Walk-ins are also accepted, but the wait may be lengthy. When parking in the Redfern lot, it is essential that you obtain a temporary parking permit from the reception desk. If you do not, you will be ticketed and your vehicle will likely be towed. In case of an emergency, notify the front desk and they may be able to assist you. Parking is also available adjacent to Redfern for anyone with a commuter sticker on their vehicle.

**Parking Services**

Vehicles must be registered and a fee paid immediately upon being brought to campus. Parking permits and further information may be obtained from Parking Services, which is located in the Student Union across from Brackett Hall. Lines get to be long as the August 15 deadline nears, so it is best to register your vehicle as early as possible. You may have already received a notice from Parking Services during the summer regarding vehicle registration. The commuter sticker allows you to park in any orange parking space during regular class hours and in any green parking space (except those marked “24 hour employee parking) after 4:30 PM. If
you are parked outside your permit zone during regular hours, be assured you will be ticketed and towed. However, plenty of commuter parking is available on the sides of roads and near the stadium. Buses shuttle students from all commuter and resident lots through main campus on a regular basis. Maps of their routes and daily schedules are available from the Parking Services office, at many of the bus stops, or on the buses themselves. Because these shuttles are City of Clemson buses, all questions regarding their policies and procedures should be directed to the CATS office at the number listed in Appendix D.

A shuttle bus that is operated by the University operates hourly between Rich Laboratory and the Hendrix Center on campus. Parking permits are not required for the Rich Laboratory parking lot.

**Student ID**
Before you begin classes, it is important to obtain a Tiger Stripe card. This card will serve as your student identification card, your library card, your financial debit card, and your access card to all university events. In order to receive your card, you must bring one form of photo identification to the Tiger Stripe office and prepare to have your picture taken. Processing of the card should only take a few minutes.

**Campus Post Office**
The campus post office is located on the bottom floor of the Student Union. It provides all regular postal services, including the sale of money orders, outgoing registered mail, and incoming and outgoing COD mail. You may also pick up or ship UPS packages. Post office boxes may be rented on an academic year basis, but are usually reserved for undergraduates.

**City of Clemson**
For all information regarding local issues of any kind, call the Clemson information line or the Chamber of Commerce. The information line is automated and will supply you with anything you want to know about the local area, including “how to” information regarding fishing permits, etc. The Chamber of Commerce is located off of College Avenue. After you cross Tiger Blvd. and pass under the train trestle, make a right and then an immediate left into the parking lot. The office is just inside the front door.

**Military Leave**
The Graduate School has ruled that a graduate student on military leave, for example summer camp, will not receive a stipend for the period of that leave. Students planning to take military leave should notify the departmental secretary of the inclusive dates. Short periods of about one week can be taken as regular vacation with no interruption in pay. Students leaving the campus for six weeks to attend
summer camp must obtain written permission from the Dean of the Graduate School to be excused from the continuous enrollment provision.

ETHICS

All EEES students are required to abide by a code of ethics. This code is shown below. An additional copy, attached inside the front cover, is to be signed and turned into the receptionist.

ENVIRONMENTAL ENGINEERING AND EARTH SCIENCES
CLEMSON UNIVERSITY

POLICY ON RESEARCH ETHICS

The effectiveness of the research infrastructure throughout the world is based on the personal and professional integrity of the people involved. The basic assumption that is central to all research endeavors is that researchers have done what they say that they have done. The Department of Environmental Engineering and Earth Sciences is part of that infrastructure and the research conducted here must withstand the highest scrutiny. Consequently, we must all ensure that our scholarly work is conducted and reported with the highest ethical standards. We must be careful in our record keeping and diligent in our efforts to always attribute credit where it belongs. In particular, we must guard against any activity that would bring the integrity of the department or the individuals within it into question. Among the activities to be avoided are:

- Falsification of Data - ranging from fabrication to deceptively selective reporting of results or methods, including the purposeful omission of conflicting data with intent to falsify results;
- Plagiarism - representation of another's work as one's own;
- Misappropriation of Others' Ideas - the unauthorized use of privileged information, however obtained.

