School of Engineering & Applied Science

Mission Statement
The mission of the School of Engineering & Applied Science at Washington University is to serve society as a center for learning in engineering, science and technology. It is our duty to disseminate and create knowledge through teaching, research, publications and the transfer of important ideas and research into the development of new products and technologies. We strive to provide an environment that nurtures critical thinking and the education of innovators and leaders for the future.

Undergraduate Degree Programs
The School of Engineering & Applied Science offers four-year, full-time programs of instruction leading to various professional Bachelor of Science degrees. Bachelor of Science degrees are available in the fields of biomedical engineering, chemical engineering, computer engineering, computer science, electrical engineering, mechanical engineering, and systems science and engineering.

If a student is not preparing for a professional engineering career (i.e., one that might one day lead to licensure as a professional engineer [P.E.]), but is interested in an academic program broadly based on the engineering sciences, the School of Engineering & Applied Science offers the Bachelor of Science (BS) Major in Applied Science degree with several options including Chemical Engineering, Electrical Engineering, Mechanical Engineering, and Systems Science & Engineering. These degree options provide more flexibility for students who do not intend to become licensed engineers and want to select their course work according to their personal educational objectives. For example, some students use this flexibility to gain technical background and training while pursuing or preparing for professional training in medicine, business or law. However, although the flexibility exists to do so, it is not necessary to combine an Applied Science degree program with another major or degree. Students also can use this added flexibility to achieve a well-rounded undergraduate education by selecting courses from across the university while pursuing a major in the School of Engineering & Applied Science or to deepen their understanding in their chosen major.

BS in Engineering (Individually Designed Major)
Many of the most interesting and developing areas of engineering and applied science do not fit within a single undergraduate major. Students can create an Individually Designed Major (IDM) under the direction of a faculty adviser. Sample IDMs include biomedical informatics, imaging, energy engineering, robotics, computer graphics and more. The requirements to be admitted to an IDM are more stringent than those for our other engineering degree programs, and the IDM will not be available to students when they first enter WU (so it will not be listed on the admissions application as an option).

Students applying for an IDM should:
• have already completed at least one semester at WU.
• apply before the beginning of the junior year.
• have at least a 3.5 cumulative GPA at WU and be maintaining good standing in the School of Engineering.
• find an Engineering faculty member who will agree to serve as that student's IDM adviser. The student and adviser will design a plan of study, which lists the courses that must be successfully completed to earn the IDM. That plan must include at least 42 engineering units of credit.
• satisfy all other general engineering degree requirements.
• present (with the help of their adviser) the plan to a standing engineering committee (normally, the Engineering Undergraduate Studies Committee), which will then assess the proposed plan and will approve or deny the request.

Combined Majors and/or Multiple Degrees

Multiple Majors in Engineering
All undergraduate divisions at Washington University allow students to pursue majors and degrees in more than one division. The following options are available:

Second degrees. A student in any undergraduate division of the university may be allowed by another division to pursue a second bachelor's degree. For this, the student must satisfactorily complete all of the degree requirements for BOTH degrees in order to earn two diplomas. These requirements may include a "residency" requirement. For engineering majors, this residency requirement is stated on the Engineering Degree Requirements page. In addition, the College of Arts & Sciences requires any student earning an AB degree and a bachelor's degree from another division to earn a minimum of 150 total units. If the additional residency and units requirement for a second degree are incompatible with a student's plan, then the student should consider a second major as a more convenient and equally viable alternative.

Second majors. A student pursuing a bachelor's degree in engineering may also pursue second majors offered by other undergraduate divisions. There are three second majors offered by the School of Engineering & Applied Science: Computer Science, Electrical Engineering Science, and Systems Science. In addition, there are second majors offered by the
College of Arts & Sciences, School of Business, and College of Architecture. Students may declare a second major online via WebSTAC up until the time they have filed an Intent to Graduate. Upon completion of the requirements, the student's transcript will show an engineering degree and all earned second majors. Only one diploma is granted, and no reference to the second major is noted on the diploma.

**Minors.** Undergraduate students are allowed to pursue minors offered by any undergraduate division of the university. A minor usually requires five to six courses. The minor program's home division sets the requirements for admission and completion of the minor program. Students may declare a minor online via WebSTAC up until the time they have filed an Intent to Graduate. An engineering student who completes all of the requirements will have the award of the minor noted on the official transcript; no reference of the minor is noted on the diploma.

**Residency Rule for Engineering Minors:** No more than 6 units of credit transferred from another institution (outside Washington University) can be used to meet the requirements of any minor offered by the School of Engineering & Applied Science. The remaining units (up to the amount required for the minor) must be applicable units from Washington University. The review committee that oversees a minor has the authority to establish a more stringent residency rule.

