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Appendix A. List of Graduate Courses
1. Background

The Florida A&M University-Florida State University (FAMU-FSU) College of Engineering is a joint college that serves Florida A&M University, which is a historically black institution founded in 1887, and The Florida State University, which traces its history back to 1851. Established in 1982 and located in Tallahassee, Florida, the mission of the FAMU-FSU College of Engineering is to provide an innovative academic program of excellence at the undergraduate and graduate levels, as judged by the highest standards and recognized by national peers; to attract and produce greater numbers of women and minorities in professional engineering, engineering teaching, and engineering research; and to attain national and international recognition of the College through educational and research achievements and professional service of its faculty and students. The FAMU-FSU College of Engineering has an enrollment of more than 2,100 undergraduate students and approximately 300 graduate students.

The Department of Civil and Environmental Engineering (CEE) at the FAMU-FSU College of Engineering has had a Master of Science (MS) in Civil Engineering program since 1987 and a Doctoral program since 1999. Since its first ABET accreditation in 1985, the CEE department has been successful in developing a high quality, ABET-accredited undergraduate program in civil engineering, which embraces students with different backgrounds.

1.1 Degrees Offered

The Civil and Environmental Engineering Department maintains undergraduate and graduate programs that lead to the following degrees:

- Bachelor of Science (B.S.) in Civil Engineering (with civil engineering and environmental engineering majors), which is fully accredited by ABET
- Master of Science (M.S.) in Civil Engineering
- Master of Engineering (M.Eng.) in Civil Engineering
- Doctor of Philosophy (Ph.D.) in Civil Engineering

The CEE department focuses in the specialty areas of structural engineering, geotechnical engineering, transportation engineering, construction engineering and management, environmental engineering, and water resources engineering. Students may have the option, with prior approval, to pursue a specialty nontraditional civil engineering field such as infrastructure or sustainability by combining a focused set of courses from the existing specialty areas and from courses outside of the department.

1.2 Graduate Program Objectives and Outcomes

Program Objectives: To provide the highest quality civil engineering graduate education possible for our students and to reach the level of a state, regional, national, and international reputation for excellence in engineering education.

Program Outcomes: Upon graduation, civil and environmental engineering students will be able:
1. Demonstrate fundamental knowledge in at least one broad area of Civil / Environmental Engineering disciplines.
2. Identify needs, define problems, and apply analysis and/or design techniques to obtain solutions in at least one specific area of specialization.
3. Demonstrate independent self-learning and research capabilities, which enable students to grow throughout his/her career after graduation.
4. Communicate effectively with written, oral and visual means.
5. Demonstrate mastery of the subject matter at an advanced level well beyond fundamental knowledge gained in the undergraduate learning.

2. Admissions Requirements

Individuals seeking admission to graduate study in the CEE department must meet the criteria set by both the university and the department. The following sections detail the admission requirements as set by the department. Applicants should note that the Graduate Office at both FAMU and FSU have additional requirements including application fees and requirements covering international applicants. Information on FAMU admission requirements may be found at [http://www.famu.edu/index.cfm?graduatestudies&AdmissionRequirements](http://www.famu.edu/index.cfm?graduatestudies&AdmissionRequirements) and FSU admission requirements may be found at [http://admissions.fsu.edu](http://admissions.fsu.edu). Also, since this college is owned jointly by FAMU and FSU, applicants can apply to join the CEE graduate program either through FAMU or through FSU depending on individual circumstances or preferences.

2.1 M.S. Program

The CEE department admissions requirements for the Master of Science (MS) degree program are as follows:

- Have a bachelor’s degree in Civil Engineering, Environmental Engineering, or closely related engineering science discipline from an accredited college or university.
- Good academic standing in the academic institution last attended.
- A minimum grade point average (GPA) of 3.0 on a 4.0 scale on all coursework attempted as an upper division student (beyond 60 semester credit hours).
- A minimum graduate record examination (GRE) percentile ranks of 25% (score of 144) on the verbal reasoning section and 65% (score of 153) on the quantitative section. For valid GRE tests taken prior to August 2011, minimum of 370 on the verbal reasoning section and 680 on the quantitative reasoning section.
- Three letters of recommendation from academics or professionals attesting to the M.S. study potential of the applicant.
- Statement of purpose describing reasons for pursuing the Master of Science degree and career goals.
- International students whose native language is not English will be required to pass the TOEFL examination and demonstrate proficiency in English prior to admission per university guidelines. The minimum score is 550 (paper-based), 213 (computer-based) or 80 (internet-based) on the Test of English as a Foreign Language (TOEFL). This
requirement may be waived for students who have obtained a prior degree from a U.S. institution.

2.2 M.Eng. Degree Option

The CEE department admissions requirements for the Master of Engineering (MEng) degree program are as follows:

• Have a bachelor’s degree in Civil Engineering, Environmental Engineering, or closely related engineering science discipline from an accredited college or university.
• Good academic standing in the academic institution last attended.
• A minimum grade point average (GPA) of 3.0 on a 4.0 scale, on all work attempted as an upper division student (beyond 60 semester credit hours).
• Satisfy at least one of the following: 1) Graduate record examination (GRE) minimum percentile ranks of 25% (score of 144) on the verbal reasoning section and 65% (score of 153) on the quantitative section; for valid GRE tests taken prior to August 2011, minimum of 370 on the verbal reasoning section and 680 on the quantitative reasoning section; 2) evidence of passing the NCEES Fundamentals of Engineering (FE) or Principles and Practice of Engineering (PE) exam; or 3) hold PE licensure in any state.
• Three letters of recommendation from academics or professionals attesting to the M.Eng. studies potential of the applicant.
• Statement of purpose describing reasons for pursuing the Master of Engineering degree and career goals.
• International students whose native language is not English will be required to pass TOEFL examination and demonstrate proficiency in English prior to admission per university guidelines. The minimum score is 550 (paper-based), 213 (computer-based) or 80 (internet-based) on the Test of English as a Foreign Language (TOEFL). This requirement may be waived for students who have obtained a prior degree from a U.S. institution.

2.3 Ph.D. Program

The CEE department admissions requirements for the Ph.D. program are as follows:

• Have a master’s degree in Civil Engineering, Environmental Engineering, or closely related engineering science discipline from an accredited college or university. Exceptional applicants with a bachelor’s degree may be admitted to the Ph.D. program provided they complete requirements of the MS degree in the CEE department before obtaining the Ph.D. degree.
• Good academic standing in the academic institution last attended.
• A minimum grade point average (GPA) of 3.0 on a 4.0 scale on all coursework attempted as an upper division student (beyond 60 semester credit hours).
• A minimum graduate record examination (GRE) percentile ranks of 35% (score of 147) on the verbal reasoning section and 70% (score of 155) on the quantitative section. For valid GRE tests taken prior to August 2011, minimum of 410 on the verbal reasoning section and 710 on the quantitative reasoning section.
• Three letters of recommendation from academics or professionals attesting to the doctoral study potential of the applicant.
• Statement of purpose describing reasons for pursuing the Ph.D. degree and career goals.
• International students whose native language is not English will be required to pass TOEFL examination and demonstrate proficiency in English prior to admission per university guidelines. The minimum score is 550 (paper-based), 213 (computer-based) or 80 (internet-based) on the Test of English as a Foreign Language (TOEFL). This requirement may be waived for students who have obtained a prior degree from a U.S. institution.

3. Program Requirements

3.1 M.S. Program

The Master’s of Science (M.S.) in Civil Engineering provides students with training in advanced civil engineering topics as well as research experience.

