2024-2025

Stanford University

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ELECTRICAL ENGINEERING DEPARTMENT GRADUATE HANDBOOK

Contents

Getting Started 3
Axess (Registration and Enrollment) 3
EE and Stanford Email Lists 3
Graduate Advising 4
Masters 4
PhD 5
Degree Progress Overview 6
General Description of Programs 6
Master of Science 6
Doctor of Philosophy 6
Program Planning: M.S. Degree 7
M.S. Academic Requirements 7
Milestones Timeline: M.S. Degree 8
Guidelines for Preparing the MS Program Proposal 8
1) Depth: 8
2) Breadth: 9
3) Technical Courses: 9
4) Other Courses: 9
5) Special Studies: 10
6) Deviations: 10
Approved Depth and Breadth Area Courses 10
EE Graduate Curriculum Flow Charts 15
Additional Courses Taught by Electrical Engineering Faculty 22
Joint Degree MS/JD Program 24
Joint Degree MS/MBA Program 25
Program Requirements 25
Approved GSB Courses 26
Coursework Planning 27
Other Course Policies 28
Courses and Registration 28
Tuition and Financial Aid 28
Career Resources 28
Programs and Activities 29

Honors Cooperative Program 29
Program Planning: Ph.D. Degree 30
Ph.D. Academic Requirements and Milestones 30
Ph.D. Milestones Timeline 32
Ph.D. Qualifying Exam 33
Applying for Doctoral Candidacy 34
Reading Committee 37
Terminal Graduate Registration (TGR) 37
University Oral Examination 38
Dissertation 39
Graduation Quarter Petition 39
Program Planning: PhD Minor 40
Additional Program Information 41
Leave of Absence 41
Extension of Candidacy 41
Conferral of Degrees 41
Curricular Practical Training (EE290) 42
Financial Support 44
Research Assistantships 44
Course (Teaching) Assistantships 45
Course Grader Appointments 45
Fellowships 45
How to Be Paid 46
Cardinal Care 47
International Students 47
Taxes and Tax Reporting 47
Computing Resources 47
Treatment of Students Sustaining Injuries 48
Campus Emergency Information 48

Getting Started

Axess (Registration and Enrollment)
Summary of Grading Policies
Advising Guidelines
Office of Community Standards – Honor Code
Graduate Life Office (GLO)
Stanford Housing
Stanford Services and Support (HelpSU)
EE and Stanford Email Lists
Academic Calendar
Health Insurance

Axess (Registration and Enrollment)

Axess is a student information system available via the web. It is generally available 24 hours a day, 7 days a week. You will need your SUNetID and password to login to Axess.

Using Axess, you can:

1. File or adjust your study list and elect grading options
2. Review your grades
3. Request an official transcript
4. Print a history of your courses and grades (i.e., unofficial transcript)
5. Apply to graduate
6. Submit University eForms
7. Update your address (e.g., mailing, permanent, campus P.O. Box), and personal email address.
8. Apply for housing
9. View financial aid information
10. Pay your university bill
11. View advisor information

Important Points:

☐ Please make sure to carefully read the University's policies regarding Registration, Enrollment and Academic Progress on the Graduate Academic Policies and Procedures (GAP) Handbook website.

☐ Students are also strongly encouraged to bookmark or print a copy of Stanford's Academic Calendar in order to meet the University's enrollment deadlines (e.g., study list deadline, change of grading basis deadline, withdrawal deadline, etc.)

EE and Stanford Email Lists

The Electrical Engineering Department maintains several email lists for the use of its students, staff, and faculty. You can subscribe and unsubscribe from email lists at: mailman.stanford.edu/.

- Students are automatically added to the ee-students@lists.stanford.edu email list.

