SCHOOL OF ENGINEERING AND APPLIED SCIENCE

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The School of Engineering and Applied Science was organized in 1884 as the Corcoran Scientific School of Columbian University, named in honor of William W. Corcoran, president of the University's Board of Trustees from 1869 to 1888. The school was among the first to accept women for degree candidacy in engineering. While the organization and offerings of the school have evolved over the years, through most of its history its programs have been characterized by an emphasis on principles guiding the advancement of technology.

Through its five departments—Civil and Environmental Engineering, Computer Science, Electrical and Computer Engineering, Engineering Management and Systems Engineering, and Mechanical and Aerospace Engineering—the School of Engineering and Applied Science offers the Bachelor of Science, Bachelor of Arts, Master of Science, Doctor of Philosophy, and the professional degrees of Engineer and Applied Scientist. Several graduate certificate programs are offered, and combined bachelor’s/master’s degree programs are available. In cooperation with the GW Law School, an integrated engineering and law program leading to the B.S. or B.A. and J.D. is offered.

Research centers and institutes provide opportunities for student and faculty research, strengthening ties with counterparts in government and industry, and contributing to the development and harnessing of emerging technology. Extensive and varied laboratories and computing facilities support the academic programs. The School strongly supports co-curricular activities to broaden and deepen its students’ overall educational programs, including an extensive array of internship opportunities at government laboratories and private companies, both in the Washington area and elsewhere. Other opportunities are engineering-type team competitions, research projects, and the SEAS student government organization, the Engineers’ Council.

REGULATIONS

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Undergraduate Programs

Residence

Sixty credit hours must be completed in residence. Full-time students normally complete their programs in four years.

Advising

Every entering undergraduate student is assigned a professional advisor to assist in orientation in the professional discipline. Faculty advisors counsel students on their programs of study, achievement and maintenance of satisfactory scholastic performance, professional development, and extracurricular activity as part of the educational process. The advisor represents the student in all cases requiring faculty action. Students must obtain their advisor’s approval of their program of study prior to registration for each academic semester and summer session. The advisor’s approval must be obtained before registering for a course at another institution. Until the work required for the degree is completed, students must consult with their advisors in all academic matters. However, an advisor may not deny entry into any course or activity to which the student is entitled under the regulations of the School.

Assignment of Transfer Credit

Transfer students should complete a Transfer of Credit worksheet (http://www.seas.gwu.edu/forms), available in the SEAS Office of Undergraduate Student Services, Advising, and Records (http://www.seas.gwu.edu/undergraduate-student-services-advising-and-records) and present the worksheet to the faculty advisor for approval. See Admissions page for more detail on residence and transfer credit policies.

Credit by Examination

See Admissions page for information on credit assignment for College Board Advanced Placement Tests.

Makeup of Credit for Waived Courses

Waiver of a required course requires approval of the student’s faculty advisor and department chair. If a course required by the SEAS curriculum is waived, the corresponding credit hours must be earned by satisfactory completion of a university-level academic course, either technical or nontechnical, approved by the student’s faculty advisor. Only if the substituted course would normally be considered part of the student’s curriculum will the grade earned be used in determining grade-point average, Dean’s List, probation, and suspension.

Scholarship Requirements

To be eligible for graduation a student must have at least:

1. an overall grade-point average of 2.0,
2. an overall GPA of 2.0 for the program taken at SEAS, and
3. a GPA of 2.2 for technical courses required in the fifth through eighth semesters.

All computer science courses taken to meet the degree requirements of the Bachelor of Arts or Bachelor of Science in computer science are considered technical for this purpose. As part of a residency requirement, all Computer Science majors must take a minimum of 30 credits in Computer Science at GWU including courses taken during their approved study abroad program. (In determining probation, suspension, or
Dean’s List status, the grades used are for academic courses taken in fulfillment of degree requirements and not for remedial courses or those taken to make up deficiencies. For example, EAP courses and non-SEAS courses taken in excess of the number needed to fulfill degree requirements are not considered.)

Probation

Full-time students are placed on probation if their grade-point average is below 2.0 for one semester or if they receive more than one grade of F in one semester or summer session. Part-time students are placed on probation if their GPA is below 2.0 or they have received more than one grade of F after accumulating 12 credit hours; a new grading period is considered to begin once this accumulation is reached. Students on probation who earn a GPA of at least 2.0 (for 12 or more credit hours) during the semester on probation but also receive a grade of F are continued on probation; students in this category who receive two or more Fs are suspended.