Curriculum. The M.S. curriculum includes a total of 30 semester hours, consisting of coursework and thesis research (Table 3.1). For all courses in the curriculum, students must satisfy prerequisites to enroll in a course. Students entering the major without a civil or environmental engineering degree also must satisfy a set of articulation courses (see Section 3.4). Students are expected to enroll in Graduate Seminar (CGN 5935) each semester they have full-time status.

The specialty (depth) area courses provide students with advanced training beyond the bachelor’s degree in a specific civil engineering sub-discipline. The majority of the specialty area courses should be taken from the CEE department.

The supplementary electives are intended to assist the student with developing complementary multidisciplinary skills and knowledge. Supplementary electives may include courses from other civil and environmental engineering areas outside of the chosen specialty, other engineering disciplines, the sciences, computer/computational science, urban and regional planning, and geography.

Mathematics and quantitative skills are critical in civil engineering work. Therefore a student will be required to take at least one course (a minimum of three (3) credit hours) in mathematics, statistics, or computational science in the M.S. curriculum.
Table 3.1. Summary of M.S. curriculum requirements

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articulation courses (if required)</td>
<td>0-22</td>
</tr>
<tr>
<td>Specialty (depth) area</td>
<td>12-15</td>
</tr>
<tr>
<td>Supplementary electives</td>
<td>6-9</td>
</tr>
<tr>
<td>Mathematics or statistics</td>
<td>3</td>
</tr>
<tr>
<td>Thesis research CGN 5971</td>
<td>6</td>
</tr>
<tr>
<td>Thesis defense CGN 6972</td>
<td>0</td>
</tr>
<tr>
<td>Graduate seminar CGN 5935</td>
<td>0</td>
</tr>
<tr>
<td>Minimum Total Hours</td>
<td>30</td>
</tr>
</tbody>
</table>

**Major professor and supervisory committee.** The M.S. student selects a major professor and a Supervisory Committee by the beginning of the second semester. The major professor must agree to serve as the student’s academic advisor and thesis supervisor and must be a full-time CEE faculty with Graduate Faculty/Directive status.

The M.S. student will identify the supervisory committee in consultation with the major professor. The supervisory committee consists of three (3) full-time faculty members, in which the Major Professor is the chair and one member may be from outside of the CEE department. All committee members must have Graduate Faculty status. Additional members may be appointed to the Committee, if deemed appropriate by the major professor. The supervisory committee oversees and supervises the student’s research effort, approves the written thesis, attends the oral defense of the thesis, and recommends granting of the degree.

**Plan of study.** The M.S. student, in consultation with his/her major professor, is required to submit an approved Plan of Study to the departmental Graduate Committee by the end of the first semester. The Plan of Study (see Section 8) includes a list of proposed courses, a time schedule for completion of these courses, and a summary of the proposed thesis topic. Upon recommendation of the Graduate Committee, the Department Chair will approve the proposed Plan of Study. The Plan of Study is used by the student and major professor as a guideline throughout the student’s M.S. study and must be updated and approved if changes occur.

**Degree requirement certification.** The M.S. degree candidate must submit an approved Degree Requirement Certification form to the CEE department by the beginning of the final semester of coursework. The form certifies that the student has satisfied all degree requirements as set forth in the latest approved Plan of Study (see Section 8). If courses shown in the Degree Certification form differ from those shown in the latest approved Plan of Study, the department will not approve the Certification form.

**Thesis.** The M.S. student prepares the thesis with the supervision of the major professor and supervisory committee. The student selects the thesis topic in consultation with the major professor and supervisory committee. Before registering for thesis hours, the student must consult the major professor as to the proportion of time to be devoted to thesis work.
It is the responsibility of the student to comply with the required thesis format of his/her university and the deadlines and requirements for thesis submission <see http://www.famu.edu/index.cfm?graduestudies or http://www.gradstudies.fsu.edu/>.

When the complete thesis is ready for review by the supervisory committee, the major professor will authorize the distribution to committee members. The thesis should be complete in every respect, including data analysis, figures, and tables. The supervisory committee can recommend editorial and/or substantive changes after review and the oral thesis defense. The thesis should be provided to the major professor and the examining committee (supervisory committee) at least ten (10) working days before the date of the oral examination.

**Journal manuscripts.** In partial fulfillment of the M.S. degree requirements, the M.S. student must prepare at a minimum one (1) complete manuscript that is ready for submittal to a peer-reviewed journal publication. It is expected that the major professor will submit the manuscript and complete the publication process.

**Thesis defense.** An oral examination in the form of a thesis defense is mandatory and is part of the degree requirements. The student must satisfactorily pass this oral examination, as determined by the Supervisory Committee, before submission of the final thesis to the university.

- The thesis defense will be scheduled only with approval of the major professor, supervisory committee, and the department. The approvals are documented in the Request for Thesis Defense Examination form (see Section 8). The student will be permitted to schedule the thesis defense only if the student has 1) completed the research work, 2) written a complete thesis, and 3) satisfied the journal manuscript requirement.
- The defense should be scheduled before the final thesis submission deadline with sufficient time to allow for revisions; see university deadlines.
- The oral presentation of the thesis is announced and open to the public.
- The oral defense consists of two parts: 1) a defense presentation that include appropriate use of visual aids and duration of 30-40 minutes and 2) oral examination by the supervisory committee.
- The outcome of thesis defense is determined by the major professor and supervisory committee and is reported by the major professor to the department in the Thesis Defense Outcome Form (see Section 8).

**Suggested timeline and checklist.** A suggested timeline for completion of M.S. degree requirements and milestones checklist is provided in Tables 3.2 and 3.3, respectively.
Table 3.2. Suggested M.S. timeline.

Students may need to enroll in additional hours to maintain full-time status each semester.

<table>
<thead>
<tr>
<th>Semester</th>
<th>Degree requirement item(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester 1</td>
<td>9 hours of approved coursework</td>
</tr>
<tr>
<td></td>
<td>Complete RCR training*</td>
</tr>
<tr>
<td>Semester 2</td>
<td>9 hours of approved coursework</td>
</tr>
<tr>
<td></td>
<td>Identify thesis topic</td>
</tr>
<tr>
<td>Semester 3</td>
<td>6 hours of approved coursework</td>
</tr>
<tr>
<td></td>
<td>3 hours of thesis research CGN 5971</td>
</tr>
<tr>
<td>Semester 4</td>
<td>3 hours of thesis research CGN 5971</td>
</tr>
<tr>
<td></td>
<td>Prepare complete journal manuscript</td>
</tr>
<tr>
<td></td>
<td>Thesis defense CGN 6972</td>
</tr>
<tr>
<td></td>
<td>Submit approved final thesis</td>
</tr>
</tbody>
</table>

*See Section 4.3 RCR Training

Table 3.3. M.S. milestones checklist

<table>
<thead>
<tr>
<th>Milestone or Action</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select a Major Professor</td>
<td>First semester</td>
</tr>
<tr>
<td>Complete RCR training</td>
<td></td>
</tr>
<tr>
<td>Submit approved Plan of Study</td>
<td>By completion of 9 credit hours</td>
</tr>
<tr>
<td>Request transfer credit (if applicable)</td>
<td>By completion of 9 credit hours</td>
</tr>
<tr>
<td>Complete RCR training</td>
<td>By end of first year</td>
</tr>
<tr>
<td>Submit approved Degree Certification form</td>
<td>Semester prior to graduation</td>
</tr>
<tr>
<td>Apply for graduation with university</td>
<td>Beginning of final semester</td>
</tr>
<tr>
<td>Prepare a complete manuscript for journal submission</td>
<td>Final semester</td>
</tr>
<tr>
<td>Request thesis defense</td>
<td>Final semester.</td>
</tr>
<tr>
<td>Defend thesis</td>
<td>Check university for deadlines</td>
</tr>
<tr>
<td>Submit approved final M.S. thesis to university</td>
<td></td>
</tr>
<tr>
<td>Complete Exit Survey</td>
<td>End of final semester</td>
</tr>
</tbody>
</table>

3.2 M.Eng. Degree Option

The Master of Engineering (M.Eng.) in Civil Engineering provides students with additional training in advanced civil engineering topics, management, and professional issues. The M.Eng. degree option is ideal for students who will pursue a master’s degree part-time or for full-time students who desire an option for accelerated completion within one year.