Information on mailing lists in general can be found here: itservices.stanford.edu/service/mailinglists. Some recommended mailing lists are listed below:

- *The Stanford Computer Forum*: The Computer Forum provides students with a unique opportunity to meet potential employers in a relaxed and focused environment through on-campus interviews, information sessions, job lunches, company tours, and career fairs. For additional information, please visit forum.stanford.edu/careers/recruiting.php.
  Sign up here: mailman.stanford.edu/mailman/listinfo/recruiting

- *Electrical Engineering Students Forum*: This list is for course/seminar announcements, recruiting events, academic/professional events, textbooks for sale, social activities, etc. You can post to the list or unsubscribe at any time. Sign up here: mailman.stanford.edu/mailman/listinfo/ee-students-forum

Graduate Advising

Masters

The Department of Electrical Engineering is committed to providing academic advising in support of our MS students' education and professional development. When most effective, this advising relationship entails collaborative engagement by both advisor and advisee. As a best practice, advising expectations should be discussed and reviewed to ensure mutual understanding. Both advisor and advisee are expected to maintain professionalism and integrity. They should also be responsive to one another in a timely manner.

At the start of graduate study, each student is assigned a master's program advisor: a member of our faculty who provides guidance in course selection and in exploring academic opportunities and professional pathways. Students are expected to meet with the program advisor during the first quarter to discuss their proposed master's plan. Typically, the same faculty member serves as program advisor for the duration of master's study. If a student wishes to change their program advisor, they may contact the Degree Progress Officer to initiate the formal process of changing advisor.

In addition to the program advisor, the EE Graduate Teaching Assistant (student advisor) is a peer advisor who is available to advise students on aspects of course selection and academic opportunities on and off campus.

Our Department's student services office is also an important part of the master's advising team. They inform students and advisors about University and Department requirements, procedures, and opportunities, and they maintain the official records of

advising assignments and approvals. Their contact information can be found on the Department's Graduate Degree Progress website.

Finally, graduate students are active contributors to the advising relationship, proactively seeking academic and professional guidance and taking responsibility for informing themselves of policies and degree requirements for their graduate program.

PhD

The Department of Electrical Engineering is committed to providing academic advising in support of doctoral student scholarly and professional development. When most effective, this advising relationship entails collaborative and sustained engagement by both advisor and advisee.

PhD students are initially assigned a program advisor based on the interests expressed in their application. This faculty member provides initial guidance in course selection, in exploring academic opportunities and professional pathways, and in identifying doctoral research opportunities. The Department does not require formal lab rotations, but students are encouraged to consider exploring research activities in two or three labs during their first academic year. After the first year, students who do not have a dissertation advisor are encouraged to check in with their program advisor.

The Department's Graduate Handbook provides information and suggested timelines for different stages of the doctoral program. For more information, please visit: ee.stanford.edu/academics/graduate-degree-progress.

As a best practice, advising expectations should be periodically discussed and reviewed to ensure mutual understanding. Both advisor and advisee are expected to maintain professionalism, respect, and integrity. They should also be responsive to one another in a timely manner. Students are expected to meet with their Ph.D. dissertation advisor regularly, as their research progresses.

Students will identify their doctoral research/thesis advisor, pass the qualifying exam, and advance to candidacy prior to the end of the second year of study. The research supervisor assumes primary responsibility for the future direction of the student, taking on the roles previously filled by the program advisor, and ultimately directs the student's dissertation. Most students find an advisor from among the primary faculty members of the Department. The research advisor may alternatively be a faculty member from another Stanford department who is familiar with supervising doctoral students and able to provide both advising and funding for the duration of the doctoral program. When the research advisor is from outside the Department, the student still retains the previous program advisor from the primary faculty, to provide guidance on Departmental requirements and opportunities.

The faculty Associate Chair of Graduate Education is available during the academic year by email and during office hours. The Department's student services office is also an important part of the doctoral advising team: they inform students and advisors about University and Department requirements, procedures, and opportunities, and they maintain the official records of advising assignments and approvals. Students are encouraged to talk with their doctoral program advisor, the Graduate Student Teaching Advisor, and the Degree Progress Office from the student services office as they consider advisor selection, or for guidance in working with their advisor(s).

Our doctoral students are active contributors to the advising relationship, proactively seeking academic and professional guidance and taking responsibility for informing themselves of policies and degree requirements for their graduate program.

Degree Progress Overview

General Description of Programs

The profession of electrical engineering demands a strong foundation in physical science and mathematics, a broad knowledge of engineering techniques, and an understanding of the relation between technology and society. Curricula at Stanford are planned to offer the breadth of education and depth of training necessary for leadership in the profession. To engage in this profession with competence, four years of undergraduate study and at least one year of postgraduate study are recommended. For those who plan to work in highly technical development or fundamental research, additional graduate study is helpful.