### Special Combined Programs

#### Process Control Systems

The Department of Energy, Environmental & Chemical Engineering and the Department of Electrical & Systems Engineering jointly sponsor a double-degree program in process control systems. Undergraduate degrees are earned in both Chemical Engineering and in Systems Science & Engineering. The emphasis in this course of study is on the science and technology of process automation with a solid traditional foundation in the two major disciplines. Graduates of the program can contribute, through automation, to improved product quality, reduced manufacturing costs, greater capital productivity, and improved safety and environmental quality.

#### BS/Master's Program in Engineering

This program provides undergraduate engineering students with the opportunity to plan a coordinated five-year program of studies in the School of Engineering & Applied Science leading to both the bachelor's and master's degrees. The program requires at least 150 units and normally takes five years to complete. With departmental approval, up to 6 units completed at the School of Engineering & Applied Science for the master's degree may be used to count toward the engineering undergraduate degree; however, at least 150 applicable degree units must still be completed. The degrees available to students are the traditional engineering master's degrees offered by the School of Engineering & Applied Science and do not include interdisciplinary graduate degrees with other schools on campus.

The program is open to students who have at least 3.0 cumulative GPAs; some departments may require higher minimum cumulative GPAs. Students must apply no later than September 1 of their senior year. Approval by both the department and the dean's office is required.

Undergraduate financial support is not extended for the additional semesters to complete the master's degree requirements. Students are classified as graduate students in their final year of study, and the tuition charges are at the graduate student rate at that time.

**When to earn the BS degree**

Students can choose to earn their BS degrees at the end of their senior year or they may instead choose to defer earning their BS until they also complete their master's degree. The latter option may have financial advantages for students who do not want to earn their BS degrees early due to financial aid issues. For example, loan interest may accrue once an undergraduate degree has been earned, depending on the type and terms of the undergraduate student loan. Students should check with Student Financial Services if they have questions or concerns.

**NOTE:** If a student does opt to earn the BS degree prior to completing the master's degree, it will not restrict the student from receiving the merit-based scholarship support described below.

### Scholarship support

Scholarship support for the final year of study (the master's year of study) is automatically awarded to students who are admitted into the program. For a student who began as a freshman at Washington University, this typically would be in the student's fifth year of study. Any scholarship support given is based upon a student's major GPA that is computed at the end of the student's junior year. The major GPA is found on DARS (Degree Audit Reporting System).

Students may apply during their junior year. Admission offers will begin on September 1 of the senior year, and the major GPA at the end of the junior year will be used to determine the amount of scholarship support awarded. Award amounts vary and are granted on a graduated scale as shown below:

<table>
<thead>
<tr>
<th>Major GPA after junior year</th>
<th>Scholarship Support Given in the Final Master's Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.75-4.00</td>
<td>50% of tuition</td>
</tr>
<tr>
<td>3.65-3.74</td>
<td>45% of tuition</td>
</tr>
<tr>
<td>3.55-3.64</td>
<td>40% of tuition</td>
</tr>
<tr>
<td>3.45-3.54</td>
<td>35% of tuition</td>
</tr>
<tr>
<td>3.35-3.44</td>
<td>30% of tuition</td>
</tr>
<tr>
<td>3.25-3.34</td>
<td>25% of tuition</td>
</tr>
</tbody>
</table>
If students are enrolled at an affiliated institution, they may apply course units taken at Washington University.

A degree in engineering by attending the affiliated institution for three or four years, then completing the program with two years of concentrated engineering study at Washington University. Qualified students earn both a non-engineering baccalaureate and an engineering baccalaureate. For more information, please visit the Dual Degree Program website.

The School of Engineering & Applied Science and the Olin Business School offer a five-year program leading to the Bachelor of Science engineering degree and the Master of Business Administration degree. The purpose of the program is to provide students with the opportunity to develop an educational background particularly in demand by industry. Students should apply to this joint program by April 1st of their junior year. They must complete the application for admission to the Olin Business School, available through the business school. There is no GPA requirement, but students must take the Graduate Management Admission Test (GMAT) administered by the Educational Testing Service. Registration materials for the test may be obtained through the business school. Applicants are judged on undergraduate performance, GMAT scores, summer and/or co-op work experience, recommendations and personal interviews.

The BS/MBA student's fourth-year curriculum is composed largely of business courses. The fifth-year curriculum is divided almost evenly between business and engineering courses. Because merging of the two curricula results in very tight scheduling, it is possible that course overloads may be necessary to complete both programs in 10 semesters. Students are strongly urged to meet with their advisers to plan the remaining years of the program.