Full-time students are removed from probation when the GPA is at least 2.0 with no grade of F during the semester on probation. Part-time students are removed from probation when the GPA is at least 2.0 and they receive no grade of F for the next 12 credit hours after being placed on probation.

Suspension

The following circumstances constitute grounds for suspension:

1. two grades of F any time during a probation period (part-time students who receive two grades of F while on probation will be suspended at the time of receipt of the second F);
2. four grades of F in any semester (or the equivalent for part-time students);
3. placement on probation for a third time;
4. a cumulative grade-point average of
   a. 1.5 or below at the end of four semesters of full-time enrollment at the university,
   b. 1.9 or below at the end of six semesters of full-time enrollment at the university, or
   c. below 2.0 at any time during the senior year.

Department faculty may designate additional courses to be taken and specify grades to be received by students who fail to meet but come close to meeting the graduation requirements; suspension may be held in abeyance for a stated period in this circumstance.

Students readmitted on probation will be suspended if they do not attain a minimum GPA of 2.0 during their first semester (12 or more credit hours) or if they receive more than one grade of F during the period.

Once suspended, a student may not have that suspension rescinded by a grade change at a later date, although the student may apply for readmission noting the grade change. Students who have been suspended may not apply for readmission until one year after the suspension. To be considered for readmission, a student must have undertaken academic work at another institution, primarily in mathematics, science, or engineering, during the year of suspension and earned a GPA of at least 2.7. Applications for readmission are reviewed by the respective departments.

Dean’s Honors and Commendation Lists

The names of all students who, in a given semester, take 12 or more graded credit hours in course work that applies to graduation requirements (or in any additional SEAS courses taken) may appear on the Dean’s Honors List if a grade-point average of 3.5 is achieved or on the Dean’s Commendation List if a GPA of 3.0 is achieved. No disciplinary action may have been taken against the student, and no more than one grade below B– and no grades below C– may have been earned. A student who receives a notation of I (Incomplete) during a semester will not be placed on the Dean’s Honors or Commendation List for that semester unless the I is changed to F followed by a letter grade within 30 days of the end of the marking period and the student continues to meet all the requirements for the Dean’s Honors or Commendation List.

Incompletes

Conditions under which the notation of I (Incomplete) may be assigned are described under University Regulations. If the I is not changed to F followed by a letter grade within 30 days, decisions on probation, removal from probation, and suspension will be made with the information on hand, in conformance with SEAS regulations. Although the I may remain on the record for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work (usually the final examination or required paper) must be made up. The I cannot be removed by the student’s reregistering for the course here or taking its equivalent elsewhere. An I that is not removed after one calendar year or at the time of graduation of the student, whichever occurs first, will be changed on the permanent record to a grade of IF. When the I is changed to a letter grade, the I followed by the letter grade (e.g., IB) will appear on the student’s record. The grade for which the I is changed will be applied to the grade report for the semester or summer session during which the change is made for the purposes of determining probation, suspension, grade-point average, and Dean’s and other honor lists.

Pass/No Pass Grading System

SEAS students may not take courses required for graduation on the pass/no pass (P/NP) grading system. They may, however, take courses outside their regular SEAS academic program under this grading system.

Academic Work Load

A full-time undergraduate student who is not on probation may register for no more than 21 credit hours. Students on probation may not register for more than 13 credit hours. A
student employed more than 24 hours a week may take no more than 10 credit hours. In exceptional cases these limits may be exceeded with the faculty advisor’s permission.

**Humanities and Social Sciences Electives**
With the assistance of the advisor, each student in a SEAS B.S. program chooses a set of elective courses in the humanities and social sciences. For most B.S. curricula, these normally consist of a minimum of 18 credit hours, divided equally between the humanities and social sciences. Each 9-credit group must include two courses in one subject area and a third course in a different subject area. When a foreign language is taken as part of the humanities requirement, the following rules apply:

1. the foreign language studied must not be a native language of the student, unless the courses taken are literature courses;
2. if the student has studied the language previously, he or she must first take a placement test given by the language department concerned and enroll in a course recommended by that department; and
3. the student may use at most two foreign language courses to satisfy SEAS’s humanities requirements. If two courses are used, they must be in the same foreign language.

The advisor must approve the program.

Since the SEAS curricula are, by necessity, oriented toward technical subjects, the humanities and social sciences electives should be courses that broaden the student’s outlook. Courses in areas such as anthropology, economics, foreign languages, geography, history, literature, philosophy, political science, psychology, and sociology are considered appropriate.

