### Program Approval Form

For approval of new programs and deletions or modifications to an existing program.

#### Action Requested:
- [ ] Create New (SCHEV approval required except for minors)
- [ ] Modify Existing (check ALL that apply)
- [ ] Inactivate Existing

**Title (SCHEV approval required except for minors)**

**Concentration (Choose)**
- [ ] Add
- [ ] Delete
- [ ] Modify

- [ ] Degree Requirements
- [ ] Admission Standards / Application Requirements
- [ ] Other
- [ ] Changes:

#### Type (Check one):
- [ ] B.A.
- [ ] B.S.
- [ ] Minor (req. C3 approval)
- [ ] M.A.
- [ ] M.S.
- [ ] M.Ed.
- [ ] Ph.D.
- [ ] Undergraduate Certificate* (req. C3 approval)
- [ ] Graduate Certificate*
- [ ] Bachelor’s/Accelerated Master’s
- [ ] Other:

#### College/School:
VSE

#### Department:
SEOR

#### Submitted by:
SEOR

#### Ext:  
Email: 

#### Effective Term:
Fall 2016

#### Please note: For students to be admitted to a new degree, minor, certificate or concentration, the program must be fully approved, entered into Banner, and published in the University Catalog.

#### Justification: (attach separate document if necessary)

<table>
<thead>
<tr>
<th>Existing</th>
<th>New/Modified</th>
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<tbody>
<tr>
<td>Computer Engineering, MS</td>
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<tr>
<th>Program Title: (Required)</th>
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<tr>
<td>Title must identify subject matter. Do not include name of college/school/dept.</td>
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<th>Concentration(s):</th>
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<th>Admissions Standards / Application Requirements:</th>
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<td>(Required only if different from those listed in the University Catalog)</td>
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<th>Degree Requirements:</th>
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<td>Consult University Catalog for models, attach separate document if necessary using track changes for modifications</td>
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<th>Courses offered via distance:</th>
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<td>(if applicable)</td>
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<th>TOTAL CREDITS REQUIRED:</th>
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*For Certificates Only: Indicate whether students are able to pursue on a [ ] Full-time basis  [ ] Part-time basis

#### Approval Signatures

3/2/16

#### Unit Approval Form

If this program may impact another unit or is in collaboration with another unit at Mason, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

<table>
<thead>
<tr>
<th>Unit Name</th>
<th>Unit Approval Name</th>
<th>Unit Approver’s Signature</th>
<th>Date</th>
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**For Minors and UG Certificates only (Cross-College Curriculum Committee Approval)**

C3 Committee Member  Provost Office  C3 Committee Approval Date

**For Graduate Programs Only**
2015-2016 University Catalog

Computer Engineering, MS

Banner Code: VS-MS-CPE

School: Volgenau School of Engineering

Department: Electrical and Computer Engineering

Computer Engineering involves knowledge of hardware and software development. The students learn how to design new generations of computers, as well as embedded computing systems, such as those found in smartphones, cars, appliances, computer networks, smart factories, and the internet-of-things. The program covers the entire digital integrated circuit design process targeting Field Programmable Gate Arrays (FPGAs) and Application Specific Integrated Circuits (ASICs), using various optimization criteria, such as speed, cost, power, energy, reliability, and security. It also encompasses the complete software development process targeting microcontrollers, microprocessors, multi-cores, and Graphics Processing Units (GPUs). It teaches students how to efficiently partition the system into software and hardware components, and develop high-performance interfaces between these two parts. Project-oriented courses and labs expose students to modern computer-aided design tools for hardware and software design. The students master the art of writing comprehensive technical reports and giving successful oral presentations. The computer engineering program offers the following specialization areas: digital systems design, microprocessor and embedded systems, digital signal processing, computer networks, and network and system security.

Admission is very competitive. The department’s policy is to admit only those students who have demonstrated a potential for outstanding performance in their graduate work.

An accelerated master’s option is available to students in the bachelor’s program. See Computer Engineering, BS/Computer Engineering, Accelerated MS for specific requirements.

