**MASTER OF SCIENCE IN ENGINEERING: CONCENTRATION IN EMBEDDED ELECTRICAL AND COMPUTER SYSTEMS**

**Admission to the Program**

Applicants must hold a bachelor’s degree in engineering, or a closely related discipline, with a minimum GPA of 3.0 in upper-division major classes in addition to meeting general university requirements for graduate standing. The School of Engineering also requires two letters of recommendation from persons familiar with the student’s previous academic work or professional accomplishments. Graduate Record Exam (GRE) scores within the last three years are also required. A minimum score of 550 on the paper exam or 213 on the computer-based TOEFL is required for graduate applicants whose preparatory education was principally in a language other than English.

**Advancement to Candidacy**

The applicant is advanced to candidacy when the Advancement to Candidacy (ATC) has been signed and approved by the Dean of the Graduate Division.

**Written English Proficiency Requirements**

**Level One**

As a preadmission requirement, applicants must have satisfied one of the following:

1. a score of at least 4.0/6.0 on the GRE or GMAT Analytic Writing Assessment;
2. a score of at least 4.5/6.0 on the essay test of the paper-based [PBT] TOEFL (a minimum score of 24/30 on the Writing section of the Internet-based test [IBT] TOEFL);
3. a score of at least 6.5/9.0 on the IELTS writing test, or a concordant score on the Pearson Test of English.

An applicant that does not meet the above requirement may be conditionally accepted to the program but must complete SCI 614 within the first year of attendance at SF State in order to meet the Level One requirement. SCI 614 does not count toward the 30 unit MS coursework requirement.

**Level Two**

is satisfied by the completion of a written thesis (ENGR 898) or research project (ENGR 895).

**Curriculum**

The Master of Science in Engineering is based on 30-semester units of which at least 21 units must be earned from graduate level courses. We expect that the graduate coordinator will work closely with individual students to develop a curriculum plan that ensures academic rigor while at the same time meeting the needs of the student. The curriculum includes 12 units of required engineering courses and a minimum of 6 units of elective engineering courses. A maximum of 6 units of elective non-engineering courses may be applied to the degree requirements with the consent of the graduate coordinator if they are consistent with the student’s overall career objectives as provided in the program of study. There are two options for the culminating experience. One option is to first take a 3-unit research course (ENGR 897), and then a 3-unit thesis course (ENGR 898). The other option is to take a 3-unit applied research project course (ENGR 895).

**Engineering (M.S.): Concentration in Embedded Electrical and Computer Systems – Minimum 30 units**

**Required Courses (12 units)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 800</td>
<td>Engineering Communications</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 801</td>
<td>Engineering Management</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 844</td>
<td>Embedded Systems</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 852</td>
<td>Advanced Digital Design</td>
<td>3</td>
</tr>
</tbody>
</table>

The aggregate of courses that comprise the core of this concentration is designed to give students a broad foundation in general areas of engineering project management and engineering communications, and in embedded systems. These courses are aimed to provide our students opportunities for career advancement in their profession.

**Elective Engineering Courses (6 - 15 units)**

Elective technical engineering courses are selected from the following list upon approval of the graduate coordinator.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 447</td>
<td>Control Systems</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 446</td>
<td>and Control Systems Laboratory</td>
<td></td>
</tr>
<tr>
<td>ENGR 449</td>
<td>Communication Systems</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 451</td>
<td>Digital Signal Processing</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 456</td>
<td>Computer Systems</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 476</td>
<td>Computer Communications Networks</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 478</td>
<td>Design with Microprocessors</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 484</td>
<td>Digital VLSI Design</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 849</td>
<td>Advanced Analog IC Design</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 850</td>
<td>Digital Design Verification</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 851</td>
<td>Advanced Microprocessor Architectures</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 853</td>
<td>Advanced Topics in Computer Communication and Networks</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 854</td>
<td>Wireless Data Communication Standards</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 856</td>
<td>Nanoscale Circuits and Systems</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 868</td>
<td>Advanced Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 869</td>
<td>Robotics</td>
<td>3</td>
</tr>
</tbody>
</table>

A program cannot contain more than 9 units of courses with a course number below 700. Some upper division engineering courses may also be used as electives if not used in the undergraduate degree program and approved by the graduate coordinator.

**Non-Engineering Electives (0 - 6 units)**

Courses, either graduate or upper-division, selected primarily from science, mathematics, social science, or business, upon approval of the graduate coordinator.
Culminating Experience (3 - 6 units)
Units selected from one of the options below

**Option A**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 897</td>
<td>Research and Master's Thesis (thesis may not be started until completion of 12 units of graduate course work and ENGR 897)</td>
<td>6</td>
</tr>
<tr>
<td>&amp; ENGR 898</td>
<td></td>
<td></td>
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</tbody>
</table>

**Option B**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 895</td>
<td>Applied Research Project (project may not be started until completion of 12 units of graduate course work)</td>
<td>3</td>
</tr>
</tbody>
</table>