The undersigned attests that they recognize the importance of maintaining the highest ethical standards in research and covenants with the other members of the department to conduct their research and professional life in a manner consistent with those ideals.

NAME

SIGNATURE

DATE
Cantina Keeper’s Duties

**ONCE PER WEEK** (on an individual basis)

- **EMPTY** the recycle boxes in all *graduate student offices* into the larger recycle bins at the rear of the building. These bins are located on the loading dock in a wooden holding bin. The paper bin is located indoors behind the loading dock wall. Please sort into appropriate containers and remove items that do not belong. If the containers on the loading dock are full, please contact Ken Dunn.

- **EMPTY** the recycle boxes in the cantina. Please note the acceptable plastics discard all others.

- **WIPE DOWN** lunch tables.

**LAST FRIDAY OF THE MONTH** (Cantina Keepers for the month meet at 4:30 p.m.)

- **CLEAN** the refrigerator (date items and toss out old items). Toss anything that is not initialed or named.

- **WIPE** down countertops, coffee tables, and lunch tables.

- **CLEAN** the microwaves and toaster ovens.

- **STRAIGHTEN** magazines and other items.

- **RINSE** the cantina’s recycling containers.
# FACULTY

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Office</th>
<th>Phone</th>
<th>E-mail</th>
<th>University</th>
<th>Degree</th>
<th>Year</th>
<th>Professional Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SCOTT E. BRAME</strong></td>
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<td>(864) 656-7167</td>
<td><a href="mailto:BRAMES@clemson.edu">BRAMES@clemson.edu</a></td>
<td>M.S. Clemson University</td>
<td>Hydrogeology, 1993</td>
<td></td>
<td>AGU</td>
</tr>
<tr>
<td><strong>TANJU KARANFIL</strong></td>
<td>Professor and Chair</td>
<td>156 Rich Lab</td>
<td>(864) 656-1005</td>
<td><a href="mailto:TKARANF@clemson.edu">TKARANF@clemson.edu</a></td>
<td>Ph.D. University of Michigan</td>
<td>Environmental Engineering, 1995; Professional Activities: ACS, ASCE, AWWA, IAWQ, TCCE, WEF, WEPC of Turkey</td>
<td></td>
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</tr>
<tr>
<td><strong>ELIZABETH R. CARRAWAY</strong></td>
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<td>(864) 656-2189</td>
<td><a href="mailto:ECARRAW@clemson.edu">ECARRAW@clemson.edu</a></td>
<td>Ph.D. University of Virginia</td>
<td>Chemistry, 1989</td>
<td></td>
<td>ACS, AEESP, AAAS, SETAC</td>
</tr>
<tr>
<td><strong>DAVID LADNER</strong></td>
<td>Assistant Professor</td>
<td>163 Rich Lab</td>
<td>(864) 656-5572</td>
<td><a href="mailto:LADNER@clemson.edu">LADNER@clemson.edu</a></td>
<td>PhD, University of Illinois</td>
<td>Environmental Engineering, 2009</td>
<td></td>
<td>AWWA, AEESP, IWA, NAMS</td>
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<tr>
<td><strong>JAMES CASTLE</strong></td>
<td>Professor &amp; Hydrogeology Graduate Program Coordinator</td>
<td>335 Brackett Hall</td>
<td>(864) 656-5015</td>
<td><a href="mailto:JCASTLE@clemson.edu">JCASTLE@clemson.edu</a></td>
<td>Ph.D. University of Illinois, Urbana-Champaign</td>
<td>Geology (Sedimentology), 1978</td>
<td></td>
<td>AAPG</td>
</tr>
<tr>
<td><strong>CINDY M. LEE</strong></td>
<td>Professor &amp; Environmental Engineering &amp; Science Program Coordinator</td>
<td>169 Rich Lab</td>
<td>(864) 656-1006</td>
<td><a href="mailto:LC@clemson.edu">LC@clemson.edu</a></td>
<td>Ph.D. Colorado School of Mines</td>
<td>Geochemistry, 1990</td>
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<td>ACS, AGU, AEESP, IAA, SETAC</td>
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<tr>
<td><strong>JOHN T. COATES</strong></td>
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<td>171 Rich Lab</td>
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<td><a href="mailto:COATES@clemson.edu">COATES@clemson.edu</a></td>
