



Computer Engineering

Computer Systems and Electrical Engineering concentrations

MS Graduate Handbook

2023-2024

MANUAL OF THE MS DEGREE IN
COMPUTER ENGINEERING

ARIZONA STATE UNIVERSITY

<http://cen.engineering.asu.edu>

Computer Engineering (Computer Systems) graduate degrees please contact:

School of Computing and Augmented Intelligence
Arizona State University
PO Box 878809
Tempe, AZ 85287-8809
PHONE: (480) 965-3199
E-mail addresses-
Prospective Students: Scai.grad.admission@asu.edu
Continuing Students: Scai.grad.tempe@asu.edu

Computer Engineering (Electrical Engineering) graduate degrees please contact:

School of Electrical, Computer and Energy Engineering
Arizona State University
PO Box 875706
Tempe, AZ 85287-5706
PHONE: (480) 965-3424
E-mail address: eceegrad@asu.edu

Introduction to the Computer Engineering Program	5
Objective of the Handbook	5
Student Responsibility and Resources	5
Faculty Responsibility	6
Admission and Eligibility to the MS Degree Programs	6
Eligibility	6
GPA Requirement	6
Application	6
Application Deadlines	6
GRE Scores	7
English Proficiency	7
Personal Statement	7
Letters of Recommendation – (Optional)	7
Application Evaluation	7
Recommended Academic Preparation	7
Notice of Admission	8
Pre-admission Credits and Transfer Credit	8
Transferring Between Programs	8
4+1 Accelerated Bachelor’s/Master’s program	8
MS Degree Requirements	9
Summary of Degree Requirements	9
Elective Courses	10
CEN 590 Reading and Conference	10
Culminating Experience for MS Non-Thesis Students – Portfolio	11
Culminating Experience for MS Thesis Students – Written and Oral Defense	11
CEN 584 Internship (Curricular Practical Training)	13
Optional Practical Training (OPT)	15
Academic probation policies and status	15
General Information	17
Diversity, Inclusion, And Indigenous Land Acknowledgement	17
Title IX	18
Financial Assistance and/or Fellowships	18
Continuous Enrollment	18
Leave of Absence	19
Maximum Time Limit	19
Registration requirements for RA’s and TA’s	19

Academic Integrity	20
Engineering Student Organizations and student clubs	20
Appendix I	21
Random Signal Analysis (ASU Course: EEE 350)	21
Discrete Mathematics (ASU Course: MAT 243)	21
Digital Signal Processing (ASU Course: EEE 203)	22
Computer Architecture & Organization (ASU Course: CSE 230)	22
Algorithms and Data Structures (ASU Course: CSE 310)	23

Introduction to the Computer Engineering Program

Computer Engineering is a multi-disciplinary program that builds on the fundamentals of Computer Science, Electrical Engineering, Applied Mathematics, and Physical Sciences. Graduates of this program will have the knowledge and skills necessary to advance the design, system integration, testing, evaluation and deployment of state-of-the-art hardware and software for systems that include computing, communications, and networking (wired and wireless), control functions, sensing, signal processing, and actuation.

The MS degree program is intended for students that want to gain deeper knowledge beyond the bachelor's degree level and obtain sufficient knowledge for designing and implementing state-of-the-art systems in research and development positions. The program is also appropriate for students contemplating future PhD study and desiring to gain experience in research. MS graduates may work under the direction of scientists and engineers in high tech lab settings, assisting in developing innovative products and systems that require strong foundational knowledge in the underlying sciences and the ability to synthesize and analyze engineering principles as they relate to the development of new computer engineering technology.

Objective of the Handbook

The purpose of this handbook is to provide guidance and information related to admission, degree requirements, and general policies and procedures. Please note that in some cases, you will find differences between the Graduate College's Policies and Procedures and the Computer Engineering (CEN) Program requirements. In these cases, CEN has established higher standards. Students must satisfy both sets of requirements. Please note that policies and procedures are occasionally amended to improve the program. Changes will be communicated to students via email.

Student Responsibility and Resources

All students are expected to become familiar with the university and the program policies and procedures and abide by the terms set forth. Information is available both online and by hardcopy upon request. Most importantly, you should visit the following websites:

- [Graduate College](#)- visit the section on policies and procedures.
- [The Schedule of Classes](#)
- [The Computer Engineering Program](#)
- [The International Student and Scholars Center](#) if applicable.
- [The Ira A. Fulton Schools of Engineering](#)
- Maintain [academic integrity](#) standards per the [ASU Student Code of Conduct](#)
- ["Graduate Wellness Resources"](#) – a one-page guide to Financial, Social, Emotional, and Physical Health and Wellness Resources for ASU Graduate Students, developed by the GPSA.

