

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

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The School of Engineering and Applied Science (SEAS) 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, throughout most of its history its programs have been characterized by an emphasis on principles guiding the advancement of technology.

The School offers the bachelor of arts, bachelor of science, master of engineering, master of science, doctor of engineering, doctor of philosophy, and the professional degrees of engineer and applied scientist through its six departments—Biomedical Engineering, Civil and Environmental Engineering, Computer Science, Electrical and Computer Engineering, Engineering Management and Systems Engineering, and Mechanical and Aerospace Engineering. In addition, the School offers several graduate certificate programs, as well as dual bachelor's/master's degree programs.

Research centers and institutes provide opportunities for students and faculty to strengthen ties with counterparts in government and industry and contribute 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 in the Washington, DC, area and elsewhere. Other co-curricular opportunities include engineering-type team competitions, research projects, and the SEAS student government organization, the Engineers' Council.

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until graduation, the faculty advisor and professional advisor work together to ensure the student's success.

Faculty advisors advise students on and approve the following requests, among others:

- All course substitutions, course waivers, minor declarations, and changes in curriculum.
- Elective courses within their major.
- Courses taken through the consortium.
- Petitions for exceptions to an academic policy.

Faculty advisors also provide support and consultation for students on their program of study, including majors and minors, course planning, and career guidance.

Mathematics Placement Exam

All incoming first-year students are required to take a mathematics proficiency examination, administered through the Department of Mathematics, which places students in either MATH 1220 or MATH 1231. Additional information is available on the mathematics placement exam website (<https://math.columbian.gwu.edu/gw-mathematics-placement-test/>).

Makeup of Credit for Waived Courses

Waiver of a required course requires the approval of the student's faculty advisor and department chair. If a course required by the SEAS curriculum is waived, the corresponding credits must be earned by satisfactory completion of a university-level academic course, either technical or non-technical, approved by the student's faculty advisor. The grade earned will be used in determining the SEAS GPA only if the substituted course would normally be considered part of the student's curriculum.

Scholarship Requirements

To be eligible for graduation an undergraduate SEAS student must have:

- A minimum overall GPA of 2.0.
- A minimum overall GPA of 2.0 in their SEAS program.
- A minimum GPA of 2.2 for technical courses (see below).
- Completed all degree and University General Education requirements.

Technical Grade-Point Average

What constitutes a technical course is determined by each program. For applied science and technology, biomedical engineering, civil engineering, computer engineering, electrical engineering, mechanical engineering, and systems engineering majors, all technical courses taken during the fifth through eighth semesters as outlined on each program's four-year curriculum sheet and approved by the student's faculty advisor, are counted towards the student's technical GPA. Current and archived curriculum sheets are available from SEAS departments.

As of fall 2014, for the BA and BS programs in computer science, all CSCI courses count toward the student's technical GPA.

Each student is assigned a curriculum year, with its own set of requirements, based either on the time of matriculation at GW or

University Regulations

All SEAS students are required to review the University Regulations (<https://bulletin.gwu.edu/university-regulations/>) as outlined in the Bulletin, as they are responsible for understanding and adhering to this document.

Undergraduate Programs

Advising

The School of Engineering and Applied Science (SEAS) uses an integrated advising model where students are assigned both professional and faculty advisors. Every undergraduate student entering SEAS is assigned a professional advisor to support them throughout their time in SEAS. First-year students are assigned a faculty advisor during the spring of their first year. From that point

time of declaring a major. For students who choose to update their curriculum year to a more recent one, courses that apply toward their technical GPA can change. The same is true for students who change their SEAS major. Students should consult their faculty advisor before making any changes to their academic plans.

Incompletes

Additional information is available under Incompletes in the University Regulations (<https://bulletin.gwu.edu/university-regulations/>). In addition, SEAS students must get an incomplete agreement in writing by completing a Request for an Incomplete form (<http://www.seas.gwu.edu/forms/>) with the instructor.

Pass/No Pass Grading System

SEAS students cannot take any course that is graded on a *P* (Pass)/*NP* (No Pass) basis and have that course apply toward any SEAS degree requirement. However, students can take courses outside of their SEAS academic program on a *P/NP* basis with the approval of the instructor and the SEAS Associate Dean for Undergraduate Studies so long as that course is not applied toward any SEAS degree requirement. However, under no circumstances can a student change from *P/NP* status to graded status, or vice versa, after the end of the eighth week of class during the fall and spring semesters or after the end of the third week of class during each summer session.

Academic Workload

SEAS adheres to all academic workload regulations outlined under University Regulations (<https://bulletin.gwu.edu/university-regulations/>). In exceptional cases, these limits can be exceeded with the faculty advisor's approval.

General Education Requirement

All undergraduate students are required to fulfill Tier One of the University General Education (<https://bulletin.gwu.edu/university-regulations/general-education/>) requirement. Many of the general education requirements are required for completion of your major requirements or electives.

- One course in quantitative reasoning (must be in mathematics or statistics)
- One course in scientific reasoning (must be in natural and/or physical laboratory sciences)
- Two courses in critical thinking, quantitative reasoning, or scientific reasoning in the social sciences
- One course in critical thinking in the humanities
- UW 1020 University Writing
- Six credits distributed over at least two Writing in the Discipline (WID) courses taken in separate semesters. WID courses are designed by a "W" appended to the course number.
- One course that has an approved oral communication component. (See Oral Communication Requirement, below.)

A complete list of approved University General Education courses is available on the SEAS Undergraduate Student Services and Advising website (<https://www.seas.gwu.edu/university-general-education/>).

Non-Technical Elective Requirement

SEAS undergraduate students are required to complete a specific number of non-technical elective courses, which varies by major. The details of this requirement are outlined in this Bulletin under the respective major.

Students in all majors must take at least 6 credits (two courses) in critical thinking, quantitative reasoning, or scientific reasoning in the social sciences and at least 3 credits (one course) in critical thinking in the humanities, selected from the list of courses approved for the University General Education Requirement (<https://bulletin.gwu.edu/university-regulations/general-education/>). These courses count toward both the non-technical elective requirement and the University General Education requirement.

Unless stated otherwise in an individual major program's degree requirements, each additional non-technical, 3-credit elective course must be selected from the following pre-approved categories:

- GPAC/University General Education: Critical thinking in the humanities
- GPAC/University General Education: Critical thinking, quantitative reasoning, or scientific reasoning in the social sciences
- GPAC: Creative or critical thinking in the arts
- GPAC: Global or cross-cultural perspectives
- GPAC: Local or civic engagement
- GPAC/University General Education: Oral communication
- One or more of the following courses: PHIL 2135, SOC 1001, PSYC 1001

Faculty advisors can approve additional non-technical course options that are not required to satisfy the University General Education requirement. However, any course approved to satisfy the non-technical elective requirement must be in a non-technical area of study and cannot include courses in scientific disciplines, mathematics, or courses that focus on technology.

When a foreign language course is taken as part of the non-technical elective requirement, the following rules apply:

- The foreign language studied cannot be the student's native language unless the courses taken are literature courses.
- If the language has been studied previously, students must take a placement test given by the appropriate language department. This is to determine the level of the language the students should enroll in.

University General Education Oral Communication Requirement
SEAS bachelor of science students will fulfill the University General Education requirement for oral communication by completing their program's capstone design course sequence, as these courses are assessed regularly for SEAS standard accreditation processes. SEAS students in degree programs that do not require a capstone design

course sequence must take an oral communication course from the list of approved University General Education courses.