Curriculum. The M.Eng. curriculum includes a total of 30 semester hours of coursework (Table 3.4). For all courses in the curriculum, students must satisfy prerequisites to enroll in a course. Students entering the major without a civil or environmental engineering degree also must satisfy a set of articulation courses (Section 3.4).
Table 3.4. Summary of M.Eng. curriculum requirements

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articulation courses (if required)</td>
<td>0-22</td>
</tr>
<tr>
<td>Specialty (depth) area</td>
<td>15</td>
</tr>
<tr>
<td>Supplementary electives</td>
<td>12</td>
</tr>
<tr>
<td>Mathematics, statistics or computation</td>
<td>3</td>
</tr>
<tr>
<td>M.Eng. Comprehensive Exam CGN 5931</td>
<td>0</td>
</tr>
<tr>
<td><strong>Minimum Total Hours</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

The *specialty (depth) area* courses provide students advanced training beyond the bachelor’s degree in a specific civil engineering sub-discipline. The majority of the specialty area courses should be taken from the CEE department. A minimum of 15 credit hours of specialty (depth) is required in the M.Eng. curriculum.

The *supplementary electives* are intended to assist the student with developing complementary multidisciplinary and professional skills required in the civil engineering profession. Supplementary electives may include courses from other civil and environmental engineering areas outside of the chosen specialty, as well as courses from other disciplines that support the professional development focus of the M.Eng. Example supplementary electives outside of engineering include courses in the sciences, mathematics, statistics, computer/computational science, social sciences, public policy, urban and regional planning, business, and law. A minimum of 12 credit hours of supplementary electives is required in the M.Eng. curriculum.

*Mathematics and quantitative skills* are critical in civil engineering work. Therefore a student is required to take at least one course (a minimum of three (3) credit hours) in mathematics, statistics, or computational science in the M.Eng. curriculum.

**Major professor.** The M.Eng. student selects a major professor, who agrees to serve as the advisor for the Master of Engineering study, by the end of the first semester. The major professor must be a full-time CEE faculty with Graduate Directive status. The major professor oversees and guides the student in the Master of Engineering study and recommends granting of the degree.

**Plan of study.** The M.Eng. student, in consultation with his/her major professor, is required to submit an approved Plan of Study to the departmental Graduate Committee by the end of the first semester. The Plan of Study includes a list of proposed courses and a time schedule for completion of these courses (see Section 8). Upon recommendation of the Graduate Committee, the Department Chair will approve the proposed Plan of Study. The Plan of Study is used by the student and major professor as a guideline throughout the student’s M.Eng. study and must be updated and approved if changes occur.

**Degree requirement certification.** The M.Eng. degree candidate must submit an approved Degree Requirement Certification form to the CEE department by the beginning of the final semester of coursework. The form certifies that the student has satisfied all degree requirements as set forth in the latest approved Plan of Study (see Section 8). If courses shown
in the Degree Certification form differ from those shown in the latest approved Plan of Study, the department will not approve the Certification form.

**Comprehensive exam.** In partial fulfillment of degree requirements, M.Eng. students must pass the comprehensive exam. The purpose of the M.Eng. comprehensive exam is to evaluate the student’s skills and knowledge (fundamental, applied, and theoretical) in advanced civil engineering topics within the selected specialty area and required for practicing engineers. The M.Eng. student must register for the course CGN 5931 M.Eng. Comprehensive Exam (zero-credit hour, pass/fail grading). The M.Eng. comprehensive exam is administered during the final semester of coursework by the student’s major professor (advisor). The M.Eng. comprehensive exam is a 24-hour, take-home exam, with the content focused on the student’s specialty area of study, as identified in the Plan of Study. In general, the exam will consist of 4-6 questions that are similar in depth and format as final exams. A score of 70% or higher is required to pass the M.Eng. comprehensive exam. If a student does not pass the exam during the first attempt, a second attempt is permitted and should be done within a semester.

**Suggested timeline and checklist.** A suggested timeline for completion of M.Eng. degree requirements and milestones checklist is provided in Tables 3.5 and 3.6, respectively.

### Table 3.5. Suggested M.Eng. timeline.

<table>
<thead>
<tr>
<th>Time</th>
<th>Full-time option</th>
<th>Part-time option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester 1</td>
<td>15 hours of approved coursework</td>
<td>6 hours of approved coursework</td>
</tr>
<tr>
<td>Semester 2</td>
<td>15 hours of approved coursework</td>
<td>6 hours of approved coursework</td>
</tr>
<tr>
<td></td>
<td>Take comprehensive exam</td>
<td></td>
</tr>
<tr>
<td>Semester 3</td>
<td>N/A</td>
<td>6 hours of approved coursework</td>
</tr>
<tr>
<td>Semester 4</td>
<td>N/A</td>
<td>6 hours of approved coursework</td>
</tr>
<tr>
<td>Semester 5</td>
<td>N/A</td>
<td>6 hours of approved coursework</td>
</tr>
<tr>
<td></td>
<td>Take comprehensive exam</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3.6. M.Eng. milestones checklist

<table>
<thead>
<tr>
<th>Milestone or Action</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select a Major Professor</td>
<td>First semester</td>
</tr>
<tr>
<td>Submit approved Plan of Study</td>
<td>By beginning of second semester, or</td>
</tr>
<tr>
<td></td>
<td>completion of 9 credit hours</td>
</tr>
<tr>
<td>Request transfer credit (if applicable)</td>
<td>By completion of 9 credit hours</td>
</tr>
<tr>
<td>Submit approved Degree Certification form</td>
<td>Beginning of final semester</td>
</tr>
<tr>
<td>Apply for graduation with university</td>
<td>Beginning of final semester</td>
</tr>
<tr>
<td>Take M.Eng. comprehensive exam</td>
<td>Final semester</td>
</tr>
<tr>
<td>Complete Exit Survey</td>
<td>End of final semester</td>
</tr>
</tbody>
</table>
3.3 Ph.D. Program

The Ph.D. degree in Civil Engineering is a research degree designed to produce a scholar and is granted only to students who have demonstrated mastery in a specialty in civil engineering and capacity to conduct original and independent scholarly work.

Curriculum. The Ph.D. curriculum includes a total of 51 semester hours, consisting of coursework and dissertation research (Table 3.7). For all courses in the curriculum, students must satisfy prerequisites to enroll in a course. Students entering the major without a civil or environmental engineering degree also must satisfy a set of articulation courses (see Section 3.4). Students are expected to enroll in Graduate Seminar (CGN 5935) each semester they have full-time status.