- “[10 Best Practices in Graduate Student Wellbeing](#)” – proven ways to help graduate students better care for themselves under the increasing demands of graduate school.

Faculty Responsibility

The members of the faculty of Computer Engineering have diverse backgrounds and knowledge. They are available to guide you in your plan of study and your educational and career goals. We encourage you to take the opportunity to make individual appointments with faculty members with whom you have common interests. Please refer to the list of the faculty names, areas of expertise, and research interest on the [Computer Engineering website](#).

Admission and Eligibility to the MS Degree Programs

The Computer Engineering MS degree requires a background in engineering, sciences or closely related fields. However, in some cases, students with non-traditional educational backgrounds will be considered for admission. These students may be required to take foundational courses to better prepare for the graduate coursework. A student is encouraged to contact a graduate advisor in the respective concentration Advising Center to obtain advice on their educational pursuits.

Eligibility

A minimum of a bachelor’s degree (or equivalent) or a graduate degree from a regionally accredited College or University of recognized standing in a related field such as Computer Engineering, Computer Systems Engineering, Electrical Engineering, and Computer Science.

GPA Requirement

To be considered for the MS program, we require a minimum of a 3.00 cumulative GPA (scale is 4.0) in the last 60 hours of a student’s first bachelor’s degree program.

Application

All students are required to submit an application with Graduate Admission and pay the required fee to have their application properly processed.

Application Deadlines

December 31 for Fall and August 15 for Spring. Students can apply through the [Graduate Admission application portal](#). To receive full consideration, we ask that you have all the required documents submitted by the deadline.

GRE Scores

As of the fall 2023 semester, the GRE is no longer required for the CEN MS programs.

English Proficiency

The University requires all international applicants from a country whose native language is not English to provide the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS), or the Pearson scores. This program requires a score of at least 575 (paper-based) or 90 (internet-based) TOEFL, 7 for IELTS, or Pearson 65 as minimum expectations for admission. Note that your application will not be processed until the university receives official scores, which are valid two years from the start date of the degree program. If a student has completed coursework in the US, they can contact Graduate Admission to see if they qualify for a waiver. Please address all TOEFL questions to Graduate Admissions. The ASU institution code is 4007. If department code is required use 0000.

Personal Statement

Applicants must submit a personal statement that indicates professional goals and reasons for desiring to enroll in the MS program.

Letters of Recommendation – (Optional)

If you choose to submit letters of recommendation. The following guidelines are recommended. Three (3) letters of recommendation, at least one of which must come from former faculty. There is no standard form for letters of recommendation. Our current application process allows students to indicate the names and emails of their recommenders. In turn, Graduate Admission sends an e-mail to the recommender alerting him or her to go online and submit a recommendation. We encourage letters from people who know you well, such as teachers, professional associates, and supervisors. Ask people who can comment on your academic, emotional, intellectual, and professional development.

Application Evaluation

Several factors are taken into consideration when evaluating a student's application: the student's cumulative GPA, major, institution, personal statement, letters of recommendation, standardized test scores, and performance in individual courses.

Recommended Academic Preparation

The CEN Program recommends the following courses completed at the time of admission:

- Calculus I and II
- Discrete Math (MAT 243)
- Algorithms & Data Structures (CSE 310)
- Random Signal Analysis (EEE 350)

Additional details on these courses can be found at the end of this handbook in Appendix 1.

Notice of Admission

Computer Engineering submits its recommendation of admission to Graduate Admission and the final notice of admission decision are posted by Graduate Admission on [MyASU](#).

Pre-admission Credits and Transfer Credit

Please refer to [Graduate College's policies and procedures](#).

Transferring Between Programs

Students wanting to change between concentrations or change from a master's to a PhD in Computer Engineering must submit a new application with Graduate Admission. If admitted, Graduate College's pre-admission policy states that a student is allowed to use only twelve graduate-level credits with grades of "B" or better that were not used towards a previous degree. Pre-admission credits must have been taken within three years of admission to the ASU degree to be accepted. Pre-admission credits are evaluated and are subject to approval by the Program Chair and the Graduate College.

4+1 Accelerated Bachelor's/Master's program

Students interested in the 4+1 Accelerated Bachelor's/Master's program can apply with their respective units and program. Students in the BSE in Computer Systems Engineering program would apply for admission into the MS in Computer Engineering (Computer Systems Concentration) program, and students in BSE in Electrical Engineering program would apply for admission into the Computer Engineering (Electrical Engineering Concentration). Students must have a GPA of at least 3.0 to qualify.