**Bachelor of Science Degree Programs**
Check with the department concerned for total credit requirements for the degree programs. The listed curriculums assume all electives to be at least 3 credit hours. Credit toward the degree is not allowed for LSPA courses.

**Bachelor of Arts Degree Programs**
The School of Engineering and Applied Science offers a Bachelor of Arts degree, with majors in applied science and technology and in computer science. Each program provides a strong and level base for students who intend to make their careers in fields allied to science and technology or to computer science. See the department of Computer Science for more information about its Bachelor of Arts degree and the department of Engineering Management and Systems Engineering for more information about its Bachelor of Arts degree.

**Special Programs**
Combined degree programs available to SEAS students include the B.S. and M.S. in civil engineering, mechanical engineering, and systems engineering; the B.A. or B.S. and M.S. in computer science or in cybersecurity in computer science; the B.S. in biomedical engineering, computer engineering, or electrical engineering and M.S. in biomedical engineering, computer engineering, or electrical engineering; and the B.S. in computer engineering, computer science, electrical engineering, or systems engineering and M.S. in engineering management. Also available is the B.A. in applied science and technology or computer science in SEAS and M.Ed. in secondary education (with a specialization in computer science, science, or mathematics) in the Graduate School of Education and Human Development. Specific information is available from the departments concerned.

**Integrated Engineering and Law Program**
The integrated engineering and law program provides an opportunity for very highly qualified entering students to complete a B.S. or B.A. degree in a SEAS field and then a J.D. degree, by assuring admission to the GW Law School’s J.D. program for students who meet stated conditions. Detailed information on this program is available from the Office of Undergraduate Admissions.

**Double Majors**
Students who complete the requirements for two majors in SEAS may graduate with a double major, provided the two majors are in different departments. Consult advisors in the two departments and declare both majors on the appropriate form in the SEAS Office of Student Services, Advising, and Records.

SEAS students may also pursue a second major in Columbian College of Arts and Sciences or the Elliott School of International Affairs, and Columbian College and Elliott School students may pursue a second major in SEAS, provided that permission has been obtained from the appropriate administrative office of each of the two schools.

The degree is earned from the home school, and students must complete the major in their own school in order to graduate.

In all cases, double majors do not result in two degrees. See Double Majors and Double Degrees under University Regulations.

**3:2 Dual-Degree Programs**
The School of Engineering and Applied Science has developed 3:2 dual-degree programs in liberal arts and engineering with the following institutions: Bowie State University, Gallaudet University, Hood College, Bridgewater College, St. Thomas Aquinas College, and Trinity University. Students enroll initially at one of the above institutions and pursue a three-year course of studies covering social sciences, humanities, mathematics, physics, and chemistry. They then follow a two-year program at SEAS in any of the areas of engineering or computer science offered in the School’s regular four-year programs. Upon successful completion of the two-year program at GW, students are awarded two baccalaureates: a B.S. or B.A. from the first institution and a B.S. or B.A. from GW. For further information
on the 3:2 dual-degree programs, contact the admissions offices of the institutions listed above.

Minors
The SEAS Departments of Computer Science, Electrical and Computer Engineering, Engineering Management and Systems Engineering, and Mechanical and Aerospace Engineering offer minors that are available to SEAS undergraduates whose major is not offered by that department. Depending on the student’s major, additional credit hours beyond the minimum required for the major may be necessary to complete the minor. Consult the advisor and the departments concerned.

The School offers minors in biomedical engineering, computer engineering, computer science, electrical engineering, engineering analysis, and operations research to students in other schools of the University. SEAS students are cautioned to consult their advisor and department chair before enrolling in a minor in another school of the University.

Concentration in General Business
The GW School of Business offers a concentration in general business for well-qualified SEAS undergraduates. Depending on the student’s major, additional credit hours beyond the minimum required for the major may be necessary in order to complete this concentration; students should consult their advisor before requesting to add the concentration to their program or beginning to fulfill its requirements.

Master’s Programs
Degree Programs
Fields of graduate study offered by the School of Engineering and Applied Science include biomedical engineering, civil and environmental engineering, computer engineering, computer science, electrical engineering, engineering management, mechanical and aerospace engineering, systems engineering, and (at the M.S. level only) cybersecurity in computer science, and telecommunications engineering. Degree requirements and representative areas of focus within each field are listed in subsequent pages. Within some fields, students may choose to focus their course work in other specialties as well. For information on professional and doctoral degree study in a given field, contact the department administering the field.

Entrance requirements are outlined under individual degree programs, below. The following information pertains to all SEAS graduate programs.