Master of Science

The master's degree program provides advanced preparation for professional practice or for teaching at the junior college level. The master's degree is offered as a full-time or part-time program and consists of 45 units. The average length of time it takes students to complete the full-time program is 5 quarters, excluding summer. Students in the full-time program must complete the degree within 3 years (2 years if on a student visa). The time for students to complete the part-time program is typically 3 to 5 years. Students in the part-time Honors Cooperative Program must complete the degree within 5 years. The Department does not prescribe specific courses to be taken but it does provide guidelines for acceptable programs. Each student, with the help of a faculty advisor, prepares an individual program of study. There is no thesis requirement.

Doctor of Philosophy

The Ph.D. degree is designed to prepare students for careers in research and teaching at the university level. The Ph.D. degree is offered exclusively as a full-time program, consisting of 135 units. The candidacy for the Ph.D. program is 5 years. Exceptions may be granted for candidacy extensions up to one year.

Students in the Ph.D. program must complete the following requirements: (1) a qualifying examination given by the faculty of the Department of Electrical Engineering; (2) an approved program of study in Electrical Engineering and allied subjects; (3) an approved topic of research and a written dissertation, based on research, which must be a significant contribution to knowledge; (4) and an oral examination that is a defense of dissertation research and is taken near the completion of the doctoral program.

Program Planning: M.S. Degree

M.S. Academic Requirements
Milestones Timeline: M.S. Degree
Guidelines for Preparing the MS Program Proposal
Approved Depth and Breadth Area Courses
EE Graduate Curriculum Flow Charts

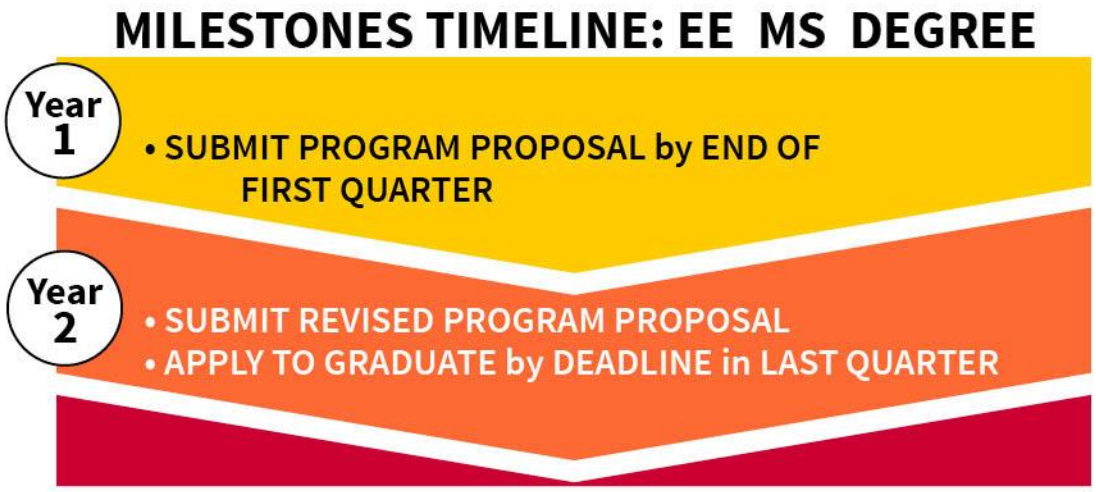
M.S. Academic Requirements

Each student, with the help of their faculty advisor, prepares a program of study that meets his or her particular area(s) of interest. **Word of Advice:** New students are strongly advised not to undertake a heavy academic program in their first quarter at Stanford, as they are adjusting to their new environment and the demanding nature of graduate work. Three regular courses (8-10 units) constitute a full-time workload. The student's advisor should be consulted for further guidance on this and other course selection questions.

Because the M.S. degree is an advanced degree in electrical engineering awarded entirely on the basis of course work, the program should contain a substantial amount of advanced electrical engineering course work. Mezzanine (200 level) courses, suitable for advanced undergraduates or beginning graduates, may be used in partial satisfaction of this requirement, but at least part of the program should be in the more advanced 300 or 400 series courses.