Department Orientation Course Requirement

All SEAS undergraduate programs require completion of their major department's orientation course. These courses are BME 1010 Introduction to Biomedical Engineering, CE 1010 Introduction to Civil and Environmental Engineering, CSCI 1010 Computer Science Orientation, ECE 1010 Introduction to Electrical and Computer Engineering I, EMSE 1001 Introduction to Systems Engineering, and MAE 1001 Introduction to Mechanical and Aerospace Engineering. SEAS students who have not yet declared a major take APSC 1001 Introduction to Engineering for Undeclared Majors. If a student changes majors within SEAS, the orientation course taken in their original SEAS department can be counted toward this requirement.

Bachelor of Science Degree Programs

Students should consult the department concerned for total credit requirements for the degree programs. The listed curricula assume that all elective courses are offered for at least 3 credits. Credits for Lifestyle, Sport, and Physical Activity (LSPA) courses cannot be counted toward the degree.

Bachelor of Arts Degree Programs

SEAS 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 computer science. The curriculum requirements for these programs can be viewed under the Undergraduate tab in this section of the Bulletin. The listed curricula assume that all elective courses are offered for at least 3 credits. Credits for Lifestyle, Sport, and Physical Activity (LSPA) courses cannot be counted toward the degree.

Special Programs

DUAL DEGREE PROGRAMS

The School of Engineering and Applied Sciences (SEAS) offers a variety of dual (5-year) bachelor of science/master of science (BS/MS) degree programs. Such programs are available to any undergraduate student in SEAS who meets the eligibility requirements outlined by each dual program. A comprehensive list of dual programs, as well as eligibility requirements and deadlines, is available on the SEAS website (<https://graduate.seas.gwu.edu/five-year-program/>). Admission to a dual BS/MS degree program requires a bachelor of science degree from SEAS recognized in the SEAS Regulations section in this Bulletin. In general, a minimum overall GPA of 3.0 (on a 4.0 scale) in the BS program is required. Some programs might have additional technical GPA requirements, such as those in which the MS degree is in computer science, cybersecurity, or data analytics; additional information is available on the program websites. Interested undergraduate students must submit a statement of purpose and a minimum of two letters of recommendation, which can be from the student's advisor, faculty member(s), and/or workplace supervisor. Additional information is available on the SEAS Office of Graduate Admissions and Student Services (<https://graduate.seas.gwu.edu/>) website.

Double Major

In addition to the regulations governing double majors found under University Regulations (<https://bulletin.gwu.edu/university-regulations/>), the following regulations and requirements pertain:

DOUBLE MAJOR WITHIN THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Students in the School of Engineering and Applied Science (SEAS) who complete the requirements for two SEAS majors can graduate with a double major, provided the majors are in different departments and are both bachelor of science degrees; the major in civil engineering is not offered as a second major. Students must fulfill all major requirements for both degrees as outlined in this Bulletin and must receive approval by their faculty advisor and double major faculty advisor and submit a Declaration of Double Major form.

In addition, any SEAS student wishing to complete a double major within SEAS must fulfill the following requirements:

- Due to ABET accreditation, the completion of a distinct number of major specific credits/courses for each major must be met and approved by respective major departments.
- Completion of two capstone projects, one for each major, following registration for the two capstone course sequences approved by the major departments.

DOUBLE MAJOR GRADUATION GPA CRITERIA FOR SEAS STUDENTS

To satisfactorily complete a double major with any two engineering/computer science majors, a SEAS student must have a minimum grade-point average of 2.2 in all technical engineering/computer science courses and a 2.0 overall GPA in courses required for the double major. Additional information regarding how this GPA is calculated is available under the Technical GPA section.

To satisfactorily complete a double major with an engineering/computer science major as the second major, all students whose primary degree is from outside of SEAS must have a minimum grade-point average of 2.2 in all technical engineering/computer science courses and a 2.0 overall in courses required for the double major. Additional information about how this GPA is calculated is available in the Technical GPA section.

DOUBLE MAJOR IN TWO SCHOOLS: PRIMARY SEAS MAJOR AND A MAJOR FROM A NON-SEAS SCHOOL

SEAS students also can pursue a double major with a program in another school of the University, following all school and University guidelines. The requirements for each major outlined in this Bulletin must be fulfilled. SEAS students must consult both their SEAS faculty advisor and an advisor in the department offering the second major. To officially declare a double major in another school, SEAS students must complete a Declaration of Double Major form and have it approved by both their SEAS faculty advisor and the second major department advisor.

DOUBLE MAJOR IN TWO SCHOOLS: PRIMARY NON-SEAS MAJOR AND A MAJOR FROM SEAS

Undergraduate students pursuing a bachelor of science degree outside of SEAS as their primary degree can declare a double major with the following SEAS majors: biomedical engineering, computer

science (BS)*, computer engineering, electrical engineering, mechanical engineering, and systems engineering. Such students must fulfill all requirements for the BS in an engineering or computer discipline, which includes SEAS general, major, technical elective, humanities/social science, and technical GPA requirements.

Undergraduate students pursuing a non-BS primary degree (e.g., BA, BFA, BSHS) can pursue a double major with the following SEAS majors: biomedical engineering, computer science (BA), computer engineering, electrical engineering, mechanical engineering, and systems engineering; the majors in applied science and technology and in civil engineering are not offered as second majors. Students with a non-BS primary degree must fulfill all requirements for the bachelor of science degree in an engineering discipline, which includes SEAS general, major, technical elective, humanities/social science, and technical GPA requirements. The one exception is the BA in computer science, which allow for slightly different requirements.

GRADUATION GPA CRITERIA FOR NON-SEAS MAJORS

To satisfactorily complete a double major with an engineering/computer science discipline as the second major, all students—BS or non-BS—whose primary degree is outside of SEAS, must have a minimum grade-point average of 2.2 in all technical engineering/computer science courses and a minimum overall GPA of 2.0 in required courses required for the double major. Additional information about how this GPA is calculated is under the Technical GPA section.

DEGREE CONFERRAL FOR NON-SEAS MAJORS

The degree is conferred by the home school and students must complete the major in their own school in order to graduate. In no case will a double major result in two degrees. Additional information regarding double degrees is available in the University Regulations (<https://bulletin.gwu.edu/university-regulations/>) and SEAS Regulations.

*The double major in computer science (BA or BS) is a limited enrollment program and the Department of Computer Science has specific requirements that must be met before a student whose primary major is outside SEAS will be allowed to declare either a BS or BA degree as their second major.

Double Degree

Any SEAS student pursuing a double degree must meet all eligibility requirements outlined under Double Degree (<https://bulletin.gwu.edu/university-regulations/>) in University Regulations. They also must:

- Complete SEAS double degree application
- Provide a course plan approved by both primary and second-degree departments.
- Receive approval from both the primary and second-degree programs' Dean's offices.

In addition, a SEAS student wanting to complete a double degree within SEAS must:

- Complete a distinct number of major-specific credits/courses for each major, and approved by respective major departments, in accordance with ABET accreditation requirements.
- Complete two capstone projects, one for each major, with registration in the two capstone course sequences approved by the major departments.