Transfer of Credit
With the approval of the student’s advisor and department chair, graduate credit may be transferred, when applicable, to meet degree requirements of the School. For a master’s or professional degree candidate, or a doctoral candidate whose highest earned degree is a master’s, up to 6 credit hours may be transferred. For a doctoral candidate whose highest earned degree is a bachelor’s degree, up to 24 credit hours may be transferred from another doctoral program. The credit must have been completed with grades of A or B at another accredited and recognized institution, at a level of study equivalent to that being pursued at GW. The professional and doctoral degree programs require that the credit be earned no more than five years prior to admission to the GW program, and some departments require that it be earned more recently. Credit applied toward a previous degree may not be transferred. Transfer of credit regulations apply to courses taken as a nondegree student through GW’s Office of Non-Degree Students; that is, up to 6 credit hours may be taken in non-degree status before applying for admission to degree status. For purposes of transfer of credit, SEAS graduate certificate programs are not considered prior degrees; at the discretion of the department concerned, the credit hours earned in a SEAS certificate program may be applied to a subsequent master’s degree program.

English Language Requirements for International Students
Applicants who are not citizens of countries where English is the official language or who do not hold a degree from a regionally accredited U.S. institution of higher learning are required to submit scores from the Test of English as a Foreign Language (TOEFL), the academic International English Language Testing System (IELTS), or the Pearson Test of English-Academic (PTE). Specified possible exemptions from this policy can be found at graduate.admissions.gwu.edu/english-language-requirements (http://graduate.admissions.gwu.edu/english-language-requirements). The required minimum score for admission is 550 paper-based or 80 Internet-based on the TOEFL, an overall band score of 6.0 on the IELTS with no individual band score below 5.0, or a score of 53 on the PTE. Applicants for graduate teaching assistantships must have a minimum score of 600 paper-based or 100 Internet-based on the TOEFL, an overall band score of 7.0 on the IELTS with no individual band score below 6.0, or a score of 68 on the PTE. The Department of Engineering Management and Systems Engineering requires a TOEFL score of 600 paper-based or 100 internet-based, or an overall band score of 7.0 on the IELTS with no individual band score below 6.0, or a score of 68 on the PTE.

Students with the following English language test scores are exempt from taking English for Academic Purposes (EAP) courses: TOEFL, 600 paper-based or 100 Internet-based; IELTS, overall band score of 7.0 with no individual band score below 6.0; PTE, 68. Students with test scores below these minimums must register for an EAP course during their first semester. Students assigned EAP courses should anticipate additional tuition expenses as well as a possible extended period of time required to complete their degree program. EAP courses do not count toward degree requirements.
Grades
Information on grades and computing the grade-point average is found under University Regulations.

At the option of the instructor, the notation of I (Incomplete) may be recorded if a student, for reasons beyond his or her control, is unable to complete the work of the course and if the instructor is informed of and approves such reasons before the date when grades must be reported. The I may be used only if the student’s prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course that is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded F. If acceptable reasons are later presented, the instructor may initiate an appropriate grade change. Although the I may remain on the record for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work must be made up. The I cannot be removed by the student’s reregistering for the course here or taking its equivalent elsewhere. An incomplete that is not removed within one calendar year or at the time of graduation of the student, whichever occurs first, is automatically changed to an IF. When the I is changed to a letter grade, the I followed by the letter grade (e.g., IB) will appear on the student’s record. EMSE students with two or more outstanding Incompletes are barred from further course enrollment; see Incompletes under University Regulations regarding continuous enrollment.

Credit/No Credit Grading System
SEAS students may take SEAS courses under the credit/no credit grading system, but credit for such courses cannot be applied toward any degree program in SEAS.

Program of Study
In consultation with the academic advisor, each student develops a program of study and enters it on a form that governs the student’s degree requirements and that must be approved by the advisor and department chair. The form should be established soon after matriculation and must be completed before the end of the student’s first semester.

Residence and Continuous Enrollment
All work for the degree must be done in residence unless an exception is granted by the department chair. A student in a degree program is expected to be continuously enrolled in the School until the degree is conferred. To maintain continuous enrollment, a student may register in one of the following categories.

Leave of Absence
This status is available to students who are attending classes at another institution (special approval is required); who are temporarily transferred out of the area (e.g., for military TDY); or who are having temporary medical problems. A leave of absence is usually limited to two semesters.

Continuing Research
Students who have completed their research credits, but are not yet ready to defend a thesis or dissertation, must register for 1 credit of Continuing Research each semester as appropriate.