The specialty (depth) area courses provide students advanced training in a specific civil engineering sub-discipline and support the student in attaining mastery in a specialty area. Courses in the specialty area may include related courses from other departments.

The supplementary electives are intended to assist the student with developing complementary multidisciplinary skills and knowledge. Supplementary electives may include courses from other civil and environmental engineering areas outside of the chosen specialty, other engineering disciplines, the sciences, advanced mathematics and statistics, computer/computational science, urban and regional planning, and geography.

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articulation courses (if required)</td>
<td>0-22</td>
</tr>
<tr>
<td>Specialty (depth) area</td>
<td>15</td>
</tr>
<tr>
<td>Supplementary electives</td>
<td>12</td>
</tr>
<tr>
<td>Preliminary exam CGN 8988</td>
<td>0</td>
</tr>
<tr>
<td>Dissertation research CGN 6980</td>
<td>24</td>
</tr>
<tr>
<td>Dissertation defense CGN 8985</td>
<td>0</td>
</tr>
<tr>
<td>Graduate Seminar CGN 5935</td>
<td>0</td>
</tr>
<tr>
<td><strong>Minimum Total Hours</strong></td>
<td><strong>51</strong></td>
</tr>
</tbody>
</table>

Major professor and supervisory committee. The Ph.D. student selects a major professor and a Supervisory Committee by the beginning of the second semester. The major professor must agree to serve as the student’s academic advisor and thesis supervisor and must be a full-time CEE faculty with Graduate Faculty/Directive status.

The Ph.D. student will identify the Supervisory Committee in consultation with the Major Professor. The Supervisory Committee consists of four (4) full-time faculty members, one of whom must be from outside of the CEE department and serves as the University Representative. All committee members must have Graduate Faculty/Directive status. Additional members may be appointed to the Committee, if deemed appropriate by the major professor. The Supervisory Committee, chaired by the major professor, oversees and supervises the student’s dissertation research effort, administers the Ph.D. Preliminary
Examination, recommends doctoral candidacy, attends the oral defense of the dissertation, approves the written dissertation, and recommends granting of the degree.

**Plan of study.** The Ph.D. student, in consultation with his/her major professor, is required to submit an approved Plan of Study to the departmental Graduate Committee by the end of the first semester. The Plan of Study includes a list of proposed courses, a time schedule for completion of these courses, and a summary of the proposed dissertation topic (see Section 8). Upon recommendation of the Graduate Committee, the Department Chair will approve the proposed Plan of Study. The Plan of Study is used by the student and major professor as a guideline throughout the student’s Ph.D. study and must be updated and approved if changes occur.

**Requirements for candidacy.** Students are admitted to candidacy for the Ph.D. degree only after passing the Preliminary Examination and certified to the University Registrar. A student becomes eligible to register for dissertation credits only after the student becomes a candidate for the doctoral degree.

**Preliminary exam.** Following completion of all or a major portion of the course work defined in the Plan of Study, the supervisory committee must issue certification to the Graduate Committee that the student has maintained a minimum 3.0 GPA, demonstrated sufficient progress towards mastery of a sub-discipline and has developed a command of requisite research tools to begin independent research in the area of the proposed dissertation. Once certified, students will be permitted to take the Preliminary Examination (see Request for Preliminary Exam form).

The Preliminary Examination will be in both written and oral format, and will be prepared by the student’s supervisory committee. The examination will be administered by the committee and will comply with the requirements of the College and the University in which the student is registered.

The written portion of the Preliminary Examination will consist of two parts:

1. A written examination based on the student’s coursework. The written examination will be in “Take Home” format. Each committee member will separately administer a 24-hour “Take Home” written examination, preferably on subsequent days.

2. A written proposal describing the proposed research work for the student’s dissertation. The proposal should be in a format suitable for research proposals submitted to funding agencies. The proposal will be graded as “passed” or “failed” by the supervisory committee members. The student cannot pass the preliminary exam unless the proposal is graded as “passed”. In order to receive the “passed” grade on the proposal, at a minimum, the proposal should include the following components: abstract, problem statement, research objectives, critical literature review, research plan and tasks, intellectual merit and broader impact, expected outcomes, and timeline for completion.

The oral portion of the Preliminary Examination will involve a presentation by the student on the written proposal and dissertation research.
The supervisory committee shall report the outcome to the Graduate Committee, and designated College and University authorities as: "passed," "failed," "additional work to be completed," or "to be re-examined" (see the Preliminary Exam Outcome form, Section 8). Students are admitted to candidacy for the Ph.D. degree only after passing the Preliminary Examination. If any student requires re-examination, the outcome can only be reported as "passed" or "failed." Any student who fails re-examination will be dismissed from the program.

**Dissertation.** The most important element of the doctoral program is original and fundamental research resulting in a Doctoral Dissertation. Students will enroll in dissertation credits (CGN 6980) only after the successful completion of the Preliminary Examination and admittance to doctoral candidacy. The student selects the dissertation topic in consultation with the major professor and supervisory committee. The supervisory committee must approve the dissertation research topic by the student successfully writing the dissertation proposal and presenting it to the committee. To be acceptable, the dissertation must comprise original research constituting a significant contribution to knowledge to the discipline and represent a substantial scholarly effort on the part of the student.

It is the responsibility of the student to comply with the required dissertation format of his/her university and the deadlines and requirements for dissertation submission <see http://www.famu.edu/index.cfm?graduatestudies or http://www.gradstudies.fsu.edu/>.

At the completion of the dissertation research and when the complete dissertation is ready for review by the Supervisory Committee, the Major Professor will authorize the distribution to committee members. The dissertation should be complete in every respect, including data analysis, figures and tables. The Supervisory Committee can recommend editorial and/or substantive changes after review and the oral dissertation defense. The dissertation should be provided to the major professor and the examining committee (supervisory committee) at least ten (10) days before the date of the dissertation defense examination.

The Ph.D. student is required to present the dissertation at a department Graduate Seminar at a time scheduled by the faculty seminar coordinator.

**Journal manuscripts.** In partial fulfillment of the Ph.D. degree requirements, a Ph.D. student must prepare at a minimum two (2) manuscripts for peer-reviewed journal publication, of which at least one (1) should have the status of "Accepted."

**Dissertation Defense.** An oral examination in the form of a dissertation defense is mandatory and is part of degree requirements. The student must satisfactorily pass this oral examination, as determined by the major professor and supervisory committee, before submission of the final dissertation to the university.

- The dissertation defense will be scheduled only with approval of the major professor, supervisory committee, and the department. The approvals are documented in the Request for Dissertation Defense Examination form (see Section 8). The student will be permitted to schedule the thesis defense only if the student has: 1) completed the research work, 2) written a complete dissertation, and 3) completed the journal manuscripts requirement.
• The defense should be scheduled before the final dissertation submission deadline with sufficient time to allow for revisions; see university deadlines.
• The oral presentation of the dissertation is announced and open to the public.
• The oral defense consists of two parts: 1) a defense presentation that include appropriate use of visual aids and duration of 45-55 minutes and 2) oral examination by the supervisory committee.
• The outcome of dissertation defense determined by the Supervisory Committee and is reported by the major professor to the department in the Dissertation Defense Outcome Form (see Section 8).

Journal manuscripts. In partial fulfillment of the Ph.D. degree requirements, a Ph.D. student must prepare at a minimum two (2) manuscripts for peer-reviewed journal publication, of which at least one (1) should have the status of “Accepted.”