Minors

The School of Engineering and Applied Science offers a variety of minor programs, including biomedical engineering, computer engineering, computer science, electrical engineering, mechanical engineering, operations research, and systems engineering to all students. The School can require students to meet certain eligibility requirements to declare the minor. SEAS students can only declare a minor outside their department and must consult their faculty advisor before enrolling in a minor in another school of the University.

SEAS students who wish to officially declare a minor should complete a Declaration of Minor form, which must be signed by both their SEAS faculty advisor and the minor department advisor. Depending on the student's major, additional credits beyond the minimum required for the minor can be required. Students from schools other than SEAS should email seasadvising@gwu.edu for more information about requirements and eligibility criteria, before requesting to declare a minor through the department.

Graduate Programs

Degree Programs

At the master's level, fields of study leading to the master of engineering (MEng) degree include artificial intelligence and machine learning, cloud computing management, cybersecurity analytics, and cybersecurity policy and compliance. Fields of study leading to the master of science (MS) degree include applied computer science, biomedical engineering, civil and environmental engineering, computer engineering, computer science, cybersecurity in computer science, data analytics, electrical engineering, engineering management, mechanical and aerospace engineering, and systems engineering.

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

Registration Forms

If a student is required to submit a registration form, they must fill out a registration transaction form (RTF) (https://graduate.seas.gwu.edu/sites/g/files/zaxdzs1526/f/downloads/reg_transaction_form2019.pdf), including required signatures, and submit the completed form to their academic department for processing. SEAS graduate students cannot submit an RTF-EZ form for course registration.

Transfer of Credit

With the approval of the student's advisor and department chair, graduate credit earned at a level of study equivalent to that being pursued at GW can 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 credits can be transferred. For a doctoral candidate whose highest earned degree is a bachelor's, i.e., those considered to be direct entry, up to 24 credits can be transferred. In all cases, credits must have been completed with a minimum GPA of 3.0 at another accredited and recognized institution. 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 previously earned degree cannot be transferred.

Transfer of credit regulations apply to courses taken as a non-degree student through GW's Office of Non-Degree Students; that is, up to 6 credits can 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 credits earned in a SEAS certificate program can be applied to a subsequent master's degree program. However, credit earned in a master's or doctoral program cannot be applied to a certificate program after graduation if all requirements for the certificate have been met. Students can transfer in two courses, but they will need to successfully complete the remaining courses for the certificate. The SEAS Online programs do not allow course transfers.

Double-Counting Courses

SEAS master's students admitted into a dual undergraduate/graduate degree program (<https://graduate.seas.gwu.edu/five-year-program/>) can count two or three courses, depending on the master's program, from the undergraduate degree toward the master's degree. An undergraduate course cannot be counted toward more than one graduate certificate or degree program or toward any future program in which the student enrolls.

Statute of Limitations on Previously Earned Credit

SEAS graduate students who have not been enrolled in an academic program for five years or more cannot count courses taken more than five years prior to beginning a GW degree program. An academic program or department can require courses to have been completed in a time frame of fewer than five years prior. This policy is consistent with the SEAS Transfer Credit policy.

English Language Requirements for International Students

Applicants 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), the Pearson Test of English-Academic (PTE), or the Duolingo English Test (DET). Additional information regarding possible exemptions from this possibility is available on the SEAS Office of Graduate Admissions and Student Services (<http://graduate.seas.gwu.edu/admissions-requirements/>) website. 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, a score of 53 on the PTE, or a score of 115 on the DET. The Department of Engineering Management and Systems Engineering requires those applying to the master of science in engineering management program to have a TOEFL score of 577 paper-based or

90 internet-based, or an overall band score of 6.5 on the IELTS with no individual band score below 6.0, a score of 60 on the PTE, or a score of 120 on the DET.

Undergraduate and graduate international students who are admitted but whose test scores fall below 100 (TOEFL), 7.0 (IELTS), 68 (PTE), or 130 (DET) are required to take one or more courses in the English for Academic Purposes (EAP) Program. Both undergraduate and graduate students receive credit for EAP courses; however, in most cases, graduate EAP credits cannot be applied to a degree. Graduate students placed in EAP courses should anticipate additional tuition expenses as well as possible extension of time needed to complete their degree programs. Additional information is available on the English for Academic Purposes Program (<https://eap.columbian.gwu.edu/>) website.

Grades and Grade-Point Average

Information on grades and computing the grade-point average (GPA) can be found under University Regulations (<https://bulletin.gwu.edu/university-regulations/>).

Incompletes

The grade of Incomplete (I) is reserved for exceptional circumstances such as an illness, an accident, a family emergency, or another extraordinary life challenge that makes it impossible for a student to complete the course requirements. As soon as possible after the qualifying event, a student should request an Incomplete from the faculty instructor for the course in question. The request must be submitted prior to the last day of classes for the course. Any course in which a student fails to complete the work of the course and does not provide the instructor with a satisfactory explanation before the date when grades must be turned in will be graded F.

To be eligible for an Incomplete, a student must have satisfactorily completed, passed, and attended the majority of the course. The faculty member will determine if the student has met an acceptable threshold for the course to qualify for an Incomplete. Faculty members will thoughtfully review the request, keeping in mind the circumstances for which an I grade is appropriate. The faculty member is not required to offer an Incomplete to the student. If they do decide to grant a student an I, the student must submit a contract for incomplete course grade. The faculty member must outline and provide details for the specific remaining coursework that will need to be completed along with a timeline for completion. Although the I can 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. Once the student receives an I, they must arrange to fulfill all the terms of the contract for incomplete course grade with the faculty member.

A student cannot have an I removed by re-taking or re-registering for the same course at GW or taking the same course equivalent elsewhere. Students cannot register for a course the course with the I grade is a prerequisite for, until terms for the Incomplete are satisfied, unless given an exception from the instructor of that course. An Incomplete that is not removed by the end of the contract is automatically changed to the grade of F (Failure). When the I is changed to a letter grade, the I will be replaced by the letter grade on the transcript. All SEAS graduate students with two or more

outstanding Incompletes are barred from further course enrollment; see Incompletes under University Regulations regarding continuous enrollment. As per the continuous enrollment policy, international students studying on an F-1 visa could be required to return to their home country and reapply for a visa to complete the incomplete course(s).

Additional information regarding the Incomplete policy is available on the Office of Graduate Admissions and Student Services website. (<https://graduate.seas.gwu.edu/incomplete-policy-process/>)

Credit/No Credit Grading System

SEAS students can take SEAS courses on a *Credit/No Credit* basis, but credit for such courses cannot be applied toward any degree program in SEAS. This excludes general research courses, dissertation research, and continuing research courses that are taken as *Credit/No Credit*.

Residence and Continuous Enrollment

All work for master's, doctoral, and certificate programs must be completed in residence unless an exception is granted by the department chair. Students in a degree program are expected to be continuously enrolled in the school until the degree is conferred. See Continuous Enrollment, below.

LEAVE OF ABSENCE

A degree student who finds it necessary to interrupt active pursuit of the degree for reasons such as temporary transfer out of the area for military TDY or temporary medical problems can petition their advising office for a leave of absence for a specific period, generally limited to one calendar year. A degree student who discontinues active enrollment in degree studies without being granted a leave of absence, or a student granted a leave who does not return to active study at the close of the period of approved absence, must apply for readmission and be subject to the regulations and requirements then in force. The right to use of University facilities is suspended while the leave is in effect. Students on an F-1 visa who request a leave of absence must return to their home country. Such students should consult with the International Services Office (<https://internationalservices.gwu.edu/>) for further guidance.