Every student in the MS degree program must submit a Program Proposal prior to the end of the first quarter of enrollment (second quarter for part-time Honors Cooperative Program students). The Program Proposal must be approved by the student's faculty advisor and be submitted to the EE Degree Progress Officer by the stated deadline. Students who do not submit a Program Proposal on time will have an enrollment hold placed on their record until they submit an acceptable proposal.

Milestones Timeline: M.S. Degree



Important Points:

☐ The University's minimum requirement for each master's degree is 45 unduplicated units of coursework done at Stanford. Stanford does not accept transfer credit toward a master's degree. However, students may apply up to 18 units of applicable Stanford coursework taken via the Non-Degree Option (NDO) Program toward their EE degree.

☐ Students must maintain a minimum cumulative GPA of 3.0 in order to maintain good academic standing and graduate with the EE MS degree.

☐ Every student should be familiar with the University's requirements for minimal progress as outlined in the Graduate Academic Policies and Procedures (GAP) handbook.

☐ In your final quarter, you must be enrolled and apply to graduate in Axess by the deadline published in the Academic Calendar.

Guidelines for Preparing the MS Program Proposal

The MS Program Proposal form is available here.

To meet the requirements of the EE MS degree, you must meet the following Department guidelines:

1) Depth:

Completion of 12 units from one of the five area lists. At least six units must be at the 300 level or above. All depth units must be 200+-level and letter graded.

The list of approved depth areas is available below.

2) Breadth:

Completion of nine additional units from other area lists (in 1-3 other areas). All breadth units must be letter graded and at the 200 level or above.
**If a course is listed in the depth area, it cannot be used to count in the breadth area.*

The list of approved areas is available below*.*

3) Technical Courses:

Completion of 15 units of courses in engineering, natural sciences, mathematics or statistics.

- At least nine of the 15 units must be lecture courses at the 200 level or above.
- EE courses must be 200 level or above.
- All units must be letter graded.
- You may count a maximum of six units of EE 391 or the equivalent graduate level independent study course in other engineering departments, natural sciences, mathematics, or statistics toward the remaining units needed.
- *Independent study units may not be taken in place of the nine units of 200 level or above lecture courses.*

Courses in mathematics, natural sciences or engineering are acceptable, provided they use quantitative or scientific methods to analyze, design or optimize man-made or natural systems. Courses that primarily address entrepreneurship, management, economics, collaboration, design philosophy, language, or public speaking are typically not acceptable. Consult with your advisor or the Degree Progress Officer before selecting courses in Economics, GSB, d.school, MS&E, Psychology, or other departments that offer some semi-technical or non-technical courses.

4) Other Courses:

Completion of at least nine additional units. These units must be at the 100 level or above and letter graded or CR/NC in EE or other departments *relevant to the EE MS degree* and at the *graduate level*.

Suggested courses include:

- depth/breadth courses
- additional technical courses
- independent study (e.g., EE 390, EE 391)
- Curricular Practical Training (e.g., EE 290A)
- seminars
- entrepreneurial or design courses

Courses not relevant to the EE MS degree or practice of the EE profession are not acceptable. Consult with your advisor or the Degree Progress Officer before selecting courses in categories not listed just above this paragraph.

Please note: Athletics courses do not count toward the 45 units. EFSLANG (English for Foreign Students) courses do not count toward the 45 units. If the University requires you to take any of these classes, they are additional units above the required 45 units.
All units must be at the 100 level or higher. No courses numbered below the 100 level can count toward a graduate degree.

5) Special Studies:

Students are encouraged to take advantage of the opportunities for individual work under the supervision of individual faculty members, under the heading of Special Studies courses: EE 391 (letter grade) or EE 390 (satisfactory/no credit). Possibilities under this heading range from directed reading in an area of mutual interest to the equivalent of an M.S. thesis.

Students can pursue a master's thesis if they find a faculty thesis advisor who is willing to work with them. If so, they enroll in EE 300. However, please note that because a thesis is not required there will be no notation of this on the diploma. Students still need to complete all requirements for the MS degree in addition to their thesis work. These courses cannot be applied toward the fulfillment of the depth and breadth requirements.