Suggested timeline and checklist. A suggested timeline for completion of Ph.D. degree requirements and milestones checklist is provided in Figure 3.1 and Tables 3.8 and 3.9.

Table 3.8. Suggested Ph.D. timeline.
Students may need to enroll in additional hours to maintain full-time status each semester.

<table>
<thead>
<tr>
<th>Semester</th>
<th>Degree requirement item(s)</th>
</tr>
</thead>
</table>
| Semester 1 | 9 hours of approved coursework  
Complete RCR training*  
Identify dissertation topic |
| Semester 2 | 9 hours of approved coursework |
| Semester 3 | 9 hours of approved coursework  
Preliminary exam CGN 8988 |
| Semester 4 | 12 hours of dissertation research CGN 6980 |
| Semester 5 | 12 hours of dissertation research CGN 6980  
Submit journal manuscript 1 |
| Semester 6 | xx hours of dissertation research CGN 6980 |
| Semester 7 | xx hours of dissertation research CGN 6980  
Prepare complete journal manuscript 2  
Dissertation defense CGN 8985  
Submit approved final dissertation |

*See Section 4.3 RCR Training
Table 3.9. Ph.D. milestones checklist

<table>
<thead>
<tr>
<th>Milestone or Action</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select an Academic Advisor</td>
<td>First Semester</td>
</tr>
<tr>
<td>Identify dissertation topic</td>
<td>First Semester</td>
</tr>
<tr>
<td>Complete RCR training</td>
<td>First Semester</td>
</tr>
<tr>
<td>Submit approved Plan of Study</td>
<td>By beginning of second semester, or completion of 9 credit hours</td>
</tr>
<tr>
<td>Request transfer credit (if applicable)</td>
<td>By completion of 9 credit hours</td>
</tr>
<tr>
<td>Complete RCR training</td>
<td>By end of first year</td>
</tr>
<tr>
<td>Request preliminary exam</td>
<td>By end of third semester</td>
</tr>
<tr>
<td>Take preliminary exam (written and oral) and write proposal</td>
<td>By end of third semester</td>
</tr>
<tr>
<td>Journal manuscript 1 accepted for publication</td>
<td>Submit by semester prior to graduation or earlier</td>
</tr>
<tr>
<td>Submit approved Degree Certification form</td>
<td>Semester prior to graduation</td>
</tr>
<tr>
<td>Apply for graduation with university</td>
<td>Beginning of final semester</td>
</tr>
<tr>
<td>Request dissertation defense</td>
<td>Final semester</td>
</tr>
<tr>
<td>Dissertation oral defense</td>
<td>Final semester</td>
</tr>
<tr>
<td>Submit approved final Ph.D. dissertation</td>
<td>Final semester; check university for deadlines</td>
</tr>
<tr>
<td>Prepare complete journal manuscript 2</td>
<td>Final semester</td>
</tr>
<tr>
<td>Complete Exit Survey</td>
<td>End of final semester</td>
</tr>
</tbody>
</table>

3.4 Articulation Courses

Students who do not possess an undergraduate degree in Civil or Environmental Engineering will be granted provisional admission and must successfully complete articulation courses and the prerequisite courses necessary for the articulation courses. The articulation courses for students pursuing graduate degrees with civil engineering specialties without a degree in Civil Engineering, or closely related field, are listed in Table 3.10.

Table 3.10. Civil engineering articulation courses

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGM 3512</td>
<td>Engineering Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>EGN 3331</td>
<td>Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>CES 3100</td>
<td>Structural Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CCE 3101</td>
<td>Construction Materials</td>
<td>3</td>
</tr>
<tr>
<td>CEG 3011</td>
<td>Soil Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>TTE 3004</td>
<td>Transportation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>EES 3040</td>
<td>Intro. to Environmental Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>
The articulation courses for students pursuing graduate degrees with environmental or water resources engineering specialties without a degree in Civil Engineering, Environmental Engineering, or closely related field, are listed in Table 3.11.

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAP 3305 or MAP 2302</td>
<td>Engineering Mathematics I or Ordinary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>EGM 3512</td>
<td>Engineering Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>CEG 3011</td>
<td>Soil Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CWR 3201</td>
<td>Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>ENV 4001</td>
<td>Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CWR 4101 or CWR 4202</td>
<td>Engineering Hydrology or Hydraulic Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

4. Academic Policies

All students are required to adhere to the policies of the university, the FAMU-FSU College of Engineering, and the CEE department. It is the responsibility of the students to be familiar with these policies early and refer to them throughout their studies. Policies include academic policies, graduation requirements, and thesis and dissertation guidelines.

University requirements and policies are provided by the FAMU Office Graduate Studies and Research <http://www.famu.edu/index.cfm?a=graduatestudies> and by The Graduate School at FSU <http://www.gradstudies.fsu.edu/> (see the FSU Graduate Student Handbook). FAMU-FSU College of Engineering policies may be found at http://www.eng.fsu.edu/current/graduate/. It is the responsibility of the student to be familiar with and comply with all (university, college, and department) requirements. Department academic policies are described in this section.

4.1 Academic performance

Once enrolled into a CEE graduate program, a graduate student must satisfy the following requirements for retention:

- Maintain a cumulative GPA of at least 3.0. If a student’s GPA falls below 3.0, the student will be placed on academic probation.
- No grade below a “C” will be credited towards graduate degree requirements.
- A student may repeat one (1) time a course in which a grade of “C” or lower has been earned. Only the grade and credit received in the second attempt will be used in computing the cumulative GPA.
- Satisfy all university graduate student policies (see Section 5).
4.2 Coursework

A minimum of one-half the total required coursework must be taken at the FAMU-FSU College of Engineering.

Prerequisites. Students must satisfy prerequisites to enroll in a course. Students entering the major without a civil or environmental engineering degree also must satisfy a set of articulation courses.

Undergraduate Courses. A maximum of two (2) 4000-level courses beyond those required for a previous degree may be accepted for graduate elective credit with prior approval from the CEE department.

Directed Individual Study (DIS). A maximum of six (6) credit hours from up to two (2) Directed Individual Study (DIS) courses may be applied towards degree requirements with prior approval from the CEE department. The content of the DIS may not directly overlap with thesis or dissertation research work and may not be taken in place of an existing course.

Letter Grade and S/U Grading. The minimum number of hours of coursework taken on a letter-grade basis is as follow: M.S. students, at least 18 hours; M.Eng. students, at least 21 hours; and Ph.D. students, at least 21 hours.

Transfer Credit. Transfer of courses not counted toward a previous degree from another accredited graduate school is limited to six (6) semester hours. In addition, transfer of courses not counted toward a previous degree from the institution in which a student is enrolled (i.e., FAMU or FSU) is limited to twelve (12) semester hours total. In all cases, transfer credits require approval of the department and be completed with grades of “B” or better.

4.3 RCR Training

M.S. and Ph.D. students are required to successfully complete responsible conduct of research (RCR) training as part of degree requirements. This applies to all students whose initial enrollment occurs in Fall 2012 or later.