CONTINUOUS ENROLLMENT

A student who has completed their research credits but is not yet ready to defend a thesis or dissertation must register for 0 or 1 credits of SEAS 0920 Continuing Research - Master's or SEAS 0940 Continuing Research - Doctoral each semester as appropriate in order to maintain their active student status. Students on an F-1 visa must register for UNIV 0920 or UNIV 0940 in addition to SEAS 0920 or SEAS 0940. Such students should consult with the International Services Office for questions regarding maintaining their visa status.

Once entered in a degree program, a student is expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until such time as the degree is conferred. A student is considered to be continuously enrolled when registered for courses through GW or when registered for continuous enrollment and engaged in and appropriately registered for activities such as the following, with the prior approval of the school: cooperative work semester;

study abroad; attendance at another institution with prior approval to have the work transferred back to the GW program; completion of outstanding work in courses in which a grade of Incomplete or In Progress was received; or non-course instructional activities unique to the particular school. This status is generally limited to one year. Should the student break continuous enrollment at the University and not request and be granted a leave of absence (see above), they must apply for readmission and, if granted, be subject to the requirements and regulations then in force.

CONTINUING RESEARCH

A student who has completed their research credits but is not yet ready to defend a thesis or dissertation must register for 0 or 1 credits of SEAS 0920 Continuing Research - Master's or SEAS 0940 Continuing Research - Doctoral each semester as appropriate in order to maintain their active student status. Students studying on an F-1 visa must register UNIV 0920 Continuous Research - Master's or UNIV 0940 Continuous Research - Doctoral in addition to SEAS 0920 or SEAS 0940. Such students should consult with the International Services Office for questions regarding maintaining their visa status.

Students who have completed their research credits but are not yet ready to defend a thesis or dissertation must register for 1 credit of SEAS 0920 or SEAS 0940 each semester as appropriate.

Examination Preparation

Students who are studying for a comprehensive or qualifying examination for the current or following semester, and are not taking any courses, must register for SEAS 0930 as appropriate. A student who breaks their registration must apply for readmission to the degree program under whatever conditions and regulations are in force at that time.

Concurrent Master Of Science and Doctoral Programs

SEAS master's and doctoral programs are considered separate and unique programs with different course requirements and expectations. Students enrolled in a doctoral program cannot receive the doctoral and a master's degree concurrently, even if they have met the requirements for the master's degree. Courses counted toward a master's degree cannot be counted toward a doctoral program if the student has successfully completed the master's program and graduated. PhD students must fulfill the course and dissertation research requirements as outlined in the program requirements in this Bulletin. SEAS students cannot register for a master's or doctoral program in SEAS and a degree program in another GW school simultaneously; however, they can enroll in one graduate certificate program in SEAS or in another GW school.

Master of Science Degree

The master of science degree is offered in the fields of applied computer science, biomedical engineering, civil and environmental engineering, computer engineering, computer science, cybersecurity in computer science, data analytics, electrical engineering, engineering management, mechanical and aerospace engineering, and systems 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 an assigned advisor.

In most areas, students follow a prescribed core and approved elective courses from within SEAS and from other schools of the University. Because engineering expertise includes a broad foundation in technology, engineering students can profit from study in other academic areas to sharpen their focus in practice. Students must satisfy, through undergraduate studies or otherwise, either the prerequisites specified for the desired field or approved equivalents. Applicants can apply to a master of science degree program for a fall, spring, or summer start term. Enrollment for the summer session can be limited.

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. In general, a minimum GPA of 3.0 (on a 4.0 scale) in the last 60 credits of undergraduate coursework is recommended. Students must submit a statement of purpose and a minimum of two letters of recommendation, which can be from the student's advisor, faculty member(s) from the institution where the highest degree was earned, and/or workplace supervisor. Additional information is available on the SEAS Office of Graduate Admissions and Student Services (<https://graduate.seas.gwu.edu/>) website.

DUAL DEGREE PROGRAMS

The School of Engineering and Applied Sciences offers a variety of dual undergraduate/graduate degree programs, which are available to any student who meets the eligibility requirements outlined by the program in question. A comprehensive list of programs, eligibility requirements, and deadlines is available under Undergraduate Programs (p. 13). Admission to the dual BS/MS degree program requires an appropriate bachelor's degree from SEAS. In general, a minimum GPA of 3.0 (on a 4.0 scale) is required. Students must submit a statement of purpose and a minimum of two letters of recommendation, which can be from the student's advisor, faculty member(s) from the institution where the highest degree was earned, and/or workplace supervisor. Additional information is available on the SEAS Office of Graduate Admissions and Student Services (<https://graduate.seas.gwu.edu/>) website.

GRADUATION AND SCHOLARSHIP REQUIREMENTS

To meet graduation requirements, courses specified in a student's program of study must be completed with a minimum GPA of 3.0. This is in addition to the requirements specified for graduation under University Regulations. Courses specified upon admission as deficiency or prerequisite courses do not form part of the program of study. Students who receive two grades of *F* or three grades below *B*– are barred from further enrollment in graduate courses and will not be readmitted as a degree candidate. Students cannot repeat for credit a course in which they have received a minimum grade of *C*–, unless required to do so by the department chair. A written statement requiring a student to repeat such a course for credit must be submitted to the registrar by the department chair. Additional information is available under University Regulations (<https://bulletin.gwu.edu/university-regulations/>).

TIME LIMITS

Full-time students in the master's program are allowed a maximum of three calendar years from the date of first registration as a degree candidate in prerequisite or graduate courses to complete all degree requirements; this time limit excludes any time spent taking English for Academic Purposes courses only. Part-time students in the master's program are 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 an approved leave of absence. Students on F1 or J1 visas and students with external funding can have different time limits. Students who do not complete degree requirements within the allowed time will have their degree candidate status terminated. They can 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 a 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 can 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, students must submit their advisor-approved thesis area to the appropriate department chair. While registered in the thesis course sequence, students are entitled to the advice of the faculty member under whom the thesis is to be written. Students can consult with their advisors, but they have primary responsibility for their own thesis. Students defend their thesis orally before a committee of SEAS faculty members.

The thesis in final form must be submitted by the ETD deadline. In the event a thesis is unfinished on the date specified, the student must register for SEAS 0920. The overall time limit for earning the degree (see Time Limits, above) cannot be exceeded. All theses must be submitted electronically and meet the formatting and other requirements set forth on GW's Electronic Theses and Dissertations Submission website (<http://library.gwu.edu/etds/>). Additional information regarding thesis requirements and dates can be found under University Regulations (<https://bulletin.gwu.edu/university-regulations/>).

Master of Engineering Degree

The master of engineering (MEng) program is designed primarily for working professionals who wish to enhance their career path. The degree is offered in the fields of artificial intelligence and machine learning, cloud computing management, cybersecurity analytics, and cybersecurity policy and compliance. These programs provide an avenue for students to acquire diverse skill sets and distinguish themselves either in their profession or facilitate a career change. The program of study can be interdisciplinary and involve topics and courses from various engineering disciplines, including computer science and public policy, among others. Students must

satisfy, through undergraduate studies or otherwise, either the prerequisites specified for a desired field or approved equivalents.

ENTRANCE REQUIREMENTS

Admission to the master of engineering degree (MEng) 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.