This program requires approval from both the undergraduate and the graduate program to apply to the graduate program. Visit your undergraduate advisor for more information about the application process. Students can share up 9 credit hours between the two programs with an additional 3 credits of pre-admission coursework that can be completed while in the undergraduate side which will later count towards the MS degree. Note: Admission is competitive and meeting the minimum requirements does not guarantee admission to the program.

Satisfactory Progress as a Graduate Student: All 4+1 students must maintain a GPA of 3.0 or higher (Cumulative, Graduate and IPOS). If a student falls below a 3.0 GPA, they are placed on probation and provided the timeframe in which the GPA must be raised to the satisfactory level. Students who do not raise their GPA to a 3.0 within the provided timeline risk dismissal from the program. Please Note: any 500 level courses taken as an undergraduate student will immediately count towards your satisfactory progress GPA calculation once you become a graduate student.

MS Degree Requirements

A minimum of 30 credit hours of coursework beyond the bachelor's degree and deficiency courses are required to complete the MS degree. All Master's students are required to develop and submit an Interactive Plan of Study (iPOS) through your MyASU page during the first semester at ASU. The iPOS should be developed with the aid of the student's faculty advisor. The CEN Graduate Academic Advisor, acting on behalf of the Graduate Program Chair, will initially advise the student. Students pursuing the non-thesis option will list the Program Chair as their faculty advisor. Students pursuing the thesis option should seek out a faculty member in his or her area of study to serve as an advisor and committee chair.

Summary of Degree Requirements

Six hours of Core courses

- CSE 551 – Foundations of Algorithms (3)
- EEE 554 – Probability and Random Processes (3)

All students are required to take the core courses, CSE 551 Foundations of Algorithms and EEE 554 Probability and Random Processes in their first two semesters. Students in the Computer Systems Concentration (CEN-CS) are required to take CSE 551 in their first semester. Students in the Electrical Engineering Concentration (CEN-EE) are required to take EEE 554 in their first semester. These courses have a prerequisite of CSE 310 for CSE 551 and EEE 350 for EEE 554. If students are deficient in CSE 310 or EEE 350, they may choose to take these concurrently with the core courses, or they can petition to take these in their first semester before taking the core courses. Please note that transfer credit cannot count towards the core course requirements unless the credit was earned at ASU.

Twelve Credits of graduate-level CEN Area courses that fulfill the concentration requirement

The area courses in the graduate Computer Engineering program are partitioned into five (5) areas of study and listed in the table located on the [CEN handbooks website](#). These courses will be referred to as Computer Engineering Area (CEN-Area) courses.

The five (5) areas of study are:

1. Autonomous Systems and Robotics (ASR)
2. Communication and Networks (CN)
3. Distributed, Dependable and Secure Systems (DDSS)
4. Multimedia and Signal Processing (MSP)
5. VLSI, Architecture, and Embedded Systems (VAES)

6 of the 12 credit hours should be courses covering two (2) of the five (5) CEN areas (CEN areas listed above).

Concentration requirement

- CEN-CS Concentration: 9 credits CSE or CEN and 3 credits EEE or CEN
- CEN-EE Concentration: 9 credits EEE or CEN and 3 credits CSE or CEN

Elective Courses

Elective courses from an approved list of elective courses, CEN Area Courses, or any 500 level CSE/CEN/EEE course.

12 credits of electives for Non-Thesis Option

6 credits of electives plus 6-credit CEN 599 - Thesis for Thesis Option.

- Up to 12 credits of approved combined courses (5xx/4xx) and 400 level courses can be taken and these count as electives. Of these 12 credits, 6 of them are allowed to be CSE 4XX. Please refer to the list of approved 5xx/4xx electives that can be found on the [handbook's website](#).
- If a 400-level course is combined with a 500-level course, CEN students will be required to enroll in the 500-level course.
- Up to 3 credits of Reading & Conference (CEN 590)
- All graduate-level CSE, EEE, or CEN courses can be taken as electives
- Other graduate-level Math, Science, and Engineering courses can count as electives if they are on the approved list of electives. Please speak to your advisor if you would like to enroll in a course outside of the CSE or EEE departments.
- Internship courses do not count toward the degree 30-credit requirement

CEN 590 Reading and Conference

A maximum of 3 credit hours of CEN 590 is allowed on the iPOS. The student must complete the Reading and Conference form with the help of the supervising faculty and get written approval from the supervising faculty outlining the coverage of the content. The Program Chair must approve the Independent Study form and will be placed in the student's file. After completion of the independent study, the student needs to submit a written report to the faculty supervising the independent study. Once the supervising faculty approves the report, the report and the independent study grade form need to be

submitted to the student's assigned advising staff to be given to the CEN Program Chair for review and approval.