The School of Engineering & Applied Science makes available, as options within its undergraduate degree programs, curricula that prepare students for entry into medical, dental or veterinary school while they pursue the undergraduate degree. These curricula were formulated in recognition of the increasing importance in medicine of the methods and subject matter of the basic engineering sciences. The student who successfully completes one of the curricula will be well prepared for the study of medicine and will have, in addition, a solid background in engineering. Moreover, the student who decides not to go on to medical school will have an exceptionally wide selection of options, including not only those commonly open to the graduate in engineering, but also those of graduate study in biomedical engineering. In accordance with the recommendations of the school's Pre-medicine Committee, all curricula include, in addition to the normal degree requirements, the following courses:

- **Biology:** Biol 2960, Biol 2970
- **General Chemistry:** two semesters with lab
- **Organic Chemistry:** two semesters with lab
- **Psychology:** Psych 100B
- **Sociology:** AMCS 226

Many medical schools have other assorted prerequisites, which can be found in the Medical Schools Admissions Book. This
book may be purchased by going to the publications page of the Association of American Medical Colleges (AAMC) website (http://www.aamc.org).

If students are interested in attending medical or dental school, they must consult and register with the Pre-medicine Committee before the end of their sophomore year. Engineering students should contact the pre-medical adviser in Engineering Student Services, Lopata Hall, Room 303.

There is extensive detailed information concerning the Medical College Admission Test, the choice of advanced biology or chemistry courses, and the choice of medical school that should be discussed prior to the beginning of the junior year. Students requesting letters of recommendation from the Pre-medicine Committee must do so in writing by the end of the fall semester of the senior year. The Pre-medicine Committee reserves the right not to write letters for students deemed not qualified.

Engineering Summer School

The School of Engineering & Applied Science offers a variety of engineering courses each summer. Class times are varied to accommodate both traditional daytime students and those with full- or part-time employment. The Engineering Summer School calendar comprises one full eight-week evening session as well as several accelerated sessions of shorter duration.

If students are interested in enrolling in an engineering summer course, they can obtain further information, advice and registration materials in Lopata Hall, Room 204, (314) 935-5484.

University College Courses

Engineering students may only enroll in a limited number of University College courses that have been preapproved by the Engineering Undergraduate Studies Committee. Approved courses taken by students will display on official transcripts, and the course units will count toward engineering degree requirements, but the grade will not be calculated in grade point averages. Approved courses must be taken for letter grade, and students must earn a minimum grade of C- for the course units to count toward engineering degree requirements.

Current approved courses, which may be needed by students seeking admission into medical school, include:

- U29 204 Nutrition
- U29 322 Introduction to Anatomy and Physiology I
- U29 406 Introduction to Biochemistry
- U29 4170 Endocrine Physiology
- U29 4241 Immunology

Students who are required to do so may enroll in the courses listed below; these courses will display on official transcripts but the course units will not count toward engineering degree requirements:

- U15 1511 Academic Writing for Second Language Writers
- U15 199 Tutorial for English Composition

Undergraduate engineering students in their final year of study may enroll in one University College course (not listed above) each semester. These course units will not count toward graduation requirements.

Student Services

Engineering Student Services

Engineering Student Services, located in Lopata Hall, Room 303, has three main areas: Admissions, Advising Support, and Registrar. Our admissions officers work closely with the university Admissions Office to provide current and useful information to students and parents who are learning about our university, our community and the opportunities available in the School of Engineering & Applied Science. The advising staff has a comprehensive knowledge of all campus resources and can help with such items as tutoring, international studies, assistance with the registration process, and general advising. The registrar handles class scheduling, transfer and AP credit, course registration, graduation eligibility, and other student records-related processes. Engineering Student Services serves all students, faculty and staff. For an appointment, call (314) 935-6100.

Engineering Communication Center

The Engineering Communication Center offers all engineering students, faculty, and postdocs free help with their engineering communication needs. The faculty who staff the center work with individuals to define audiences and purposes, develop and organize ideas, create effective graphics and page design, and sharpen self-editing skills. Help is offered for résumés and employment correspondence, proposals, formal reports, lab reports, graduate program application statements, and presentations.