In general, a minimum GPA of 3.0 (on a 4.0 scale) in the last 60 credits of undergraduate coursework is recommended. Applicants (<https://onlinecybersecurity.seas.gwu.edu/admissions/>) for the MEng in the field of cybersecurity policy and compliance must submit the following: An up-to-date resume; three letters of recommendation, at least one of which must come from a professional reference; and evidence of work experience in an IT field if they do not hold a degree in a technical discipline. Additional information is available on the SEAS Office of Graduate Admissions and Student Services (<https://graduate.seas.gwu.edu/>) website. Applicants can apply to an MEng degree program for a fall, spring, or summer start term. Enrollment for the summer session can be limited.

GRADUATION AND SCHOLARSHIP REQUIREMENTS

To meet graduation requirements, courses specified in a student's program of study must be completed with a minimum GPA of 3.0. This is in addition to the requirements specified for graduation under University Regulations (https://bulletin.gwu.edu/university-regulations/#Eligibility_graduation). Courses specified upon admission as deficiency or prerequisite courses do not form part of the program of study. Students who receive two grades of *F* or three grades below *B* are barred from further enrollment in graduate courses and will not be readmitted as a degree candidate in SEAS. Students cannot repeat for credit a course in which they have received a minimum grade of *C*, unless required to do so by the department chair. A written statement requiring a student to repeat such a course for credit must be submitted to the registrar by the department chair. Additional information is available under University Regulations.

TIME LIMITS

All MEng (CPC) cohort students must complete the program in three 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 an approved leave of absence. Students on F1 or J1 visas and students with external funding can have different time limits. Students who do not complete degree requirements within the allowed time will have their degree candidate status terminated. They can be readmitted to degree candidate status under conditions specified by the department chair and approved by the dean.

Graduate Certificates

ENTRANCE REQUIREMENTS

Admission to SEAS certificate programs 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 provide an online application, statement of purpose, and resume and/or curriculum

vitae. In general, a minimum GPA of 3.0 (on a 4.0 scale) in the last 60 credits of undergraduate coursework is recommended. Certificate applicants are not required to submit letters of recommendation. Applicants can apply to a graduate certificate program for a fall, spring, or summer start term. Enrollment in the summer session can be limited. Additional information is available on the SEAS Office of Graduate Admissions and Student Services (<https://graduate.seas.gwu.edu/>) website.

GRADUATION AND SCHOLARSHIP REQUIREMENTS

An overall minimum GPA of 3.0 in courses taken as part of a certificate program must be achieved for the certificate to be granted. In general, courses completed with a grade below *B* do not count toward a SEAS certificate. For most certificates offered by the Departments of Computer Science and Electrical and Computer Engineering, courses completed with grades below *B* do not count toward a certificate. Additional information regarding graduation requirements can be found under University Regulations, Eligibility for Graduation (<https://bulletin.gwu.edu/university-regulations/>).

Students who receive two grades of *F* or three grades below *B* in the certificate program are barred from further enrollment in graduate courses and will not be readmitted as a candidate. Students cannot repeat for credit a course in which they have received a grade of *C* or below unless required to do so by the department chair. In such cases a written statement requiring the student to repeat the course for credit must be submitted to the Registrar by the department chair.

Courses specified upon admission as deficiency or prerequisite courses are not considered part of the program of study. Courses completed in any undergraduate degree program cannot be counted toward a graduate certificate. If a student has successfully completed a master's or PhD program, they cannot retroactively apply for a graduate certificate program and use all previously completed courses to fulfill all requirements for that certificate. They can count one or two courses completed in the master's or PhD program toward a graduate certificate, depending on the degree, but all other course requirements must be completed while enrolled in the certificate program. No course can be used to fulfill the requirements of more than one certificate program. In the event a student has already completed all courses required for the certificate they can work with their faculty advisor to identify course substitutions to count toward the certificate.

At the discretion of the respective departments, credit earned in a certificate program at GW can be applied toward a subsequent master's degree program.

Additional information is available on the SEAS Office of Graduate Admissions and Student Services (<https://graduate.seas.gwu.edu/>) website.

COUNTING COURSES TOWARD GRADUATE CERTIFICATE PROGRAMS

Courses taken while enrolled in a master's or doctoral program cannot be counted toward the requirements for more than one graduate certificate.

A student with a master's or doctoral degree conferred by GW can transfer in up to two previously completed courses to a graduate certificate program but they must successfully complete the remaining courses while in the certificate program. A student who has already taken all required courses for the certificate as part of their degree program can work with their faculty advisor to identify course substitutions for the certificate.

Courses specified upon admission as deficiency or prerequisite courses do not form part of the program of study. Courses completed in an undergraduate degree program cannot be counted toward a graduate certificate. A student who has successfully completed a master's or doctoral program cannot retroactively apply for a graduate certificate program and use all previously completed courses to fulfill all requirements for that certificate. Students can count one or two courses completed in the master's or doctoral program toward a graduate certificate, depending on the certificate and degree program in question, but all other course requirements must be completed while enrolled in the certificate program. No course can be used to fulfill the requirements of more than one certificate program.

At the discretion of the respective departments, credit earned in a GW certificate program can be counted toward the requirements for a subsequent master's degree.

Professional Degrees

The SEAS professional degree programs are designed for those students who wish to pursue coursework beyond the master's degree with an emphasis on applied subject material rather than on basic research. Successful completion of the professional degree program leads to the degree of either engineer or applied scientist.

For admission to the degree of engineer, an applicant must have earned both a bachelor's and master's degree in an area of engineering. For 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 can be considered as special cases by the respective departments.

ENTRANCE REQUIREMENTS

For admission to the degree of engineer, an applicant must have earned both a bachelor's and master's degree in an area of engineering. For 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 can be considered as special cases by the respective departments. Applicants can apply to a professional degree program for a fall, spring, or summer start term. Enrollment can be limited for the summer session. Additional information is available on the SEAS Office of Graduate Admissions and Student Services (<https://graduate.seas.gwu.edu/>) website.

Entrance requirements can vary by department within SEAS. A minimum GPA of 3.0 in graduate work is usually required, although individual departments often set higher admission standards. Some programs have specified prerequisites. An applicant who has significant deficiencies in preparation can be required to take

prerequisite courses, which do not count toward any part of the requirements for the professional degree. The Departments of Computer Science and Electrical and Computer Engineering require applicants for the professional degree to have had two years of professional experience after receiving the master's degree. Additional information regarding entrance and application requirements is available under Master's Degree.

GRADUATION AND SCHOLARSHIP REQUIREMENTS

The professional degree programs consist of a minimum of 30 credits in approved graduate-level courses beyond a master's degree. Programs of study are determined by established prerequisites and the requirements of the department in which the student wishes to enroll. The student's program must be approved by the faculty advisor and the department chair. Departments can require degree candidates to undertake and defend the results of a technical design project or 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 is informed of this requirement by the faculty advisor at the time when the student's program is being formulated. The project cannot account for more than 6 credits.

If a student studying for a professional degree receives two grades of *F* or three grades below *B-*, study is terminated and further enrollment prohibited. A student must have a minimum GPA of 3.0 in order to receive the degree.

TIME LIMITS

A full-time student in a professional degree program is allowed a maximum of three calendar years from the date of first registration as a degree candidate in prerequisite or graduate courses to complete all degree requirements. A part-time student 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 an approved leave of absence. Students who do not complete degree requirements within the allowed time will have their degree candidate status terminated. Such students can be readmitted to degree candidate status under conditions specified by the department chair.