<td>Ph.D.: Clemson University</td>
<td>Environmental Systems Engineering, 1984</td>
<td></td>
<td>ACS, Sigma Xi</td>
</tr>
<tr>
<td><strong>STEPHEN MOYSEY</strong></td>
<td>Assistant Professor</td>
<td>338 Brackett Hall</td>
<td>(864) 656-5019</td>
<td><a href="mailto:SMOYSEY@clemson.edu">SMOYSEY@clemson.edu</a></td>
<td>Ph.D. Stanford University</td>
<td>Geophysics, 2005</td>
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<td>AGU, IAH, IWRA</td>
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<tr>
<td><strong>ALAN COULSON</strong></td>
<td>Lecturer</td>
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<td>Ph.D. University of South Carolina</td>
<td>Geosciences, 2009</td>
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<tr>
<td><strong>LAWRENCE C. MURDOCH</strong></td>
<td>Professor</td>
<td>Geological Sciences</td>
<td>(864) 656-2597</td>
<td><a href="mailto:LMURDOC@clemson.edu">LMURDOC@clemson.edu</a></td>
<td>PhD, University of Cincinnati</td>
<td>Engineering Geology, 1991</td>
<td></td>
<td>AGU, ASCE, SPE, NGWA, AEG</td>
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<tr>
<td>Name</td>
<td>Position</td>
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<td>Professional Activities</td>
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<tr>
<td>TIMOTHY A. DEVOL</td>
<td>Professor</td>
<td>167 Rich Lab (864) 656-1014</td>
<td>PhD, University of Michigan Nuclear Engr., 1993</td>
<td>HPS, IEEE, ANS, ACS, Sigma Xi</td>
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<tr>
<td>THOMAS J. OVERCAMP</td>
<td>Professor</td>
<td>(864) 656-5573</td>
<td>PhD, Massachusetts Institute of Technology Mechanical Engineering, 1973;</td>
<td>AAEE, ACerS, AWMA, AMS, ASME</td>
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<tr>
<td>ALAN W. ELZERMAN</td>
<td>Professor</td>
<td>167 Rich Lab (864) 656-5568</td>
<td>PhD, University of Wisconsin-Madison Water Chemistry, 1976;</td>
<td>ACS, AGU, AEESP, ASLO, IAGLR, WEF, SETAC</td>
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<tr>
<td>THOMAS J. OVERCAMP</td>
<td>Professor</td>
<td>(864) 656-5573</td>
<td>PhD, Massachusetts Institute of Technology Mechanical Engineering, 1973;</td>
<td>AAEE, ACerS, AWMA, AMS, ASME</td>
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<tr>
<td>BRIAN POWELL</td>
<td>Assistant Professor</td>
<td>Rich Lab (864) 656-1004</td>
<td>PhD. Clemson University, Environmental Engineering and Science, 2004</td>
<td>ACS, AGU, Sigma Xi</td>
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<tr>
<td>RONALD W. FALTA, JR.</td>
<td>Professor</td>
<td>Geological Sciences (864) 656-0125</td>
<td>PhD University of California at Berkley Mineral Engineering, 1990</td>
<td>AGU, NWWA, ACS</td>
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<tr>
<td>MARK A. SCHLAUTMAN</td>
<td>Professor &amp; Undergraduate Geology Coordinator (864) 656-4059</td>
<td>PhD, California Institute of Technology Environmental Engineering Science, 1992;</td>
<td>ACS, AGU, AEESP, AWWA, WEF, SETAC, SSSA</td>
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<td>KEVIN FINNERAN</td>
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<td>168 Rich Lab (864) 656-4202</td>
<td>PhD University of Massachusetts-Amherst Microbiology, 2001</td>
<td>ACS, ASM</td>
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<tr>
<td>LINDSAY SHULLER-NICKLES</td>
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<td>Rich Lab (864) 656-</td>
<td>Ph.D. University of Michigan Chemistry, 2009?</td>
<td>ACS, MRS, MSA</td>
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<tr>
<td>DAVID L. FREEDMAN</td>
<td>Professor</td>
<td>161 Rich Lab (864) 656-5566</td>
<td>PhD, Cornell University, Environmental Engineering, 1990;</td>
<td>ASCE, ASM, AWWA, AEESP, IWEA, IAWQ, WEF</td>
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</tbody>
</table>
EMERITUS FACULTY