- M.S. and Ph.D. students must complete RCR training within a year of their initial enrollment to a CEE graduate program. RCR training is optional for M.Eng. students. Ph.D. students who completed RCR training as M.S. students at the FAMU-FSU College of Engineering do not need repeat this training.
- Two options are available for RCR training:
  - Option 1: FSU offers the Responsible Research one-hour graduate course each spring semester. The in-state tuition and textbook will be provided by FSU for each FSU student enrolled in the course (limited to 90 students). For details, see [http://gradschool.fsu.edu/Academics-Research/Research-and-Scholarly-Integrity/FSU-s-RCR-Course](http://gradschool.fsu.edu/Academics-Research/Research-and-Scholarly-Integrity/FSU-s-RCR-Course).
  - Option 2: FSU offers online training that includes seven 1-hour modules with quizzes. Topics include: Research Misconduct, Data Acquisition and Management, Responsible Authorship and Publication, Responsible Peer Review, Responsible Mentoring, Conflicts of Interest, and Collaborative Science. For additional
information, see http://gradschool.fsu.edu/Academics-Research/Research-and-Scholarly-Integrity/FSU-s-CITI-Courses.

- M.S. and Ph.D. need to confirm that they have completed RCR training in a timely manner and note this in their advising, plan of study, and graduation certification forms. Students who have not successfully complete RCR training by the end of the first year will receive a registration hold, which will be removed once training is completed.

4.4 Academic Advising

All graduate students must meet with their advisor (major professor) each semester during registration period. The meeting may be a face-to-face meeting, email, phone, or online conferencing. First semester students who have not selected an advisor can meet with any CEE faculty with Graduate Directive status, preferably in their specialty area.

Graduate students will need to verify that they have met with their advisor, and provide this information (via a signed advising form or email verified by advisor) to the CEE office to have their registration hold removed. Students will not be able to register for the next semester without advising confirmation.

The M.S. and Ph.D. supervisory committees are described in Sections 3.1 and 3.3, respectively.

4.5 Annual Assessment of Progress

The major professor (advisor) will assess the progress of the graduate student each year, typically at the end of the spring semester. The student will receive this annual assessment in writing. The advisor will provide feedback on the student’s progress in completing coursework, thesis or dissertation research, manuscript preparation, and other milestones and requirements. Students with teaching assistantship (TA) or research assistantship (RA) also will receive written assessment on their performance of their duties by their supervisor.

Each year, the supervisory committee, the major professor, or the student’s advisor prior to selection of a major professor will assess the progress of the student in writing and will make available copies of the annual review to the student, departmental chair, and academic dean.

5. University Requirements and Policies

University requirements and policies are provided by the FAMU Office Graduate Studies and Research <http://www.famu.edu/index.cfm?a=graduestudies> and by The Graduate School at FSU <http://www.gradstudies.fsu.edu/> (e.g., FSU Graduate Student Handbook). It is the responsibility of the student to be familiar with and comply with all (university, college, and department) requirements. Key requirements and policies are highlighted here.

5.1 Full-time and Part-time Status

A full-time load is twelve (12) hours per semester. Nine (9) hours is considered a full-time load for students with teaching or research assistantships with of at least quarter time (or 10 hours) appointments. Also international students registered for at least nine (9) credit hours per semester are considered full-time.
A student who has completed the required course work, but has not made a final thesis or dissertation submission, shall include in the required full-time load a minimum of two (2) credit hours of thesis or dissertation per semester until completion of the degree. Those with underload permission must register for at least two (2) credit hours of thesis or dissertation per semester.

5.2 **Doctoral Students Residency Requirement**

For Ph.D. students enrolled at FSU, the residency requirement ensures that Doctoral students contribute to and benefit from the complete spectrum of educational, professional, and enrichment opportunities the College of Engineering provides. After having thirty (30) semester hours of graduate coursework, or being awarded the Master’s degree, the student must be continuously enrolled in the FAMU-FSU College of Engineering, Department of Civil & Environmental Engineering, for a minimum of twenty-four (24) graduate semester credit hours in any 12 consecutive months.

5.3 **Continuous Enrollment**

Students not continuously enrolled from semester to semester during the academic year (fall and spring) may need to reapply for admission through the university.

5.4 **Time to Completion**

For Master’s students, all work towards the Master’s degree must be completed within seven (7) years from the time the student originally registers for graduate studies. For Doctoral students, all requirements for the Ph.D. degree must be completed within five (5) calendar years from the time the student passes the preliminary examination, or the student's supervisory committee will require that a new preliminary examination be passed.

5.5 **International students**

International students must comply with the U.S. Department of Homeland Security rules and regulations. International students enrolled at FAMU are encouraged to consult with the FAMU Office of International Education and Development [http://www.famu.edu/index.cfm?oied&BIEProgram]. International students enrolled at FSU are encouraged to consult with the FSU Center for Global Engagement [http://www.cge.fsu.edu/].

5.6 **University Wide Standards for Teaching Assistants**

Students who assume any teaching assistant (TA) role (e.g., grader, lab TA, course TA) must satisfy the minimum requirements for the specific teaching role(s). Requirements include graduate coursework or a Master’s in the discipline, participation in the Program in Instructional Excellence (PIE) fall conference and the PIE workshop on Sexual Harassment [http://pie.fsu.edu/], certification of spoken English for those whose native language is not English, supervision by a faculty member, and periodic evaluations. For specific requirements, see the document “University Wide Standards for Teaching Assistants,” which may be found
either at the GradSpace or CEE Students organizations websites in Blackboard <http://campus.fsu.edu>.

6. Available Courses

See Appendix A for a list of courses offered by the CEE department. Students are responsible for checking the graduate edition of the general bulletin for the university in which they are enrolled to confirm course information. See http://www.famu.edu/index.cfm?a=Registrar or http://registrar.fsu.edu/.

7. Checklist for New Students

7.1 FAMU Students

Refer to the FAMU School of Graduate Studies and Research for information on requirements at http://www.famu.edu/index.cfm?graduatestudies.

7.2 FSU Students

The Graduate School at FSU provides an information packet and checklist for new graduate students at http://gradschool.fsu.edu/Information-For/New-Current-Students. In addition, an orientation for new graduate students is held each August. International students enrolled through FSU are encouraged to consult with the Center for Global Engagement <http://www.cge.fsu.edu/>.

7.3 All Graduate Students

- Students must meet with a faculty advisor prior to registering for classes. First semester students who have not selected an advisor can meet with any CEE faculty with Graduate Directive status, preferably in their specialty area (see Section 4.4).
- See Computing and Multimedia Services (CMS) in Room A332 to request an engineering account to access the public computers at the College of Engineering.
- Once you have a FAMU or FSU account (this is different from the engineering account) check that you are able to logon onto Blackboard <http://campus.fsu.edu> and access the “Civil & Environmental Engineering Students” organization Blackboard site. FAMU students will need to request to be added by selecting the “Organizations” tab and searching for the keyword “Civil.”

8. Forms

The following forms may be found at the CEE department webpage <http://www.eng.fsu.edu/cee> (see Graduate Students link) and the CEE Students organization site in Blackboard <http://campus.fsu.edu> (see Graduate Students link). FAMU forms may be found at http://www.famu.edu/index.cfm?graduatestudies, and FSU forms may be in the
GradSpace organization site in Blackboard <http://campus.fsu.edu>. Check with your university for additional required forms.

Forms for all graduate students:
- Advising
- Annual Assessment
- Exit Survey
- Other forms (e.g., transfer credit, DIS, etc.) may be found in the CEE main office (A129).