Examination Preparation
Students who are studying for a comprehensive or qualifying exam for the current or following semester, and are not taking any courses, must register for 1 credit of Examination Preparation as appropriate. A student who breaks his or her registration must apply for readmission to the degree program under whatever conditions and regulations are in force at that time.

Master of Science
Entrance Requirements
Admission to the Master of Science degree program requires an appropriate bachelor’s degree from a recognized institution and evidence of a strong academic background and capacity for productive work in the field selected. All applicants must submit scores from the Graduate Record Examination general test, except applicants from SEAS undergraduate programs and those applying to special cohort and contract programs. In general, a grade average of B (3.0 on a scale of 4.0) in the last 60 hours of undergraduate course work is required, and most successful applicants score higher than the 90th percentile on the quantitative section of the GRE. Department-specific requirements are at the Graduate Admissions webpage (http://www.gwu.edu/gradapply).

Scholarship Requirements
Courses specified in a student’s program of study must be completed with a minimum grade-point average of 3.0 for award of a master’s degree. Courses specified upon admission as deficiency or prerequisite courses do not form part of the program of study. A student who receives two grades of F or three grades below B— is barred from further enrollment in graduate courses and, ordinarily, will not be readmitted as a degree candidate. A student may not repeat for credit a course in which he or she has received a grade of C− or above, unless required to do so by the department chair. A written statement requiring the student to repeat such a course for credit must be submitted to the registrar by the department chair.

Time Limits
A full-time student in the master’s program is allowed a maximum of three calendar years (excluding any time spent taking only English for Academic Purposes courses) to complete all degree requirements, from the date of first registration as a degree candidate in prerequisite or graduate courses. A part-time student in the master’s program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to degree candidate status or any period spent on approved leave of absence. Students on F1 or J1 visas
and students with external funding may have different time limits. Students who do not complete degree requirements within the allowed time will have their degree candidate status terminated. They may be readmitted to degree candidate status under conditions specified by the department chair and approved by the dean.

**Master’s Thesis**

The master’s thesis must demonstrate the student's ability to make independent use of the knowledge and discipline of thought acquired through graduate study, to undertake constructive work in a given field, and to communicate the results of the work in writing. Suitable work for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without faculty supervision. An accepted thesis is the property of the University.

To register for the thesis course sequence, the candidate must submit the thesis area to the appropriate department chair, on the form obtained from the department office and approved by the faculty advisor. At the beginning of the semester of expected graduation, the candidate must submit the thesis title to the dean, on the form available in the department office. While registered in the thesis course sequence, the student is entitled to the advice of the faculty member under whom the thesis is to be written. Students may consult with their advisors, but they have primary responsibility for the thesis. Students orally defend their thesis before a committee of School faculty.

The thesis in final form must be submitted by the stated deadline. In the event a thesis is unfinished on the date specified, the student must register for continuing research. The overall time limit for earning the degree (see Time Limits, above) may not be exceeded. All theses must be submitted electronically and meet the formatting and other requirements set forth on line at GW's Electronic Theses and Dissertations Submission website (http://library.gwu.edu/etds).

**Fields of Study**

Master of Science programs in the School of Engineering and Applied Science are available in the fields of biomedical engineering, civil and environmental engineering, computer engineering, computer science, electrical engineering, engineering management, mechanical and aerospace engineering, systems engineering, cybersecurity in computer science, and telecommunications engineering. Each field in turn encompasses several areas of focus. The course of study responds to the unique interests of the student, who designs an individual program in close consultation with the assigned advisor. In most areas, students follow a prescribed core and elect approved courses from within the School of Engineering and Applied Science and from other schools of the University. Because engineering expertise includes a broad foundation in technology, engineering study may profitably be combined with study in other areas to sharpen the engineer’s focus in practice. Students must satisfy, through undergraduate studies or otherwise, either the prerequisites specified for the desired field or approved equivalents.

**Professional Degrees**

The School of Engineering and Applied Science has established the professional degree program for those students who wish to pursue course work beyond the master’s degree with emphasis on applied subject matter rather than on basic research. Successful completion of the professional degree program leads to the degree of Engineer or of Applied Scientist.

Admission to study toward the professional degree requires an appropriate master's degree from a recognized institution and evidence of capacity for productive work in the field selected as indicated by prior scholarship and, where appropriate, professional experience. The Departments of Computer Science and of Electrical and Computer Engineering require applicants for the professional degree to have had two years of professional experience after receiving the master’s degree.

To study toward the degree of Engineer, an applicant must have earned a bachelor’s degree and a master’s degree in an area of engineering.