Common Requirements for CPE or ELEN Master's Program

Admission

Categories of Admission

Each student may be admitted into one of the following categories: degree, provisional, or nondegree. Provisional admission is for anyone whose past performance provides reasonable, but not strong, evidence of ability to pursue graduate work. To advance to degree status, a provisional student must achieve a 3.00 GPA after 12 credits, remove all undergraduate deficiencies by completing the
corresponding courses with grades of B or better, and receive a B or better in two core courses specific to the student’s selected program and specialization. The nondegree category is used primarily by students who want to take courses but not necessarily pursue a degree. Nondegree students seeking to enter degree programs must formally apply for admission.

Requirements

To be considered for admission to the master’s program, applicants should have a baccalaureate degree in electrical engineering, computer engineering, or a closely-related discipline from an accredited program with a reputation for high academic standards, and have earned a GPA of B or better during the last 60 credits. Other requirements are as follows:

- Three letters of recommendation, preferably from academic references or references in industry or government who hold advanced degrees and are familiar with the applicant’s professional accomplishments
- Detailed statement of career goals and aspirations
- For students who have not earned a bachelor’s degree from a U.S. university, satisfactory performance on the GRE
- For students whose native language is not English, a minimum TOEFL score of 575 for the paper-based exam or 230 for the computer-based exam. A minimum score of 600 for the paper-based exam or 250 for the computer-based exam is required for applicants who wish to be considered for a graduate teaching assistantship.

Non-ECE Students

Students with BS or MS degrees in ECE-related disciplines (for example, computer science, mathematics, mechanical engineering, physics, or electrical engineering technology) are encouraged to apply for admission. They may initially be admitted into the provisional category and advance to degree status by satisfying requirements described in the Admissions Categories section. Such students may also be advised to take some courses from the undergraduate electrical or computer engineering curriculum, according to their intended specialization and specific backgrounds.

Student Advising

Newly-admitted graduate students must consult with the ECE graduate coordinator before they register for classes. Students should make an appointment by calling the ECE office. Students are expected to select a specialization from those available in each MS degree program. Students then are assigned an academic advisor from that specialization.

GPA Requirements

A maximum of 6 credits of courses with grades of C or B- may be applied toward the degree. The student must present a GPA of at least 3.00 for all courses submitted for the degree.

Degree Requirements
Students must complete a minimum of 30 graduate credits beyond the bachelor’s degree. This work must represent a cohesive set of courses leading to comprehensive knowledge in one specialized area of computer engineering; it cannot be a set of disjointed courses.

**Plan of Study**

Before the end of the second semester, each student must submit to the graduate coordinator’s office a plan of study that has been approved by the academic advisor. This plan should be kept up to date by regular consultation with the academic advisor. A final, signed version of the plan must be turned in when the student submits a graduation application.

*Two core courses (with B or better in each) from the following (6 credits):*

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*Minimum of 3 ECE or CS courses:*

With a grade of B or better in each, at the 600 level and above (not including ECE 798 or 799), including doctoral courses (800 and 900 levels).

*Electives*

Elective courses should be chosen either from the list of pre-approved electives strongly suggested for a given specialization area or from the list of elective courses common for all specialization areas. Elective courses from the latter list must be approved by the student’s advisor prior to the registration for a given course.

The plan of study usually has no fewer than 15 credits of courses designated ECE.

Lists of courses appropriate for specialization areas, such as digital systems design, microprocessor and embedded systems, digital signal processing, computer networks, and network and system security, are available on the ECE website. A self-defined specialization may be created when appropriate, with the approval of the computer engineering graduate program coordinator. This specialization must include components of hardware and software development and the corresponding plan of study should comprise courses from ECE and the Computer Science Departments.

Seminar Requirement

Graduate students are expected to participate actively in the exchange of knowledge and ideas in their discipline. Towards this objective, all degree candidates must attend a minimum of 6 graduate seminars approved for the degree program. Approved seminars are publicized on the departmental webpage.
To demonstrate completion of the seminar requirement, students must register for ECE 795 - Engineering Seminar in their final semester. The department office will verify that the seminar requirement has been met and submit a grade of S (satisfactory) upon completion of the requirement. Students who have not met the seminar requirement in their final semester must continue to register for ECE 795 in subsequent semesters until the requirement is met. All degree candidates must attend a minimum of 10 graduate seminars approved for the degree program. Students must register for ECE 795 in their final semester. Once the department verifies that the seminar requirement has been met, a grade of S (satisfactory) will be submitted. Students who have not met the seminar requirement in their final semester must continue to register for ECE 795 in subsequent semesters until the requirement is met.