TRANSFER BETWEEN DEGREE PROGRAMS

Candidates for the professional or doctor of philosophy degree who are in good academic standing can, upon application and subsequent 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 Degrees

DOCTOR OF PHILOSOPHY

The doctoral program is designed to prepare students for careers 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 a qualifying examination; the second comprises original research and the presentation of findings in a written dissertation, which culminates in a final examination.

ENTRANCE REQUIREMENTS

Admission to the PhD program requires an appropriate bachelor's or master's degree from a recognized institution, evidence of a strong academic or relevant professional background, coursework designated by the department as pertinent to the field to be studied, and capacity for research. Except for applicants from SEAS BS and MS programs, applicants must submit scores from the Graduate Record Examination (GRE) general test. GRE requirements can vary by program or entry term. Updated information regarding GRE requirements is available on the SEAS Office of Graduate Admissions and Student Services (<https://graduate.seas.gwu.edu/>) website. All applicants must submit a minimum of three letters of recommendation, at least one of which should be from the advisor and/or faculty members at the institution(s) from which a degree was earned. Students for whom the bachelor's is the highest earned degree must have a minimum GPA of 3.3 (on a 4.0 scale) in undergraduate work. For students for whom the master's is the highest earned degree, departmental requirements for the GPA in coursework leading to that degree are as follows (on a 4.0 scale): 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. Field-specific admission requirements are available on departmental websites. Applicants can apply to a PhD program for a fall, spring, or summer start term. Enrollment for the summer session can be limited. Additional information is available on the SEAS Office of Graduate Admissions and Student Services (<https://graduate.seas.gwu.edu/>) website.

GRADUATION AND SCHOLARSHIP REQUIREMENTS

Upon admission to the first stage of the program—study of related fields culminating in the qualifying examination—students are assigned a faculty advisor who directs their studies. In some departments, a faculty committee can be appointed instead of a single advisor. Additional information regarding requirements is available on the department websites.

For students who enter the program with a master's degree, the formal program of study consists of a minimum of 30 graduate-level credits. For students who enter with a bachelor's degree only, the program of study consists of a minimum of 54 graduate-level credits. These credits include both course and dissertation research credit. Individual requirements can vary by department. 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 credits stated above. Departments can establish a tool requirement, such as an examination in a computer language. Additional information regarding specific curriculum requirements is available on the departmental websites.

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 earned grades below *B*- are not

included in the total credit requirement for the degree. Students who receive any grade below *B*- must review their programs of study with their advisors. Additional information regarding graduation and scholarships requirements for distance learning doctorates are available on the doctor of engineering in engineering management (<https://online.engineering.gwu.edu/online-doctor-engineering-engineering-management/>) and doctor of philosophy in systems engineering (<https://seasonline.gwu.edu/doctoral-degrees/doctor-of-philosophy/>) program websites.

GRADUATION AND DISSERTATION DEFENSE

SEAS PhD students must defend their dissertation and upload it prior to the Electronic Theses and Dissertations (ETD) deadline for the semester in which they intend to graduate. Students should defend their dissertation several weeks prior to the ETD deadline to allow for time to make editorial changes suggested by their defense committee. PhD students must be registered for courses in their final semester to graduate. Students cannot defend their dissertation and then register for courses in a subsequent semester to prolong their program.

TIME LIMITS

In general, one year of full-time study is the minimum amount of time needed to prepare for the qualifying examination. Additional information regarding specific timelines and regulations is available on the individual departments' websites. In general, the qualifying examination must be completed within five years of the date of admission unless specified otherwise by the department. The entire degree program must be completed within seven years unless the department grants an extension. Approval of an extension is conditional on satisfactory progress. The period for completion of the degree can be adjusted by the department for an approved leave of absence. The degree program is expected to include a minimum of two years of full-time study and three years of research. All time periods indicated here are increased by two years for students 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 number of credits are completed, and 1 credit in SEAS 0940 each semester thereafter until satisfactory completion of the final examination. Part-time doctoral students usually register for a minimum of 6 credits per semester until the minimum number of credits is completed, and 1 credit of SEAS 0940 each semester thereafter until satisfactory completion of the final examination. No minimum workload is required during the summer session unless the student is an F-1 visa holder who begins their program in a summer term.

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 GW 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, students must have a minimum cumulative GPA of 3.2 in the Departments of Civil and Environmental Engineering and Computer Science, and of 3.4 in the Departments of Biomedical Engineering, Electrical and Computer Engineering, Engineering Management and Systems Engineering, and Mechanical and Aerospace 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 whether the student's background and intellectual development are adequate to support doctoral research in the central field.

Preliminary and qualifying examinations can be written or oral or both. Additional information regarding specific guidelines is available on the departments' websites. The examinations 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, students are admitted to candidacy for the degree. Students then begin 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, students who fail any part of the qualifying examination can 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.

DISSERTATION

Students admitted to candidacy for the degree of doctor of philosophy choose the faculty member under whom they wish to conduct research. The faculty member can accept or reject the request to serve as the student's director of research. The research area must be approved by the director, under whom the candidate conducts dissertation research throughout the remainder of the doctoral program. Students can consult other members of the faculty on an informal basis. In the Departments of Engineering Management and Systems Engineering and 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 credits, depending on the department.

The dissertation should embody the results of extended original study and include material deemed worthy of publication in recognized scientific and engineering journals. Students are expected to attempt to have the results of the research published as soon as possible after they receive 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; additional information is available on the doctor of philosophy in systems engineering program (<https://seasonline.gwu.edu/doctoral-degrees/doctor-of-philosophy/>) website. 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 PhD.

All dissertations must be submitted electronically and meet the formatting and other requirements set forth 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 can include qualified experts brought to the University especially to participate in the examination. The director of research usually serves as an 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 sections on Eligibility for Graduation and Participation in the Commencement Ceremony under University Regulations (<https://bulletin.gwu.edu/university-regulations/>).

DOCTOR OF ENGINEERING

The doctor of engineering (DEng) program addresses the widespread need for practitioners who can apply the knowledge they gain in the program of study within a business or technical environment, wherein the constant challenge is to create useful applications of the latest engineering principles and lead organizations that are occupied in this work.

The doctor of engineering degree is offered online in three fields of knowledge: artificial intelligence and machine learning, cybersecurity analytics, and engineering management. Additional information is available on the online program website (<https://seasonline.gwu.edu/doctoral-degrees/doctor-of-engineering/>). The DEng program is also offered on-campus.

DOCTOR OF ENGINEERING IN THE FIELD OF ENGINEERING MANAGEMENT

The doctor of engineering (Deng) in engineering management (EM) program demands that research be applied to the solution of a real-world problem using the latest engineering concepts and tools—in other words, research toward the DEng program is applied, rather than basic. Its purpose is to empower students who are likely to be practicing engineers to create advanced, practice-based solutions.

Admission to the DEng (EM) program requires a bachelor's and master's degrees from accredited institutions in engineering, applied science, mathematics, computer science, business administration, or information technology; a minimum of two college-level calculus courses passed with grades of *B*- or above; and a minimum graduate-level GPA of 3.2 (on a 4.0 scale). Applicants can apply to the DEng program for a fall, spring, or summer start term. Enrollment can be limited for the summer session. Additional information is available on the SEAS Office of Graduate Admissions and Student Services (<https://graduate.seas.gwu.edu/>) website.