Culminating Experience for MS Non-Thesis Students – Portfolio

The purpose of the portfolio is to require engagement and demonstrate understanding of topics in the Computer Engineering field, and how those topics apply to the student's personal and professional growth. Students must attend at least three SCAI/ECEE seminars or student defenses in their final year of the program. In the portfolio, students must show attendance records of three seminars/student defenses and fill out the attendance form. The attendance form asks students questions relating to the topic of the seminar/defense and how the topic relates to their personal and professional growth.

Students must be in good academic standing (all GPAs above 3.0) in order to submit their portfolio for review. Students must submit their portfolio in their last semester of the program and will be contacted by their advising office with instructions. If the portfolio submission is not satisfactory, it will be returned to the student with feedback. The student needs to resubmit their portfolio after making the revisions within a week of receiving the revisions. Students might need to attend additional seminars/defenses and will be given an appropriate amount of time to resubmit their portfolio within the semester. Failure to resubmit or make revisions could result in the student not graduating in a timely manner.

Culminating Experience for MS Thesis Students – Written and Oral Defense

A thesis requires a research advisory committee composed of at least three faculty members including the committee chair. The committee chair must be a CEN faculty member approved to chair a committee. The two additional members are chosen jointly by the committee chair and the student to facilitate the student's research. At least one additional member should be from the CEN faculty. Please refer to the Computer Engineering website for a list of CEN faculty and their research and to the Graduate College website for a list of faculty with the right to chair in Computer Engineering.

The written thesis and a successful oral defense constitute their final examination. A majority pass vote by the student's committee is required to graduate.

Steps to Preparing for Your MS Defense

Detailed instructions can be found on the [Graduate College](#) website.

Before defense:

1. Obtain a consensus of approval from the committee chair and the committee members to proceed with the oral defense.

2. Schedule a date and time with your committee for the oral defense.
3. Important: Ensure that a minimum of 50% of the official committee is physically present at the defense. The Chair must be physically present at the defense. If at least 50% of the committee cannot be physically present, the defense must be rescheduled.
4. Visit the Graduate College website to familiarize yourself with the dates and deadlines on format approval.

10 calendar days prior to the defense

1. Submit the thesis draft to Graduate College following the instructions on the [Graduate College](#) website.

10 working days prior to the defense

1. Reserve a room for your defense. Contact your respective concentration advising center for help with a room reservation.
2. Submit an electronic version of your abstract with title, full names of your committee members, defense date/time/place, and your name as you want it to appear on the defense announcement to your respective concentration advising center.
3. Schedule your defense through your iPOS.

On the day of the defense

1. Set-up all your equipment at least 30 minutes before your presentation to make sure they work properly.

After the defense

1. Your committee will have comments and a discussion with you. In the end, the committee makes a recommendation: Pass, Pass with minor revisions, Pass with major revisions, or Fail.
2. You must be registered for at least one credit hour of graduate-level coursework each semester until the final submission of your thesis. Revisions must be completed within one year from the date of the defense.
3. After you have passed the defense and/or completed all required revisions, your committee chair should complete the defense results section in the student's iPOS.
4. Upload your thesis online through ProQuest.

Research Standards for Publication of Thesis

Graduate research is the study of an issue that is of sufficient breadth and depth to be publishable in a CEN-related journal. The effort should reflect a minimum of 750 hours of thoughtful work for an MS thesis. The research should follow the 'scientific method' and thus be both objective and reproducible. The thesis should demonstrate independent, original, and creative inquiry. There should be predefined hypotheses or

developmental goals and objectives that are measurable and can be tested. The document should demonstrate proficiency with written English and should conform to Graduate College format guidelines. For more information on format guidelines, please visit the [Graduate College website](#).

CEN 584 Internship (Curricular Practical Training)

Internship (CPT) is an academic experience usually obtained at off-campus work settings, allowing the student to apply knowledge and skills gained in various classes. It is intended as a unique, hands-on learning experience to provide students with several valuable skills that they can use upon graduation from their graduate degree programs. Accordingly, it is not available to full-time or part-time workers regularly employed by the company where the internship is proposed.

The internship (CPT) is available to both domestic and international students. International students need to be aware of immigration policies and regulations, which may jeopardize their academic status. It is strongly recommended for international students to consult with the International Students and Scholars Center (ISSC). Students will be required to submit the required documentation to obtain work authorization from ISSC.

The internship (CPT) experience (up to three 1-credit CEN 584) must be included as part of the student's Program of Study. It is highly recommended that the internship (CPT) course(s) be listed at the initial submission of the student's iPOS during the first semester of study.

Internship (CPT) should occur prior to the student completing the required 30 hours. CPT cannot be the only course remaining in the last semester of study. An internship course cannot be added to an approved iPOS once all coursework has been completed. Exceptions may be made if the internship is relevant to thesis research. The Graduate Program Chair will determine the need for a CPT internship in such cases in consultation with the Graduate Academic Advisor.