To study toward the degree of Applied Scientist, an applicant must possess a master's degree in engineering, computer science, natural science, or mathematics. Applicants who have an equivalent quantitative background may be considered as special cases by the respective departments.

Normally, a B average in graduate work is required, although the departments often set higher admission standards. Some programs have specified prerequisites. An applicant who has significant deficiencies in preparation may be required to take prescribed prerequisite courses, which do not count toward any part of the requirements for the professional degree.

The minimum program consists of 30 credit hours of approved graduate courses beyond a master's degree. Students whose prior study does not include course prerequisites may be required to take additional course work.

Programs are determined by established prerequisites and the requirements of the department in which the student wishes to study. The program of each professional degree candidate must be approved by the student’s advisor and the department chair.

Each department may require its degree candidates to undertake and defend the results of a technical design project or a development problem or to prepare a comprehensive technical report to demonstrate the candidate’s ability to make independent use of the knowledge and discipline of thought acquired through graduate study. When applicable, the student will be informed of this requirement by the faculty advisor at the time the student’s program is being formulated.
The project may not be more than 6 credit hours out of the minimum 30.

If a student studying for the professional degree receives two grades of F or three grades below B−, study is terminated and further enrollment prohibited. A student must have a final grade-point average of at least 3.0 to receive the degree. The Department of Engineering Management and Systems Engineering requires a final grade-point average of at least 3.4.

A full-time student in the professional degree program is allowed a maximum of three calendar years to complete all degree requirements, from the date of first registration as a degree candidate in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to degree candidate status or any period spent on approved leave of absence. Students who do not complete degree requirements within the allowed time will have their degree candidate status terminated. They may be readmitted to degree candidate status under conditions specified by the department chair.

Candidates for the Doctor of Philosophy degree or professional degree who are in good academic standing may, with the approval of the faculty advisor and department chair, transfer from one degree program to the other within their department if they meet the qualifications and requirements specified by the department. In the Department of Engineering Management and Systems Engineering, only one such transfer is permitted.

**Doctoral Program**

**Doctor of Philosophy**

The doctoral program is designed to prepare the student for a career of creative scholarship by providing a broad but balanced background of knowledge and guidance in the performance of research. The program is divided into two stages. The first comprises a study of related fields of learning that support the general area of research concentration and culminates in the qualifying examination. The second, composed of original research and the presentation of findings in a written dissertation, culminates in the final examination.

Admission to the Doctor of Philosophy degree program requires an appropriate earned bachelor’s or master’s degree from a recognized institution, evidence of a strong academic or relevant professional background, course work designated by the department as pertinent to the field to be studied, and capacity for research. All applicants must submit scores from the Graduate Record Examination general test, except applicants from SEAS M.S. programs. Most successful applicants score higher than the 90th percentile on the quantitative section of the GRE. Students whose highest earned degree is a bachelor’s degree must present a grade-point average of at least 3.3 on a scale of 4.0 in undergraduate work. For students whose highest earned degree is a master’s degree, departmental requirements for the grade-point average in course work leading to that degree are as follows (on a scale of 4.0): Civil and Environmental Engineering, Electrical and Computer Engineering, and Mechanical and Aerospace Engineering, 3.4; Computer Science, and Engineering Management and Systems Engineering, 3.5. Consult the department concerned for field-specific admission requirements.

Upon admission to the first stage of the program (that is, study of related fields culminating in the qualifying examination), the student is assigned a faculty advisor who directs his or her studies. In some departments a faculty committee may be appointed instead of a single advisor. Programs of study are structured to include a major field and two minor or supporting fields. Check with the department concerned for requirements.

A minimum of 30 credit hours in a formal program of study at the graduate level beyond master’s study or, for students without a master’s degree, a minimum of 54 credit hours in a formal program of study at the graduate level beyond the baccalaureate is required. These credit hours include both course credit and Dissertation Research credit. Individual requirements may vary by department; check with the department concerned. In many cases, particularly when the student undertakes a doctoral program in a field other than that in which the earlier degree was earned, the program of study exceeds the minimum number of credit hours.

Departments may establish a tool requirement, such as an examination in a computer language. Consult the department concerned for specific curriculum requirements.

If a doctoral student receives two grades of F or three grades below B−, graduate study is terminated and further enrollment prohibited. Courses in which the student earns grades below B− are not included in the total credit-hour requirement for the degree. Students who receive any grade below B− are required to review their programs of study with their advisors.