The DEng (EM) program consists of 45 credits divided into a classroom phase of 10 graduate-level, three-credit courses, and a research phase during which a practice-based case study is undertaken on a topic related to engineering management, chosen by the student and approved by the adviser. Research for the case study comprises 15 credits. Prospective students are advised to contact the Engineering Management and Systems Engineering Department for additional information.

Additional information is available on the SEAS online program website (<https://seasonline.gwu.edu/doctoral-degrees/doctor-of-engineering/>) or in this Bulletin (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/doctor-engineering-management/>) for the on-campus program.

DEPARTMENTS

Departments

- Biomedical Engineering (<https://bulletin.gwu.edu/engineering-applied-science/biomedical-engineering/>)
- Civil and Environmental Engineering (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/>)
- Computer Science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/>)
- Electrical and Computer Engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/>)
- Engineering Management and Systems Engineering (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/>)
- Mechanical and Aerospace Engineering (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/>)

UNDERGRADUATE

Bachelor's programs

- Bachelor of Arts with a major in computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/ba/>)
- Bachelor of Science with a major in biomedical engineering (<https://bulletin.gwu.edu/engineering-applied-science/biomedical-engineering/bs/>)
- Bachelor of Science with a major in civil engineering (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/bs-civil-engineering/>)
- Bachelor of Science with a major in civil engineering, environmental engineering option (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/bs-civil-engineering/environmental/>)
- Bachelor of Science with a major in computer engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/bs-computer-engineering/>)
- Bachelor of Science with a major in computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/bs/>)
- Bachelor of Science with a major in electrical engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/bs-electrical-engineering/>)
- Bachelor of Science with a major in electrical engineering, energy option (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/bs-electrical-engineering/energy/>)
- Bachelor of Science with a major in electrical engineering, medical preparation option (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/bs-electrical-engineering/medical-preparation/>)
- Bachelor of Science with a major in mechanical engineering (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/bs-mechanical-engineering/>)
- Bachelor of Science with a major in mechanical engineering, aerospace option (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/bs-mechanical-engineering/aerospace/>)
- Bachelor of Science with a major in mechanical engineering, biomechanical option (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/bs-mechanical-engineering/biomechanical/>)
- Bachelor of Science with a major in mechanical engineering, medical preparation option (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/bs-mechanical-engineering/medical-preparation/>)
- Bachelor of Science with a major in mechanical engineering, patent law option (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/bs-mechanical-engineering/patent-law/>)

- Bachelor of Science with a major in mechanical engineering, robotics option (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/bs-mechanical-engineering/robotics/>)
- Bachelor of Science with a major in systems engineering (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/bs-systems-engineering/>)

Minors

- Minor in biomedical engineering (<https://bulletin.gwu.edu/engineering-applied-science/biomedical-engineering/minor/>)
- Minor in computer engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/minor-computer-engineering/>)
- Minor in computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/minor/>)
- Minor in data analytics for decisions (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/data-analytics-for-decisions-minor/>)
- Minor in electrical engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/minor-electrical-engineering/>)
- Minor in engineering management (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/minor-engineering-management/>)
- Minor in mechanical engineering (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/minor-mechanical-engineering/>)
- Minor in operations research (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/minor-operations-research/>)
- Minor in systems engineering (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/minor-systems-engineering/>)

Combined programs

- Dual Bachelor of Arts or Bachelor of Science in various majors and GW School of Business Master's degree (<http://bulletin.gwu.edu/business/dual-ba-bs-and-business-masters/>)
- Dual Bachelor of Arts with a major in computer science and Master of Science in the field of computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/combined-ba-ms-computer-science/>)
- Dual Bachelor of Arts with a major in computer science and Master of Science in the field of cybersecurity in computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/combined-ba-ms-cybersecurity/>)
- Dual Bachelor of Science with a major in biomedical engineering and Master of Science in the field of biomedical engineering (<https://bulletin.gwu.edu/engineering-applied-science/biomedical-engineering/combined-bs-ms-biomedical-engineering/>)

- Dual Bachelor of Science with a major in biomedical engineering and Master of Science in the field of computer engineering (<https://bulletin.gwu.edu/engineering-applied-science/biomedical-engineering/combined-bs-biomedical-engineering-ms-computer-engineering/>)
- Dual Bachelor of Science with a major in biomedical engineering and Master of Science in the field of computer science (<https://bulletin.gwu.edu/engineering-applied-science/biomedical-engineering/combined-bs-biomedical-engineering-ms-computer-science/>)
- Dual Bachelor of Science with a major in biomedical engineering and Master of Science in the field of electrical engineering (<https://bulletin.gwu.edu/engineering-applied-science/biomedical-engineering/combined-bs-biomedical-engineering-ms-electrical-engineering/>)
- Dual Bachelor of Science with a major in civil engineering and Master of Science in the field of civil and environmental engineering (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/combined-bs-ms-environmental-engineering/>)
- Dual Bachelor of Science with a major in civil engineering and Master of Science in the field of structural engineering (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/combined-bs-ms-structural-engineering/>)
- Dual Bachelor of Science with a major in civil engineering and Master of Science in the field of transportation engineering (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/combined-bs-ms-transportation-engineering/>)
- Dual Bachelor of Science with a major in computer engineering and Master of Science in the field of computer engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/combined-bs-ms-computer-engineering/>)
- Dual Bachelor of Science with a major in computer engineering and Master of Science in the field of electrical engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/combined-bs-computer-engineering-ms-electrical-engineering/>)
- Dual Bachelor of Science with a major in computer science and Master of Science in the field of computer engineering (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/combined-ba-ms-computer-engineering/>)
- Dual Bachelor of Science with a major in computer science and Master of Science in the field of cybersecurity in computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/combined-bs-ms-cybersecurity/>)
- Dual Bachelor of Science with a major in computer science and Master of Science in the field of cybersecurity in computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/combined-bs-ms-cybersecurity/>)
- Dual Bachelor of Science with a major in electrical engineering and Master of Science in the field of computer engineering

- (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/combined-bs-electrical-engineering-ms-computer-engineering/>)
- Dual Bachelor of Science with a major in electrical engineering and Master of Science in the field of electrical engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/combined-bs-ms-electrical-engineering/>)
- Dual Bachelor of Science with a major in mechanical engineering and Master of Science in the field of mechanical and aerospace engineering (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/combined-bs-ms-mechanical-engineering/>)
- Dual Bachelor of Science with a major in mechanical engineering and Master of Science in the field of electrical engineering (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/combined-bs-ms-electrical-engineering/>)
- Dual SEAS Bachelor of Science majors and Master of Science in the field of computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/combined-seas-bs-ms-computer-science/>)
- Dual SEAS Bachelor of Science majors and Master of Science in the field of cybersecurity in computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/combined-seas-bs-ms-cybersecurity/>)
- Dual SEAS Bachelor of Science majors and Master of Science in the field of data analytics (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/combined-seas-bs-data-analytics-ms/>)
- Dual SEAS Bachelor of Science majors and Master of Science in the field of engineering management (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/combined-seas-bs-ms-engineering-management/>)
- Dual SEAS Bachelor of Science majors and Master of Science in the field of systems engineering (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/combined-seas-bs-ms-systems-engineering/>)