6) Deviations:

Every attempt should be made to meet the guidelines listed above. Courses that deviate from one or more of these guidelines must be approved by your faculty advisor and the Associate Chair of Graduate Education. Students contemplating a special program should submit a current Master's Program Proposal along with an MS Deviation Petition form, describing their particular objectives and how the proposed program meets these objectives. Submit the forms to the Degree Progress Officer for a final decision.

Approved Depth and Breadth Area Courses

The following lists satisfy the depth and breadth requirements.

Please note that not all courses are offered every year.
Courses highlighted gray have not been offered since AY 2020-2021.

1) Circuits

Course Number	Course Title	Units
EE 207	Neuromorphics: Brains in Silicon (same as BIOE 313, counts as a 200-level course)	3
EE 214A	Fundamentals of Analog Integrated Circuit Design	3-4
EE 214B	Advanced Analog Integrated Circuit Design	3
EE 216	Principles and Models of Semiconductor Devices	3
EE 233	Analog Communications Design Laboratory	3
EE 251	High-Frequency Circuit Design Laboratory	3
EE 253	Power Electronics	3-4
EE 254	Advanced Topics in Power Electronics	3
EE 256	Board Level Design (EE 156)	3-4
EE 271	Introduction to VLSI Systems	3
EE 272	Design Projects in VLSI Systems I (previously EE 272A)	3-4

EE 272B*	Design Projects in VLSI Systems II	3-4
EE 273	Digital Systems Engineering	3
EE 292X	Battery Systems for Transportation and Grid Services	1-3
EE 303	Autonomous Implantable Systems	3
EE 308	Advanced Circuit Techniques	3
EE 309A	Semiconductor Memory Devices and Circuit Design	3
EE 314A	RF Integrated Circuit Design	3
EE 315	Analog-Digital Interface Circuits	3
EE 356A	Resonant Converters	3
EE 356B	Magnetics Design in Power Electronics	3
EE 371	Advanced VLSI Circuit Design	3
EE 372	Design Projects in VLSI Systems II	3-5

**EE 272B was renumbered as EE 372 starting AY21-22.*

2) Software and Hardware Systems

Course Number	Course Title	Units
BIODS 220	Artificial Intelligence in Healthcare (same as CS 271)	3-4
CS 221	Artificial Intelligence: Principles and Techniques	3-4
CS 228	Probabilistic Graphical Models: Principles and Techniques	3-4
CS 229	Machine Learning (same as STATS 229)	3-4
CS 230	Deep Learning	3-4
CS 231A	Computer Vision: From 3D Reconstruction to Recognition	3-4
CS 231N	Deep Learning for Computer Vision	3-4
CS 236	Deep Generative Models	3
CS 240	Advanced Topics in Operating Systems	3
CS 243	Program Analysis and Optimizations	3-4
CS 244	Advanced Topics in Networking	3-4
CS 245	Database Systems Principles	3
CS 246	Mining Massive Data Sets	3-4
CS 248A	Computer Graphics: Rendering, Geometry, and Image Manipulation	3-4
CS 248B	Fundamentals of Computer Graphics: Animation and Simulation	3
CS 255	Introduction to Cryptography	3
CS 316	Advanced Multi-Core Systems	3
CS 341	Project in Mining Massive Data Sets	3
CS 347	Human-Computer Interaction: Foundations and Frontiers	3-4
CS 348A	Computer Graphics: Geometric Modeling & Processing	3-4
CS 348B	Computer Graphics: Image Synthesis Techniques	3-4
CS 348K	Visual Computing Systems	3-4
CS 354	Topics in Circuit Complexity	3
CS 357S	Formal Methods for Computer Systems	3
CS 369L	Theoretical Perspective on Machine Learning	3
EE 272	Design Projects in VLSI Systems I (previously EE 272A)	3-4
EE 273	Digital Systems Engineering	3
EE 282	Computer Systems Architecture	3
EE 284	Introduction to Computer Networks	3

EE 284A	Introduction to Internet of Things	3
EE 285	Embedded Systems Workshop (same as CS 241)	2
EE 292D	Machine Learning on Embedded Systems (same as CS 329E)	3
EE 292S	Understanding the Sensors in Your Smartphone	3
EE 292Y	Software Techniques for Emergent Hardware Platforms (same as CS 349H; counts as a 200-level course)	3
EE 372	Design Projects in VLSI Systems II	3-5
EE 382A	Parallel Processors Beyond Multicore Processing	3
EE 382C	Interconnection Networks	3