Additional forms for M.S. students:
- M.S. Plan of Study
- M.S. Degree Requirements Certification
- Request for Thesis Defense Examination
- Defense Announcement (FAMU and FSU forms)
- Thesis Defense Outcome (department form)
- FAMU Defense Outcome
- FSU Manuscript Signature

Additional forms for M.Eng. students:
- M.Eng. Plan of Study
- M.Eng. Degree Certification

Additional forms for Ph.D. students:
- Ph.D. Plan of Study
- Request for Preliminary Examination
- Ph.D. Preliminary Exam Outcome
- Ph.D. Degree Requirements Certification
- Request for Dissertation Defense Examination
- Defense Announcement (FAMU and FSU forms)
- Dissertation Defense Outcome (department form)
- FAMU Defense Outcome
- FSU University Representative Doctoral Defense Report
- FSU Manuscript Signature

9. Funding Information

A limited number of teaching assistantships (TAs) and research assistantships (RAs) are available through the CEE department to qualified M.S. and Ph.D. students on a competitive basis each semester. University matriculation (tuition) waivers also may be granted as supplementary awards to students with assistantship appointments of at least 10 hours/week. Students with University Graduate Fellowship are expected to perform teaching and/or research related tasks equivalent to 20 hours/week effort for the CEE department.

In addition department sources of financial support, the universities and external organizations provide fellowships for graduate study.
• FAMU School of Graduate Studies and Research compiles information about fellowships provided by FAMU and by external sources <http://www.famu.edu/index.cfm?a=graduatestudies&p=SGSRFellowshipsandAwards> and <http://www.famu.edu/index.cfm?graduatestudies> (see the links to Financial Aid and Funding Opportunities)

• Fellowships provided by the FSU Graduate School <http://gradschool.fsu.edu/Funding-Awards/Graduate-School-Fellowships-and-Grants>

• FSU Office of Graduate Fellowships and Awards provides information about external fellowships <http://ogfa.fsu.edu/>

• College of Engineering provides information about scholarships and fellowships at http://www.eng.fsu.edu/current/scholarships.html


10. Contact Information

For more information about graduate studies in the Department of Civil and Environmental Engineering at the FAMU-FSU College of Engineering, please contact the department at:

Department of Civil and Environmental Engineering
FAMU-FSU College of Engineering
2525 Pottsdamer Street
Tallahassee, Florida 32310
Phone: 1.850.410.6136
Email: GradCEE@fsu.edu

Individuals who have submitted graduate admissions applications with questions can contact:

Ms. Belinda Morris
Phone: 1.850.410.6139
E-mail: bmorris@eng.fsu.edu
Appendix A. List of Graduate Courses

The following graduate courses are offered by the Department of Civil and Environmental Engineering at the FAMU-FSU College of Engineering. The frequency in which the courses typically are available is indicated (f = fall, s = spring, a = annually, b = biennially, every 3-4 semesters, o = occasionally, d = distance learning option). The scheduling of courses is subject to change. Students must satisfy prerequisites to enroll in a course.

Construction Engineering

**CCE 5035. Construction Planning and Scheduling (3).** Prerequisite: CCE 4004. Planning, basic arrow diagramming, basic precedence diagramming, establishing activity duration, scheduling computations, bar charts, project controls, overlapping networks, resource leveling, and program evaluation review technique (PERT). [f]

**CCE 5036. Project Controls in Construction (3).** Prerequisite: CCE 4004 and EGN 3443. Construction cost estimation, work breakdown structure, and cost control; critical path method (CPM) scheduling, resource-constrained scheduling, and integrated scheduling-cost control; probabilistic scheduling techniques, and linear scheduling techniques; contract specifications, and contract claims (schedule impact) analysis. [s]

Geotechnical Engineering

**CEG 5015. Advanced Soil Mechanics (3).** Prerequisite: CEG 3011. Mechanical behavior, internal stresses, and stability analysis of noncohesive soils, compressibility, consolidation, and settlement of cohesive soils, analytical techniques for predicting earth movement. [o]

**CEG 5115. Foundation Engineering (3).** Prerequisite: CEG 3011. Design of spread footings, pole and caisson foundations, retaining structures and waterfront structures. Investigation of slope stability. [d]

**CEG 5127. Highway and Airport Pavement Design (3).** Prerequisite: CEG 4801. Analysis of materials used for highway and runway pavements; design of rigid and flexible pavements and sub-bases for highways and airports; geotechnical considerations. [o]

**CEG 5705. Environmental Geotechnics (3).** Prerequisite: CEG 3011. The geotechnical aspects of waste containment and storage. Aspects of design, construction, and performance of earthen structures for storing or disposing waste or remediating contaminated sites. [f]

Structural Engineering

**CES 5105. Advanced Mechanics of Materials (3).** Prerequisites: CES 3100 and EGN 3331. This course covers analysis and design of load-carrying members, shear center, unsymmetrical bending, curved beams, beams on elastic foundations, energy methods, theories of failure, thick-walled cylinders, and stress concentrations. [b]

**CES 5106r. Advanced Structural Analysis (3).** Prerequisites: CES 3100 and EGN 3331. This course covers matrix algebra review, direct stiffness method for truss analysis, computer applications, statically indeterminate structures, slope-deflection and moment distribution
methods, and computer modeling and analysis of structures using commercial FE codes. May be repeated to a maximum of six hours. [b]

**CES 5144. Matrix Methods for Structural Analysis (3).** Prerequisites: CES 4101 and MAP 3305. This course covers selected fundamental techniques, including energy methods, for the formulation of the stiffness method for structural analysis. Topics include formation of element matrices, transformed element matrices, structure stiffness matrices, and equations of equilibrium. Selected computer solution techniques are also covered. [o]

**CES 5209. Structural Dynamics (3).** Prerequisites: CES 4101 and MAP 3305. This course covers analysis and design of single- and multi-degree-of-freedom structures subjected to various types of excitations and initial conditions. Topics include computational aspects of dynamic analysis, including approximate methods of analysis, and introduction to earthquake loading and design. [b]

**CES 5218. Fundamentals of Structural Stability Theory (3).** Prerequisite: CES 4101. This course covers elastic and inelastic buckling of columns including large deformation theory and imperfect columns, beam column theory, and buckling of frames. Methods of analysis include the formation and solution to differential equations, energy methods, and matrix methods. AISC stability design techniques are used with LRFD format. Computer software is used as a teaching tool. [b]

**CES 5325. Bridge Engineering (3).** Prerequisites: CES 4605 and CES 4702. This course is an introduction to design of modern steel and concrete highway bridges. Topics include materials and properties, loads on bridges, and substructure design. AASHTO LRFD Specifications are used. [b]

**CES 5585. Wind Engineering (3).** Prerequisites: EGN 3331 EGN 2212, and CWR 3201. This course covers statics and dynamics of wind-induced loads and structural responses. Topics include wind damage, extreme wind probability, wind characteristics, wind pressure and forces, basics of single DOF structural dynamics, and overview of wind dynamics. State-of-the-art research in wind engineering is also introduced. [b]

**CES 5606. Advanced Steel Design (3).** Prerequisites: CES 4101 and CES 4605. This course covers the behavior of complex steel elements and structures. Topics include analysis and design of columns and beams under combined effects of flexure, shear and torsion. Other topics include lateral torsional buckling, plastic analysis, design of plate girders, and design of frames. [b]

**CES 5706. Advanced Concrete Design (3).** Prerequisites: CES 4101 and CES 4702. This course covers advanced topics pertaining to complex reinforced concrete elements and structures. Topics include analysis and design for torsion, biaxial columns, slender columns, two-way slabs, retaining walls, shear walls, deep beams, and the strut-and-tie method. [o]

**CES 5715. Prestressed Concrete (3).** Prerequisites: CES 3100 and EGN 3331. This course covers the behavior and design of prestressed concrete structures. Topics include design of prestressed concrete beams for flexure and shear, design of slabs, prestressing losses, serviceability of prestressed concrete members, and precast members. [o]