In general, one year of full-time study is the minimum amount of time to be spent in preparation for the qualifying examination, although the student may apply for the examination whenever he or she feels properly prepared. The qualifying examination must be completed within five years of the date of admission, and the entire degree program must be completed within seven years unless an extension is granted by the department. Approval of an extension is conditional on satisfactory progress. The time period for completion of the degree may be adjusted by the department for an approved leave of absence. A minimum of two years of full-time study and research should be expected in meeting the requirements for the degree. All time periods indicated here are increased by two years for a student entering the doctoral program without a master’s degree.
Full-time doctoral students must register for a minimum of 9 credits per semester until the minimum credit hours are completed, and 1 credit of Continuing Research each semester thereafter until satisfactory completion of the final examination. Part-time doctoral students must normally register for a minimum of 6 credits per semester until the minimum credit hours are completed and 1 credit of Continuing Research each semester thereafter until satisfactory completion of the final examination. No minimum load is required during the summer sessions.

**Preliminary and Qualifying Examinations**

The Department of Computer Science requires a preliminary examination that must be passed within four semesters of starting the program. It comprises material from the areas of algorithms and theory, and software and systems.

The Department of Electrical and Computer Engineering requires a preliminary examination that must be taken before completing 18 credits after initial registration. The examination is guided by but not limited to the core material of the master’s program. Specific details regarding the structure of the exam are available in the department.

To be admitted to the qualifying examination that is required of all doctoral students, the student must have at least a cumulative grade-point average of 3.2 in the Departments of Civil and Environmental Engineering and Computer Science, and of 3.4 in the Departments of Mechanical and Aerospace Engineering, Engineering Management and Systems Engineering, and Electrical and Computer Engineering.

The qualifying examination is the principal means of determining whether a student will qualify as a candidate for the doctoral degree and progress to the second stage of the program. Its purpose is to ascertain that the student's background and intellectual development are adequate to support doctoral research in the central field. (Some departments may administer a prequalifying examination prior to completion of the study program.)

Qualifying/preliminary examinations may be written or oral or both. They are conducted on dates established by the departments and are administered by a faculty committee. Upon favorable report of the examiners following the qualifying examination, the student is admitted to candidacy for the degree; the student then begins specialized study and research under the supervision of a designated member of the full-time faculty.

At the discretion of the committee that prepared the examination, a student who fails any part of the qualifying examination may be given a second opportunity to qualify for candidacy. Usually, the entire examination must be retaken.

Students who fail to qualify for candidacy in a doctoral program of the School will be considered to have failed on a school-wide basis and will not be admitted to further doctoral study within the School.

**The Dissertation and Final Examination**

The student admitted to candidacy for the degree of Doctor of Philosophy chooses the faculty member under whom he or she wishes to conduct research; the faculty member may accept or reject the request to serve as the student's director of research. The research area is approved by the director, and throughout the remainder of the doctoral program the candidate conducts dissertation research under the director. However, the student may consult other members of the faculty on an informal basis. In the Department of Engineering Management and Systems Engineering and the Department of Civil and Environmental Engineering, students are required to present a written dissertation proposal to a committee of three full-time faculty members and to successfully defend the proposal in an oral defense prior to performing the bulk of their dissertation research. Work on the dissertation encompasses a minimum of 12 to 24 credit hours, depending upon the department concerned.

The dissertation should embody the results of an extended original study and include material deemed worthy of publication in recognized scientific and engineering journals. The student is expected to attempt to have the results of the research published as soon as possible after he or she receives the degree and to submit copies of the published material to the dean. The Department of Computer Science requires that at least one article be accepted for publication by a refereed conference or journal prior to completion of degree requirements. The Department of Engineering Management and Systems Engineering requires that an article be accepted for review by a refereed journal prior to completion of degree requirements. The Department of Electrical and Computer Engineering requires the submission of a paper to a refereed journal and its acceptance for publication prior to the completion of degree requirements. Credit must be given in the publication to the fact that the material is abstracted, summarized, or developed from a dissertation submitted to The George Washington University in partial fulfillment of the requirements for the Doctor of Philosophy degree.

All dissertations must be submitted electronically and meet the formatting and other requirements set forth online at GW's Electronic Theses and Dissertations Submission website (http://library.gwu.edu/etds). Regulations regarding the form of the dissertation and preparation of the abstract are available in department offices. The dissertation, with accompanying files, becomes the property of the University.