The Career Center

The Career Center helps engineering students prepare for a lifetime of career management by offering innovative approaches to help prepare them for a successful co-op, internship and job search. The Career Center offers a variety of services and resources for Engineering undergraduate and graduate students. Whether students are looking for a summer internship, a co-op or a full-time job, the center is here to help. The Career Center offers a breadth of resources, including Career Options; an online job, co-op and internship database; the Engineering Mentoring Program; Job and Internship Search Teams; special events; skill-building workshops; career fairs and on-campus interviews; and résumé referrals for job opportunities.

The Career Center offers one-on-one career guidance to students at any stage of their career-planning process. Students are encouraged to meet with a career adviser early in their academic career and at least once each year to establish a
relationship. To schedule an advising appointment, please contact (314) 935-5930 or email careers@wustl.edu or visit the website at http://careercenter.wustl.edu.

Course Descriptions

For administrative purposes, the School of Engineering & Applied Science is subdivided into five academic departments: Biomedical Engineering (E62); Computer Science & Engineering (E81); Electrical & Systems Engineering (E35); Energy, Environmental & Chemical Engineering (E44); and Mechanical Engineering & Materials Science (E37). Each department may offer courses leading to one or more bachelor’s, master’s or doctoral degrees.

The courses of instruction are numbered according to the following system:

- 100 to 199 are primarily for first-year students.
- 200 to 299 are primarily for sophomores.
- 300 to 399 are primarily for juniors.
- 400 to 499 are primarily for juniors and seniors, although certain courses may carry graduate credit.
- 500 or above are offered to graduate students and to juniors and seniors who have met all stated requirements. If there are no stated requirements, juniors and seniors should obtain permission of the instructor.

One unit of credit is given for each hour of lecture, and one unit for each two and one-half hours of laboratory. Each course description shows the course’s credit. A table of all engineering courses and, for each course, the division of its topics units is available and frequently updated on the school’s website.

First-year Program

This First-year Program is offered as a starting point for beginning students and their advisers when planning each student’s individual course schedule.

A typical first-year course load totals 14 to 16 units for each semester, and it is not wise to enroll for more than 16 units during the first semester. It may be that a load of less than 14 units is desirable. Students should enroll in the following courses:

Calculus: Beginning engineering students with previous calculus course work usually begin with Math 132 Calculus II. Students with a strong mathematics background may be ready for Math 233 Calculus III or even Math 217 Differential Equations.

Physics and/or Chemistry: If biomedical engineering or chemical engineering is a likely major, chemistry and physics should be completed during the first year; for other majors, physics is the recommended choice.

Other courses: Most first-year engineering students also enroll in one or more humanities/social sciences courses, engineering courses at the 100 level, and perhaps a computer science course. If students have a major or are strongly leaning toward a major, they should follow the recommendations for that major.

English proficiency: The English proficiency requirement must be completed as soon as possible. See Engineering Degree Requirements for further details on this requirement.

Suggested Courses for First Semester

<table>
<thead>
<tr>
<th>Units</th>
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<tbody>
<tr>
<td>Mathematics (Math 132)</td>
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<tr>
<td>Physics (Physics 117A or Physics 197)</td>
</tr>
<tr>
<td>Chemistry (Chem 111A and Chem 151)</td>
</tr>
<tr>
<td>(Biomedical Engineering, Chemical Engineering and Pre-medicine)</td>
</tr>
<tr>
<td>Humanities/social sciences elective</td>
</tr>
<tr>
<td>Engineering course(s)</td>
</tr>
</tbody>
</table>

Suggested Courses for Second Semester

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics (next course)</td>
</tr>
<tr>
<td>Physics (Physics 118A or Physics 198)</td>
</tr>
<tr>
<td>Chemistry (Chem 112A and Chem 152)</td>
</tr>
<tr>
<td>(Biomedical Engineering, Chemical Engineering and Pre-medicine)</td>
</tr>
<tr>
<td>Humanities/social sciences elective</td>
</tr>
<tr>
<td>Engineering course(s)</td>
</tr>
</tbody>
</table>

Recommended Courses

The following list recommends course sequences for each engineering major.

Biomedical Engineering: BME 140, first semester; Biol 2960, second semester.

Chemical Engineering: EECE 101, first semester.

Computer Engineering: CSE 131, first semester; CSE 132, second semester.

Computer Science: CSE 131–CSE 132, first and second semester; CSE 240, second semester.

Electrical Engineering: CSE 131 and ESE 103, first semester; ESE 260, second semester.

Mechanical Engineering: MEMS 202, first semester.
**Systems Science and Engineering:** CSE 131, first semester; Math 309, first or second semester; ESE 151 or ESE 251, second semester.

**Contact Person:** Engineering Student Services  
**Phone:** (314) 935-6100  
**Departmental website:** http://engineering.wustl.edu