To be eligible for internship all students must be in good academic standing. Please refer to your department's specific policies and procedures for CPT processing. Required documents and forms for the internship proposal must be submitted to the respective CEN concentration advising office two to three weeks before the beginning of the semester in which the internship is planned. Students will not be able to request late-add registration of the CEN 584 Internship credit to their class schedule after the drop/add deadline of each semester.

Below are the GPA requirements and restrictions for students to follow based on which semester they will be doing an internship in.

Summer semesters-

- Minimum GPA required: 3.0 (all GPAs must be at least 3.0)

- Full time or part time is allowed
- In state or out of state is allowed

Fall and spring semesters-

For GPAs between 3.0-3.24

- In state internships are allowed, out of state internships are NOT allowed
- Part time is allowed, full time is NOT allowed

For GPAs above 3.25

- In state and out of state is allowed
- Part time and full time is allowed

Regardless of GPA, any student doing an internship in the fall/spring semester must follow ISSC policies regarding campus presence and be registered for the proper courses per their iPOS

During the regular Fall and Spring semesters, international graduate students in F-1 status must register for a minimum of nine (9) credit hours to maintain full-time status and be enrolled in a minimum six (6) credit hours of in-person, on-campus coursework at an ASU campus. A maximum of three (3) credit hours of online courses is permitted.

The following policies apply to all students doing an internship regardless of the semester the internship occurs.

Full-time CPT is 21 hours or more. Part-time CPT is 20 hours or less.

Internship end dates can be the last day of classes or continue until the day before classes start in the following semester (unless it is the student's final semester - contact your academic advisor). Refer to the [Academic Calendar](#) for semester start and end dates.

For students doing CPT in their last semester, the end date of their internship is the conferral date if they are not a thesis student. If the student is completing their thesis defense while doing an internship, their internship end date must be their thesis defense date or earlier.

Internships cannot start before the semester or session students enroll in the CPT credit (CEN 584). For example, if you are interested in doing an internship in the summer semester, you cannot start working until the summer semester officially starts (1st day of classes). Exceptions are given to students who provide proper justification from the company supporting this request.

Reneged: (verb) to fail to carry out a promise or commitment

It is unethical for students to continue to seek or consider other employment opportunities once an offer has been accepted. SCAI and ECEE expect students to honor an acceptance and immediately stop all employment seeking activities.

Never accept a job and turn it down if “something better” comes along. Not only is it inconsiderate and unprofessional, but it also reflects badly on Arizona State University and might negatively impact another ASU student’s opportunities with that employer. Also, employers communicate with each other, and you don’t want to get a bad reputation.

After you have given your decision, careful consideration and accepted an offer, stop looking. Inform other employers who have extended offers that you have accepted another position. Don’t accept further interview invitations or search further. Please refer to NACE’s [“Playing Fair...Your Rights and Responsibilities as a Job Seeker”](#) to become familiar with Principles for Professional Practice.

Students who accept an offer from an organization and later renege the offer will be prohibited from requesting future internship opportunities pending a meeting with the Assistant Director.

Required report

A two-page typed minimum final report is required before a grade and credit is given. The final report must be submitted to the internship supervisor for comments and then submitted for evaluation following the instructions on the CEN Forms website.

Optional Practical Training (OPT)

Please visit the International Students and Scholars Center website for details regarding OPT and Pre-OPT. Students must be in good academic standing and have an approved iPOS. A student does (Pre-) OPT at their own risk since if the student doesn’t graduate in the semester indicated on the iPOS, no letter will be issued by advising to support a later graduation date unless the delay is for reasons beyond the control of the student.

Academic probation policies and status

At the end of the student’s first completed semester and every semester thereafter, the school will conduct an audit to determine if the student is maintaining the required minimum satisfactory progress, including progress on academic (GPAs and deficiencies) and probationary issues. Any student that is not in compliance with the satisfactory academic/ progress requirements is notified that she/he is either

- on academic probation and is given the next 9 credit hours or two semesters (fall and spring) to bring the GPA up to the proper level or

- on continued progress probation and is required to meet the conditions outlined in the continued probation letter.

Failure to properly remediate the GPA or the conditions outlined in the letter within the time frame will result in the school recommending that the student be dismissed from the program.

Note: Fully admitted students who take optional summer courses are placed on probation after the summer term if the earned grade(s) causes their GPA to fall below the satisfactory progress GPA minimum.

If applicable, the above-noted audit will also review each student's progress towards removing enrollment deficiency courses and/or any other degree requirement milestone(s). Failure to satisfactorily complete all deficiency course(s) and/or required milestones by the stipulated deadline may result in a recommendation for dismissal to the Graduate College.