3) Communications and Networking

Course Number	Course Title	Units
CS 244	Advanced Topics in Networking	3-4
CS 344	Topics in Computer Networks	3
CS 351	Open Problems in Coding Theory	3
EE 247	Introduction to Optical Fiber Communications	3
EE 274	Data Compression: Theory and Applications	3
EE 276	Information Theory (same as STATS 376A)	3
EE 279	Introduction to Digital Communication	3
EE 284	Introduction to Computer Networks	3
EE 284A	Introduction to Internet of Things	3
EE 348	Advanced Optical Fiber Communications	3
EE 358	Wireless System Design	3
EE 359	Wireless Communications	3-4
EE 374	Scaling Blockchains	3
EE 376B	Network Information Theory	3
EE 376C	Universal Schemes in Information Theory	3
EE 379	Digital Communication	3
EE 379A	Data Transmission Design	3
EE 379B*	Advanced Data Transmission Design	3
EE 382C	Interconnection Networks	3
EE 384A	Internet Routing Protocols and Standards	3
EE 384S	Performance Engineering of Computer Systems & Networks	3
EE 387	Error Correcting Codes: Theory and Applications	3
MS&E 335	Queueing and Scheduling in Processing Networks	3

**EE 392AA has been renumbered as EE 379B, starting AY 23-24*

4) Physical Technology and Science

Course Number	Course Title	Units
BIOE 300B	Quantitative Physiology (counts as a 200-level course)	3
EE 212	Integrated Circuit Fabrication Processes	3
EE 216	Principles and Models of Semiconductor Devices	3
EE 218	Power Semiconductor Devices and Technology	3
EE 219	3D+ Imaging Sensors (previously EE 292Q)	3
EE 222	Applied Quantum Mechanics I	3
EE 223	Applied Quantum Mechanics II	3
EE 224	Quantum Control and Engineering	3

EE 225	Biochips and Medical Imaging	3
EE 234	Photonics Laboratory	3
EE 235A	Analytical Methods in Biotechnology I (same as BIOS 212, RAD236)	3
EE 235B*	Analytical Methods in Biotechnology II	3
EE 236A	Modern Optics	3
EE 236B	Guided Waves	3
EE 236C	Lasers	3
EE 237	Solar Energy Conversion	3
EE 238	Introduction to Fourier Optics	3
EE 242	Electromagnetic Waves	3
EE 247	Introduction to Optical Fiber Communications	3
EE 252	Antennas	3
EE 258	Introduction to Radar Remote Sensing (GEOPHYS 258J)	3-4
EE 259	Principles of Sensing for Autonomy	3
EE 262	Three-Dimensional Imaging (same as GEOPHYS 264)	3
EE 293B	Fundamentals of Energy Processes	3
EE 303	Autonomous Implantable Systems	3
EE 309A	Semiconductor Memory Devices and Circuit Design	3
EE 309B	Emerging Non-Volatile Memory Devices and Circuit Design	3
EE 311	Advanced Integrated Circuits Technology	3
EE 312	Integrated Circuit Fabrication Laboratory	3-4
EE 316	Advanced VLSI Devices	3
EE 317	Special Topics on Wide Bandgap Materials and Devices	3
EE 323	Energy in Electronics	3
EE 329	The Electronic Structure of Surfaces and Interfaces	3
EE 332	Laser Dynamics	3
EE 334	Micro and Nano Optical Device Design	3
EE 336	Nanophotonics (MATSCI 346)	3
EE 340	Quantum Photonics	3
EE 346	Introduction to Nonlinear Optics	3
EE 347	Optical Methods in Engineering Science	3
EE 348	Advanced Optical Fiber Communications	3
ENERGY 201C **	Energy storage and conversion: Solar Cells, Fuel Cells, Batteries and Supercapacitors	3
ENGR 240	Introduction to Micro and Nano Electromechanical Systems	3
ENGR 241	Advanced Micro and Nano Fabrication Laboratory	3
MATSCI 209	Electronic and Optical Properties of Solids	3-4
OPHT 207	Introduction to Electro-neural Interfaces (NERP 230)	4
RAD 235	Advanced Ultrasound Imaging	3