Thesis/Scholarly Paper Option for CPE/ELEN Master’s Program

To complete the program, students may select one of the following options:

Thesis Option

Students who select this option must complete ECE 799 - Master’s Thesis (6 credits) and 24 credits of course work. The thesis is particularly recommended for those students who wish to develop and document their research skills or contemplate subsequent enrollment in a PhD program. The thesis involves a research effort, which is conducted under the guidance of a faculty advisor. In some cases, permission may be granted to complete a portion of the work at the student’s place of employment. The final written thesis and oral defense are approved by the student’s advisory committee.

For the electrical engineering program, this committee consists of at least three full-time faculty members, including two from the student’s major specialization, and one from outside the specialization. For the Computer Engineering Program, this committee consists of at least three full-time faculty members, including two affiliated with the MS in Computer Engineering Program, one of whom must be from the ECE Department. Thesis students may not register for ECE 798 - Research Project. Students must register for at least 3 credits of thesis for their first thesis semester. Following their first thesis semester, they must register for at least 1 credit of thesis each fall and spring semester until graduation.

Scholarly Paper Option

Students who select to complete their degree program with a scholarly paper must:

• Complete 30 credits of course work

• Register for ECE 797 - Scholarly Paper.

• Enroll in a 600-level or above course requiring a research project.

• Write a Scholarly Paper project report and present findings as part of the course requirements.

An acceptable scholarly paper must be technically sound, adhere to accepted formatting standards for technical reports, and contain a significant literature review evidenced by a comprehensive list of cited references.
A list of courses requiring projects that can be used to satisfy the scholarly paper requirement will be published on the department website. Scholarly papers must be individual written project reports—not group projects. To qualify as a scholarly paper an oral presentation of the project is required. A passing grade for the project, reflecting both the written report and the oral presentation, satisfies the scholarly paper requirement.

A successful scholarly paper will be recorded by awarding a satisfactory (S) grade for ECE 797—Scholarly Paper. Students are eligible to attempt the scholarly paper and register for ECE 797 after completion of 18 hours of coursework. Students choosing the scholarly paper option are not eligible for graduation until they have received a final, passing grade for ECE 797. Students who select to complete their degree program with a scholarly paper have two options:

- Complete 30 credits of course work
- Write a scholarly paper (must register for ECE 797—Scholarly Paper)
- Conduct an oral presentation of the scholarly paper

or

- Complete 27 credits of course work
- 3 credits of ECE 798—Research Project
- Write a scholarly paper (must register for ECE 797—Scholarly Paper)
- Conduct an oral presentation of the scholarly paper

The scholarly paper, with the theme selected under the guidance of a faculty advisor, can be a technical report on an independent study or laboratory or computer experimentation; a literature search on a current scientific or technological topic, such as a survey of new technologies or new methodologies; or a case study of new applications. Students must demonstrate knowledge of the topic and make a satisfactory technical presentation of the paper in the graduate seminar. The scholarly paper and final presentation must be approved by the student’s advisory committee.

When a student elects to complete the research project, it is expected that the 3 credits of effort in ECE 798 will result in a much more substantial paper than a scholarly paper submitted in addition to 30 credits of regular course work.

Students are eligible to register for ECE 797 after completion of 18 hours of coursework and they must enroll in ECE 795—Engineering Seminar the semester they plan on conducting the oral presentation to graduate. Once the department verifies that the seminar requirement has been met, a grade of S (satisfactory) will be submitted. Students who have not met the seminar requirement in their final semester must continue to register for ECE 795 in subsequent semesters until the requirement is met. Students are not eligible for graduation until they have received final grades for ECE 795, ECE 797, & ECE 798.

Total: 30 credits