All students are placed on one of the four categories:

Satisfactory progress

Satisfactory Progress means that the student does not have any academic and progress probationary issues. In addition to the probationary rules, satisfactory progress includes communication each semester with the student's faculty advisor regarding his or her progress.

Academic Probation

Academic Probation pertains to grades that might affect Program and University policies including graduation. The following are notices/letters you will receive if one of these pertains to your academics:

- GPA below 3.0 in approved iPOS courses.
- Overall post-baccalaureate (cumulative) GPA below 3.0.
- Overall graduate (500 level or above) GPA below 3.0.

Progress Probation

Progress Probation pertains to issues dealing with making progress towards a degree. The following are notices/letters you will receive if one of these pertains to your academics:

- Failure to complete core courses within the first year of study
- Failure to pass successfully complete the portfolio
- Failure to make satisfactory progress towards completing the thesis, this includes maintaining regular contact with your thesis committee chair.

Removal from the Program

A student is recommended for removal from the CEN Program if he/she fails to meet the probationary standards placed upon him/her in the semester mentioned in the probationary letter. The student will receive a letter from the Computer Engineering Program explaining the reasons for the removal. The student will have 5 calendar days from the date of the letter to appeal the decision. The Computer Engineering Graduate Programs Committee (GPC) will review the case and will make the necessary recommendation. The Graduate Program Chair, on behalf of the GPC, will provide a written explanation of the outcome. If the outcome is favorable, the student will have to meet all the outlined requirements at the end of the specified period. The student will be required to sign an agreement acknowledging the recommendations and the consequences if the requirements are not met. If the GPC recommends that the appeal is not granted in favor of the student, the Graduate Program Chair, on behalf of the GPC, will recommend to the Dean of Academic Affairs to remove the student from the CEN Program. The Ira A. Fulton Schools Standards Committee reviews the student's case and makes the final ruling to the Associate Dean of Graduate College and the CEN Program. If the appeal is not granted in favor of the student, the Dean of Academic and Student Affairs will recommend to Graduate College to remove the student from the CEN MS Program. Graduate College makes the final decision to dismiss the student from the program. Please refer to the Graduate College website for policies and procedures or contact the graduate advisor in your respective concentration advising center.

General Information

Diversity, Inclusion, And Indigenous Land Acknowledgement

Arizona State University, The Ira A. Fulton Schools of Engineering (IAFSE), and all the schools within IAFSE upholds, values, and cherishes student and faculty diversity, no matter the circumstance. As members of the ASU community, we are charged with challenging injustices and social inequities of any kind through education. These values are an integral part of our standing as an institution and must be upheld by all members of the ASU community, including but not limited to all IAFSE staff, faculty, and students. ASU is a comprehensive public research university, measured not by whom it excludes, but by whom it includes and how they succeed; advancing research and discovery of public value; and assuming fundamental responsibility for the economic, social, cultural, and overall health of the communities it serves.

ECEE and SCAI acknowledge the twenty-two Native Nations that have inhabited this land for centuries. Arizona State University's four campuses are located in the Salt River Valley on ancestral territories of Indigenous peoples, including the Akimel O'odham (Pima) and Pee Posh (Maricopa) Indian Communities, whose care and keeping of these lands allows us to be here today. ECEE and SCAI acknowledge the sovereignty of these nations and seek to foster an environment of success and possibility for Native American students and patrons. We are advocates for the incorporation of Indigenous

knowledge systems and research methodologies within computer engineering. ECEE and SCAI welcome members of the Akimel O’odham and Pee Posh, and all Native nations to our program.

Title IX

ASU prohibits all forms of discrimination, harassment and retaliation. To view ASU’s policy please see <https://www.asu.edu/aad/manuals/acd/acd401.html>.

Title IX protects individuals from discrimination based on sex in any educational program or activity operated by recipients of federal financial assistance. As required by Title IX, ASU does not discriminate on the basis of sex in the education programs or activities that we operate, including in admission and employment. Inquiries concerning the application of Title IX may be referred to the Title IX Coordinator or to the U.S. Department of Education, Assistant Secretary, or both. Contact titleixcoordinator@asu.edu or 480-965-0696 for more information. Office located at 1120 S. Cady Mall, INTDSB 284. For information on making a report please go to www.asu.edu/reportit/.

Financial Assistance and/or Fellowships

Students interested in funding should contact faculty members to inquire about their funded projects for potential hourly or assistantship positions. We also encourage our students to explore assistantships available outside CEN as well as explore the [Graduate College website](#).