**CES 5845. Composites in Civil Engineering (3).** Prerequisites: CCE 3101, CES 3100, and EGN 3331. This course covers fundamental theories of composite materials. Topics include forms of composites and their reinforcements; physical, chemical, and mechanical properties; design
and testing methods; and civil engineering applications of composite materials. [d]

**CES 6116. Finite Elements in Structures (3).** Prerequisites: CES 4101 and MAP 3305. This course covers basic concepts of finite element analysis. Topics include boundary conditions; computer techniques used in structural analysis; structural finite elements for trusses, beams, beams on an elastic foundation, and frames; plane stress and plane strains in triangular elements; and engineering modeling. [o]

**Hydraulic/Water Resources Engineering**

**CWR 5125. Groundwater Hydrology (3).** Prerequisites: CWR 3201 and EES 3040. This course examines the fundamentals of groundwater flow and contaminant transport. Topics include: Darcy’s law, flow nets, mass conservation, heterogeneity and anisotropy, storage properties, 3-D equation of groundwater flow, regional recirculation, unsaturated flow, recharge, stream-aquifer interaction, well hydraulics, slug test analyses and contaminant transport processes. [b]

**CWR 5205. Hydraulic Engineering II (3).** Prerequisites: CWR 4202 and MAP 3305. Course presents advanced hydraulic concepts and their incorporation into the design process. Methods of solving such problems are also presented. [o]

**CWR 5305. Urban Stormwater Runoff (3).** Prerequisite: CWR 3201. Corequisite: CWR 4101. This course investigates the effects of urban stormwater runoff on surface and ground water resources. Topics include legal and regulatory requirements, methods of engineering analysis and design of storm water systems. [o]

**CWR 5635. Water Resources Planning and Management (3).** Prerequisites: CWR 4101 and CWR 4202. Quantity and quality planning of water resources systems. Economic considerations. [b]

**CWR 5824. Coastal and Estuarine Hydraulics (3).** Prerequisites: CWR 3201 and MAC 2313. This course examines numerous topics including coastal hydraulic principles and waves in estuaries and coastal oceans, wave properties and wave forces on coastal structures, tidal motions, mixing and transport in estuaries, and coastal engineering analysis. [o]

**Environmental Engineering**

**ENV 5028. Remediation Engineering (3).** Prerequisite: ENV 4001 or equivalent. This course reviews various innovative remediation technologies used for clean up of contaminated soil and groundwater at a site such as air sparging, soil vapor extraction, reactive walls, reactive zones, stabilization technologies, hydraulic pneumatic fracturing and pump-and-treat systems. [f]

**ENV 5030. Applied Environmental Engineering Microbiology (3).** Prerequisite: ENV 4001 or equivalent. This course focuses on the survey of environmentally important microbes and the roles they play in environmental restoration processes. Major topics include basics of microbiology, stoichiometry and bacterial energetics, bioremediation and other environmental microbiology applications, and detoxification of hazardous chemicals. [a]

**ENV 5045. Environmental Systems Analysis (3).** Prerequisites: ENV 4001 and MAC 2311. Systems analysis techniques applied to the solution of environmental problems, with particular emphasis on linear and dynamic programming. [o]

**ENV 5055. Chemical Fate and Transport in the Environment (3).** Prerequisites: CWR 3201, EES
3040 or equivalent, and MAP 3305. Study of the processes of pollutant chemicals transformation in and transport between air, water, and soil or sediments. Use and development of predictive mathematical models for the remediation of existing contaminated sites or prevention of future contamination from new sources. [a]

**ENV 5105. Air Pollution Control (3).** Prerequisite: ENV 4001. This course investigates analytical concepts for determination of sources, amounts, and transport of air pollutants; health and environmental effects; design of control devices and management programs. [d]

**ENV 5407. Water Reuse Engineering (3).** Prerequisite: ENV 4001 or equivalent. Course covers wastewater reclamation and reuse; treatment processor and systems; monitoring and control instrumentation; health and social aspects; design of facilities/systems. [a]

**ENV 5419. Applied Environmental Engineering Chemistry (3).** Corequisite: ENV 4001. This course covers applications of fundamental principles from general, organic and biological chemistry, to major environmental engineering processes. Emphasis is placed on the chemistry of water treatment. [d]

**ENV 5504. Environmental Engineering Processes and Operations (3).** Prerequisite: ENV 4001 or instructor permission. Operational and design features of the physical, chemical, thermal, and biological treatments used in engineering for management of solid and hazardous wastes. [f]

**ENV 5565. Design of Water Quality Management Facilities (3).** Prerequisites: CWR 3201, EES 3040, and EES 3040L. Analysis of operations, processes, and systems used in the design of facilities for maintaining water supply quality, wastewater control, and aquatic pollution control. Design of wastewater collection systems, water and wastewater treatment plants, and systems for disposal for residuals from such facilities. [s]

**ENV 5615. Environmental Impact Analysis (3).** Prerequisites: EES 3040 and EES 3040L. Analysis of various measures of environmental quality. Impacts on different types of resources. Benefit-cost in environment impact assessment. [o]

**Transportation and Traffic Engineering**


**TTE 5206. Advanced Traffic Flow Analysis (3).** Prerequisite: TTE 3004. Course covers microscopic and macroscopic characteristics, traffic stream models, demand-supply analysis, shockwave analysis, queueing analysis, computer simulation models, intelligent transportation systems. [o]

**TTE 5256. Traffic Operations (3).** Prerequisite: TTE 3004. Course covers principles of capacity, freeways, rural highways, urban streets, transportation systems, and computer simulation [b]

**TTE 5270. Intelligent Transportation Systems (3).** Prerequisite: TTE 3004. Course covers advanced traffic management systems (ATMS), advanced traveler information systems (ATIS), advanced vehicle control systems, commercial vehicle operations, rural ITS human factors, institutional issues, architecture and standards, simulation and modeling. [o]

**TTE 5805. Highway Geometric Design (3).** Prerequisites: CEG 2202, CEG 2202L, and TTE 3004.
Principles and procedures for the geometric design of highways and streets; considerations of traffic, land use, and aesthetic factors. [s]

Other Courses

CGN 5310. Engineering Data Systems (3). Conceptual data modeling; application and use of relational database management systems and geographical information systems; introduction to modern conceptual tools (genetic algorithms, neural networks, etc.); completion of individual projects applying course knowledge to sub-disciplines within the civil engineering program, according to student interest. [o]

CGN 5905r. Directed Individual Study (1–6). (S/U grade only.) May be repeated to a maximum of six semester hours when topics change. [s,f,summer]

CGN 5930r. Special Topics (1–6). Special topics in civil engineering with emphasis on recent developments. May be repeated to a maximum of six semester hours. Consult instructor. [s, f]

CGN 5835. Site Development (3) [d]

CGN 5931. MEng Comprehensive Exam (0) [s,f,summer]

CGN 5935. Civil Engineering Seminar (0). (S/U grade only.) Prerequisite: graduate student status. Graduate students are expected to enroll in the course every semester they are enrolled at FAMU or FSU. The students should attend at least seventy-five percent of the seminars offered each semester to obtain a satisfactory grade. [s, f]

CGN 6942. Supervised Teaching (3). (S/U grade only.) Prerequisite: Doctoral candidate status. Students receive credit for teaching an undergraduate course under supervision of graduate faculty. PhD candidacy required. [s, f]