C. P. LESLIE GRADY JR.
R. A. Bowen Professor, Emeritus
(864) 656-5570
E-mail: GC@clemson.edu
PhD, Oklahoma State University
Bioenvironmental Engineering, 1969
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PhD, Virginia Polytechnic Institute
Biochemistry, 1951
Professional Activities: AAE Diplomate, AEESP, ASCE Fellow, WEF
Professional Engineering: Virginia, Illinois, SC

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PhD, University of Michigan
Water Resources Engineering, 1968
Professional Activities: ACS, AIChe, ASCE, ASEE, AWWA, AEESP, IAWQ, NSPE, USANC, WEG

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Professional Activities: AAAR, AAAS, ANS, GAF, HPS, IEEE-IAS, ASME-MWC

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Professor Emeritus
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E-mail: WRICHAR@clemson.edu
Ph.D. Geology, Stanford University, 1971
Professional Activities:

ADJUNCT FACULTY

A complete list of Adjunct Faculty can be found on the website.
http://www.clemson.edu/ces/eees/people/adjunct.html
# ADMINISTRATIVE STAFF

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Phone</th>
<th>Email</th>
<th>Duties</th>
</tr>
</thead>
</table>
| BETTY S. COWANS    | Administrative Specialist II                  | (864) 656-3276 | bcowans@clemson.edu | - Receptionist  
- Word Processing  
- Copying  
- Office Supplies  
- Department Library  
- Student Mailboxes  
- VISA entry |
| ANNE C. CUMMINGS   | Chemist III/Lab Manager                       | (864) 656-5571 | annec@clemson.edu | - Ordering Lab Supplies/Gas Cylinders  
- Building Keys/Security/Maintenance  
- Equipment Maintenance/Inventory  
- Technical Support Person (TSP)  
- Telecommunications  
- Copier Codes |
| KENNETH E. DUNN    | Lab/Machine Shop Supervisor                   | (864) 656-1002 | kedunn@clemson.edu | - Machinist  
- Electrician  
- Carpenter  
- Welder  
- Building Maintenance  
- Student Research Projects |
| PATSY S. ELLIS     | Accounts Payable                              | (864) 656-3277 | pellis@clemson.edu | - Department Accounts Payable  
- Interdepartmental Orders  
- Payroll (Hourly)  
- Travel  
- Gift Accounts |
| CYNTHIA L. GRAVELY | Administrative Assistant, Geology             | (864) 656-3438 | gravelc@clemson.edu | - Faculty Support  
- General Office  
- Supply ordering for Brackett  
- Room reservations |
| MARY G. SHIRLEY    | Office Manager                                 | (864) 656-5567 | mshrly@clemson.edu | - Department Chair Asst.  
- Budgets, State and Grant  
- Payroll  
- Personnel, student hires  
- Department Publications  
- Web Pages  
- Technical Support |
| JANET K. YOUNG     | Student Services Coordinator (Grad)           | (864) 656-3278 | ej@clemson.edu    | - Recruiting /Admissions  
- Assistantships  
- Sojourn  
- Graduation  
- Employment  
- Faculty Searches |