Continuous Enrollment

Once admitted to a graduate degree program or graduate certificate program, students must be registered for a minimum of one credit hour during all phases of their graduate education, including the terms in which they are admitted and graduate. This includes periods when students are engaged in research, conducting a doctoral prospectus, working on or defending theses or dissertations, submitting the portfolio or in any other way utilizing university resources, facilities or faculty time.

Registration for every fall semester and spring semester is required. Summer registration is required for

students taking examinations, completing culminating experiences, conducting a doctoral prospectus, defending theses or dissertations, or graduating from the degree program.

To maintain continuous enrollment, the credit hour(s) must:

- Appear on the student’s Interactive Plan of Study, OR
- Be research (592, 792), thesis (599), dissertation (799), or continuing registration (595, 695, 795), OR

- Be a graduate-level course.

Grades of “W” and/or “X” are not considered valid registration for continuous enrollment purposes. “W” grades are received when students officially withdraw from a course after the drop/add period. “X” grades are received for audit courses. Additionally, students completing work for a course in which they received a grade of “I” must maintain continuous enrollment as defined previously. Graduate students have one year to complete work for an incomplete grade; if the work is not complete and the grade changed within one year, the “I” grade becomes permanent and will remain on the students’ transcripts. Additional information regarding incomplete grades can be found at <https://students.asu.edu/grades>.

Leave of Absence

Graduate students planning to discontinue registration for a semester or more must submit a Leave of Absence request via their Interactive Plan of Study (iPOS). Requests should have enough detail to understand the situation thoroughly and include a plan for continuing in a future semester. This request must be submitted and approved **before** the anticipated semester of non-registration. Students may request a maximum of two semesters of leave during their entire program. Having an approved Leave of Absence by the Graduate College will enable students to re-enter their program without reapplying to the university.

Students who do not register for a fall or spring semester without an approved Leave of Absence are considered withdrawn from the university under the assumption that they have decided to discontinue their program. Students removed for this reason may reapply for admission to resume their degree program; the application will be considered along with all other new applications to the degree program.

Students with a Graduate College approved Leave of Absence are not required to pay tuition and/or fees, but in turn, are not permitted to place any demands on university faculty or use any university resources. These resources include university libraries, laboratories, recreation facilities, or faculty and staff time.

Maximum Time Limit

All work toward an MS degree must be completed within six consecutive years. The six years begin with the semester and year of admission to the program. Graduate courses taken prior to admission that are included on the iPOS must have been completed within three years of the semester and year of admission to the program.

Registration requirements for RA's and TA's

Students awarded an assistantship within the Ira A. Fulton Schools of Engineering are required to be registered for 12 credit hours (no more, no less). Audit credit hours do not count towards the 12 credit hours. Non-Thesis CEN students need to register for

3-credits of practicum (CEN 580) research hours during the semester in which they are hired as RA.

Students who obtain an assistantship outside the Ira A. Fulton Schools of Engineering are required to follow the policy of the unit that hires them.

TAs and RAs are treated as residents for tuition purposes. To be eligible for tuition remission, TAs and RAs must be employed a minimum of 10 hours per week (25 percent Full Time Equivalency {FTE}). TAs/RAs working 10-19 hours per week (25-49 percent FTE) receive a 50 percent remission of tuition for the semester or summer session of their employment. TAs/RAs working 20 hours per week (50 percent FTE) do not pay tuition during the semester or summer session of their employment. In addition, the university pays the individual's health insurance premium for those TAs and RAs working 20 hours per week (50 percent FTE). The student is responsible for fees other than tuition.

Academic Integrity

The highest standards of academic integrity are expected of all graduate students, both in the academic coursework and in their related research activities. The failure of any graduate student to meet these standards may result in severe consequences including suspension or expulsion from the university and/or other sanctions as specified in the academic integrity policies of individual colleges as well as the university.

Violations of academic integrity include, but are not limited to cheating, fabrication, tampering, plagiarism, or aiding and/or facilitating such activities. At the graduate level, it is expected that students are familiar with these issues and each student must take personal responsibility in their work. Also, graduate students are expected to follow university guidelines related to the Student Code of Conduct. University policies related to academic integrity and code of conduct are available in the [Office of Student Life](#).

Engineering Student Organizations and student clubs

Student organizations are excellent opportunities to learn about career possibilities as many of the student groups operate in conjunction with industry professional societies ... get involved today! Please visit the [Engineering Student Organizations](#) website for a list of student organizations you can join.

There are many diverse student organizations and cultural activities that offer you leadership and professional opportunities as well as developing friendship with other students. Please visit the Dean of Students Office [website](#) and [student organizations](#) website and the ISSC [student organization](#) website as well.

Get involved today! And meet other fellow Sun Devil students who have different backgrounds and cultures.