Upon acceptance of the dissertation by the research committee, the candidate is presented for the final examination. The final examination is oral and is open to the public. The candidate must demonstrate a mastery of the special field of study and of the materials and techniques used in the research. The committee of examiners may include qualified experts brought to the University especially
to participate in the examination. The director of research usually serves as advocate for the candidate. Students should consult department regulations concerning the formation of the committee and scheduling of the examination. When the examining committee is convinced of the quality and originality of the candidate’s contribution to knowledge as well as his or her mastery of the scholarship and research techniques of the field, the committee recommends the candidate for the degree of Doctor of Philosophy. Students completing their degree program should refer to the section on Graduation Requirements, Participation in the Commencement Ceremony, under University Regulations.

UNDERGRADUATE

Bachelor’s programs

• Bachelor of Arts with a major in applied science and technology (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/engineering-management-systems/bs-applied-science-technology)
• Bachelor of Arts with a major in computer science (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/computer-science/ba)
• Bachelor of Science with a major in biomedical engineering (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/electrical-computer-engineering/bs-biomedical-engineering)
• Bachelor of Science with a major in civil engineering (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/civil-environmental-engineering/bs-civil-engineering)
• Bachelor of Science with a major in civil engineering, environmental engineering option (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/civil-environmental-engineering/bs-civil-engineering/environmental)
• Bachelor of Science with a major in civil engineering, medical preparation option (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/civil-environmental-engineering/bs-civil-engineering/medical-preparation)
• Bachelor of Science with a major in civil engineering, sustainability engineering option (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/civil-environmental-engineering/bs-civil-engineering/sustainability)
• Bachelor of Science with a major in civil engineering, transportation engineering option (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/civil-environmental-engineering/bs-civil-engineering/transportation)
• Bachelor of Science with a major in computer engineering (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/electrical-computer-engineering/bs-computer-engineering)

GRADUATE

Master’s programs

• Master of Science in the field of civil and environmental engineering (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/civil-environmental-engineering/ms)
• Master of Science in the field of biomedical engineering (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/biomedical-engineering)
• Master of Science in the field of computer science (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/computer-science/ms)
• Master of Science in the field of computer engineering (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/computer-engineering)
• Master of Science in the field of cybersecurity in computer science (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/computer-science/ms-cybersecurity)
• Master of Science in the field of electrical engineering (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/electrical-engineering)
• Master of Science in the field of engineering management and systems engineering (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/engineering-management-systems/ms)
• Master of Science in the field of mechanical and aerospace engineering (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/mechanical-aerospace-engineering/ms)
• Master of Science in the field of telecommunications engineering (http://bulletin.gwu.edu/archives/2014-2015/engineering-applied-science/telecommunications-engineering)

**Doctoral program**


**CERTIFICATES**

The School of Engineering and Applied Science offers graduate certificate programs in several fields. At the discretion of the respective departments, credit earned in the certificate program can be applied to a subsequent master's degree program. Scholarship requirements are the same as those for the master's degree program. Details are available in the Office of the Dean.

• Graduate certificate in computer-integrated design in mechanical and aerospace engineering
• Graduate certificate in computer security and information assurance
• Graduate certificate in emergency management and public health
• Graduate certificate in energy engineering and management
• Graduate certificate in engineering and technology management
• Graduate certificate in enterprise information assurance
• Graduate certificate in environmental engineering
• Graduate certificate in geoenvironmental engineering
• Graduate certificate in high-performance computing
• Graduate certificate in homeland security emergency preparedness and response

• Graduate certificate in knowledge and information management
• Graduate certificate in structural engineering
• Graduate certificate in systems engineering
• Graduate certificate in transportation engineering

**COURSES**

**Explanation of Course Numbers**

• Courses in the 1000s are primarily introductory undergraduate courses
• Those in the 2000-4000s are upper-division undergraduate courses that can also be taken for graduate credit with permission and additional work
• Those in the 6000s and 8000s are for master’s, doctoral, and professional-level students
• The 6000s are open to advanced undergraduate students with approval of the instructor and the dean or advising office
• Applied Sciences (APSC) (http://bulletin.gwu.edu/archives/2014-2015/courses/apsc)
• Civil Engineering (CE) (http://bulletin.gwu.edu/archives/2014-2015/courses/ce)
• Computer Science (CSCI) (http://bulletin.gwu.edu/archives/2014-2015/courses/csci)
• Electrical and Computer Engineering (ECE) (http://bulletin.gwu.edu/archives/2014-2015/courses/ece)
• Mechanical and Aerospace Engineering (http://bulletin.gwu.edu/archives/2014-2015/courses/mae)
• School of Engineering and Applied Sciences (http://bulletin.gwu.edu/archives/2014-2015/courses/seas)