- Master of Engineering in the field of cybersecurity analytics (<https://bulletin.gwu.edu/engineering-applied-science/cybersecurity-analytics-meng/>) (online)
- Master of Engineering in the field of cybersecurity policy and compliance (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/cybersecurity-policy-and-compliance-meng/#text>) (online)
- Master of Science in the field of applied computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/ms-applied-computer-science/>)
- Master of Science in the field of biomedical engineering (<https://bulletin.gwu.edu/engineering-applied-science/biomedical-engineering/ms/>)
- Master of Science in the field of civil and environmental engineering (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/ms/>)
- Master of Science in the field of computer engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/computer-engineering/>)
- Master of Science in the field of computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/ms/>)
- Master of Science in the field of cybersecurity in computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/ms-cybersecurity/>)
- Master of Science in the field of data analytics (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/data-analytics-ms/>)
- Master of Science in the field of electrical engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/electrical-engineering/>) (on-campus)
- Master of Science in the field of electrical engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/electrical-engineering-online/>) (online)
- Master of Science in the field of engineering management (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/engineering-management-ms/>) (on-campus)
- Master of Science in the field of engineering management (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-ms-online/>) (online)
- Master of Science in the field of mechanical and aerospace engineering (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/ms/>)
- Master of Science in the field of systems engineering (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/systems-engineering-ms/>) (on-campus)
- Master of Science in the field of systems engineering (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/systems-engineering-ms-online/>) (online)

MASTER'S

Master's programs

Programs listed are offered on-campus only unless otherwise indicated.

- Master of Engineering in the field of artificial intelligence and machine learning (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/artificial-intelligence-and-machine-learning-meng/>) (online)
- Master of Engineering in the field of cloud computing management (<https://bulletin.gwu.edu/engineering-applied-science/cloud-computing-management-meng/>) (online)

DOCTORAL

Doctoral programs

Programs listed are offered on-campus only unless otherwise indicated.

- Doctor of Engineering in the field of artificial intelligence and machine learning (<https://bulletin.gwu.edu/engineering-applied-science/artificial-intelligence-and-machine-learning-deng/>) (online)
- Doctor of Engineering in the field of cybersecurity analytics (<https://bulletin.gwu.edu/engineering-applied-science/cybersecurity-analytics-deng/>) (online)
- Doctor of Engineering in the field of engineering management (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/doctor-engineering-management/>) (on-campus)
- Doctor of Engineering in the field of engineering management (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/doctor-engineering-management-online/>) (online)
- Doctor of Engineering in the field of systems engineering (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/doctor-systems-engineering/>) (on-campus)
- Doctor of Engineering in the field of systems engineering (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/doctor-systems-engineering-online/>) (online)
- Doctor of Philosophy in the field of biomedical engineering (<https://bulletin.gwu.edu/engineering-applied-science/biomedical-engineering/phd/>)
- Doctor of Philosophy in the field of civil and environmental engineering (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/phd/>)
- Doctor of Philosophy in the field of computer engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/phd-computer-engineering/>)
- Doctor of Philosophy in the field of computer science (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/phd/>)
- Doctor of Philosophy in the field of electrical engineering (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/phd-electrical-engineering/>)
- Doctor of Philosophy in the field of engineering management (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/phd-engineering-management/>) (on-campus)
- Doctor of Philosophy in the field of engineering management (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/doctor-philosophy-engineering-management-online/>) (online)

- Doctor of Philosophy in the field of mechanical and aerospace engineering (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/phd/>)
- Doctor of Philosophy in the field of systems engineering (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/phd-systems-engineering/>) (on-campus)
- Doctor of Philosophy in the field of systems engineering (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/phd-systems-engineering-online/>) (online)

CERTIFICATES

Certificate programs

In general, courses completed with a grade below *B*- do not count toward a SEAS certificate. For certificates offered by the Computer Science and Electrical and Computer Engineering departments, courses completed with grades below *B* do not count toward a certificate. An overall minimum GPA of 3.0 in courses taken as part of the certificate program must be achieved for the certificate to be granted.

At the discretion of the respective departments, credit earned in a certificate program may be applied toward a subsequent master's degree program.

Additional information is available from the Office of the Dean.

Graduate certificate programs

- Artificial Intelligence and Machine Learning (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/artificial-intelligence-machine-learning-certificate/>)
- Business crisis, continuity, and recovery management (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/business-crisis-continuity-recovery-management-certificate/>)
- Computer-integrated design in mechanical and aerospace engineering (<https://bulletin.gwu.edu/engineering-applied-science/mechanical-aerospace-engineering/certificate-computer-integrated-design/>)
- Computer security and information assurance (<https://bulletin.gwu.edu/engineering-applied-science/computer-science/certificate-computer-security-information-assurance/>)
- Cybersecurity (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/certificate-cybersecurity/>)
- Emergency management and homeland security (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/energy-management-homeland-security-certificate/>)
- Emergency management and public health (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/emergency-management-public-health-certificate/>)

- Energy engineering and management (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/energy-engineering-management-certificate/>)
- Energy systems management (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/energy-systems-management-certificate/>)
- Engineering and technology management (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/engineering-technology-management/>)
- Environmental engineering (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/environmental-engineering/>)
- Environmental systems management
- Geoenvironmental engineering (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/geoenvironmental-engineering/>)
- High-performance computing (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/certificate-high-performance-computing/>)
- Machine intelligence: frameworks, systems, and applications (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/certificate-machine-intelligence/>)
- Smart cities and transportation (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/smart-cities-transportation/>)
- Structural engineering (<https://bulletin.gwu.edu/engineering-applied-science/civil-environmental-engineering/structural-engineering/>)
- Systems engineering (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/systems-engineering-certificate/>)
- Systems engineering (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/systems-engineering-certificate-online/>) (online)
- Trustworthy AI for decision making systems (<https://bulletin.gwu.edu/engineering-applied-science/engineering-management-systems-engineering/trustworthy-ai-for-decision-making-systems-certificate/>)
- 5G and beyond (<https://bulletin.gwu.edu/engineering-applied-science/electrical-computer-engineering/5g-and-beyond-certificate/>)
- 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 Science (APSC) (<https://bulletin.gwu.edu/courses/apsc/>)
- Biomedical Engineering (BME) (<https://bulletin.gwu.edu/courses/bme/>)
- Civil Engineering (CE) (<https://bulletin.gwu.edu/courses/ce/>)
- Computer Science (CSCI) (<https://bulletin.gwu.edu/courses/csci/>)
- Electrical and Computer Engineering (ECE) (<https://bulletin.gwu.edu/courses/ece/>) (<https://bulletin.gwu.edu/courses/ece/>)
- Engineering Management and Systems Engineering (<https://bulletin.gwu.edu/courses/emse/>) EMSE (<https://bulletin.gwu.edu/courses/emse/>)
- Mechanical and Aerospace Engineering (<https://bulletin.gwu.edu/courses/mae/>) MAE (<https://bulletin.gwu.edu/courses/mae/>)
- School of Engineering and Applied Sciences (<https://bulletin.gwu.edu/courses/seas/>) SEAS (<https://bulletin.gwu.edu/courses/seas/>)

COURSES

Explanation of Course Numbers

- Courses in the 1000s are primarily introductory undergraduate courses
- Those in the 2000s to 4000s are upper-level undergraduate courses that can also be taken for graduate credit with permission and additional work assigned