Appendix I

Computer Engineering graduate program prospective student information and study guide

Computer Engineering graduate students should know about the following topics prior to applying for the program at Arizona State University: Discrete Math, Digital Signal Processing, Computer Architecture & Organization, Algorithms & Data Structures, and Random Signal Analysis. For each of the topics, there is a suggested book and list of topics along with suggested Chapters from the book in some cases. Note that a student is free to study from any other relevant book on the subject.

Random Signal Analysis (ASU Course: EEE 350)

Textbook: Yates and Goodman, Probability and Stochastic Processes, second edition, Wiley, 2005.

1. Axiomatic probability
2. Random variables, distribution functions, and density functions
3. Special distributions: Gaussian, exponential, etc.
4. Expectation and variance
5. Multiple random variables
6. Central limit theorem and law of large numbers
7. Maximum-likelihood estimation and confidence intervals
8. Random processes
9. Statistical analysis using sample statistics, histograms, and linear regression

Discrete Mathematics (ASU Course: MAT 243)

Textbook: Discrete Mathematics and Its Applications, Kenneth H. Rosen; Publisher: McGraw-Hill; 7th Ed.

1. Foundations: Logic and Proofs: understand mathematical reasoning and ability to construct mathematical proofs; mathematical induction. (Chapter 1 & 5)
2. Combinatorial Analysis: ability to solve counting problems. (Chapter 6 & 8)
3. Elementary Number Theory: (Chapter 4)
4. Discrete Probability: fundamentals of probability theory, conditional probability, random variables. (Chapter 7)
5. Graph Theory: basics of graph theory including properties of trees. (Chapter 10-11)
6. Boolean Algebra: basics of Boolean algebra, Boolean functions and their representation, minimization of Boolean circuits. (Chapter 12).

Digital Signal Processing (ASU Course: EEE 203)

Textbook: Signals and Systems by Oppenheim, Willsky and Nawab. Prentice Hall 2nd edition.

1. Signals: continuous-time and discrete-time; unit step; unit impulse; sinusoids; transformations of the time variable. (Chapter 1)
2. Systems: LTI systems -- linearity, time-invariance, causality, stability; impulse response; convolution (graphical as well as analytical); block diagrams, input-output equations. (Chapter 1, 2)
3. Fourier Transform (FT): calculation of forward and inverse transform of simple signals; use FT properties to determine the FT of a transformed signal; frequency response. (Chapter 4)
4. Discrete-Time Fourier Transform (DTFT): calculation of forward and inverse transform of simple signals; use DTFT properties to determine the DTFT of a transformed signal; frequency response. (Chapter 5)
5. Sampling: converting a continuous-time signal to a discrete-time signal; sampling theorem. (Chapter 7)
6. z-Transform: calculation of forward and inverse transform of simple signals; region of convergence; properties. (Chapter 10)

Computer Architecture & Organization (ASU Course: CSE 230)

Textbook: "Computer Organization and Design" The hardware-software Interface, by David A. Patterson, and John L. Hennessy, 4th edition.

1. Assembly Language Programming: Understand assembly language, and write assembly language programs for simple problems.
2. Procedure Calling Convention: Know about register conventions, including caller saved, callee saved, argument and return value registers. The student should be able to write procedures and recursive functions in assembly language.
3. Data Representation: Understand the data representation (unsigned, 2's complement, and floating point) inside the processor, and perform arithmetic operations on them. An understanding of hardware structures to perform these operations will be a plus.
4. Pipelined Processor Design: Understand the working of a single-cycle and pipelined processor. Pipeline hazards and basic techniques on how to avoid them.
5. Memory Hierarchy: Understand the rationale behind the memory organization, and know how caches operate.
6. I/O: Have a basic understanding of storage and I/O.
7. Advanced Computer Architecture: Be aware of the trends in computer organization and design, including superscalar, multi-threading, and multi-core architectures.

Algorithms and Data Structures (ASU Course: CSE 310)

Textbook: Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 3rd Ed.

1. Basics of algorithm design and analysis (Chapter 1 to 3).
2. Divide and Conquer (Chapter 4)
3. Elementary Data Structure, hash tables (Chapter 10,11)
4. Sorting: Heapsort (Chapter 6), Quicksort (Chapter 7), Radix Sort and Bucket Sort (Chapter 8)
5. Searching: Binary Search Trees. (Chapter 12), red-black trees (Chapter 13.1-4)
6. Dynamic Programming (Chapter 15)
7. Greedy Algorithms. (Chapter 16)
8. Minimum Spanning Tree (Chapter 23)
9. Shortest-Path Problems (Chapter 24-25)
10. Elementary Graph Theory (Chapter 22)
11. String Matching (Chapter 32)
12. NP-completeness (Chapter 34)