**EE 235B is discontinued.*

***ENERGY 201C was previously ENERGY 293.*

5) Signal Processing, Control and Optimization

Course Number	Course Title	Units
AA 203	Optimal and Learning-based Control	3
AA 212	Advanced Feedback Control Design	3

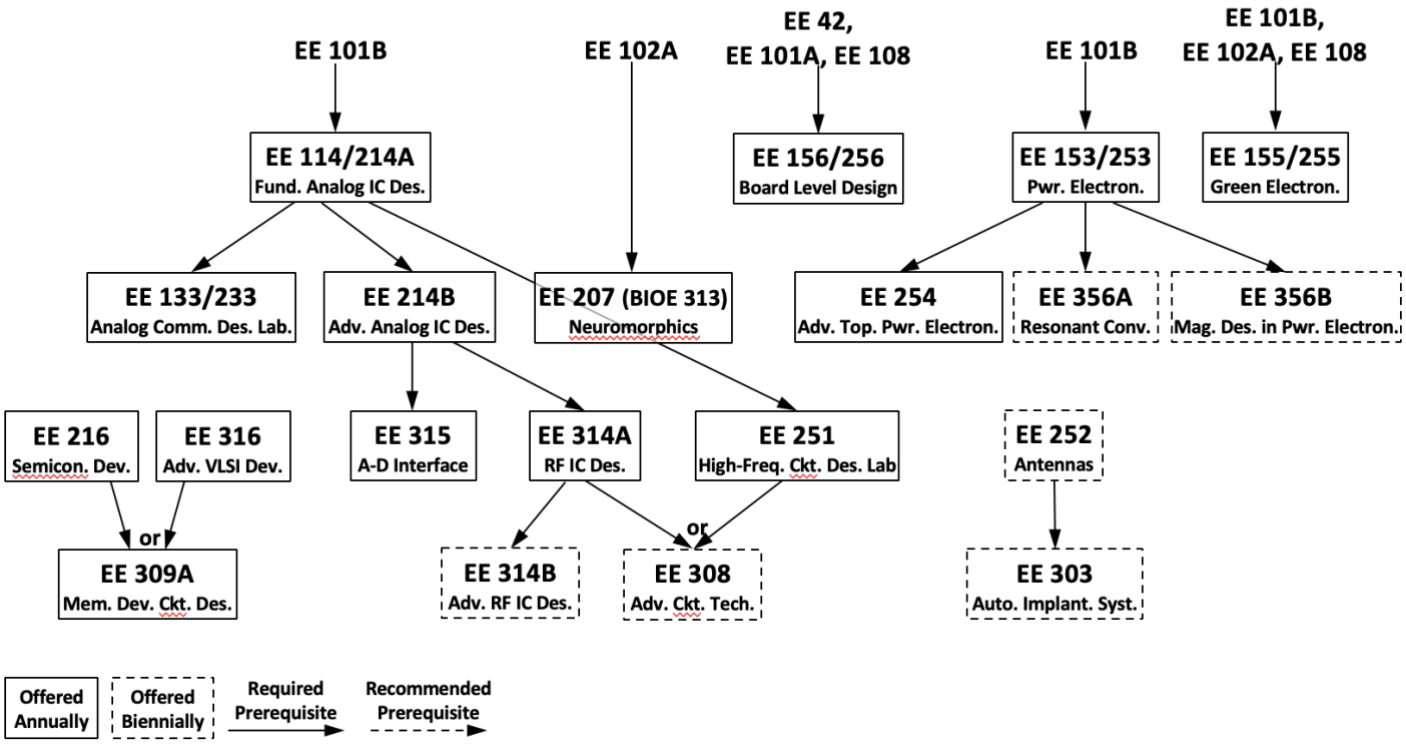
CS 234	Reinforcement Learning	3
CS 238	Decision Making Under Uncertainty (same as AA 228)	3-4
CS 326	Topics in Advanced Robotic Manipulation	3-4
EE 219	3D+ Imaging Sensors (previously EE 292Q)	3
EE 227	Robot Perception (CS 227A)	3-4
EE 258	Introduction to Radar Remote Sensing	3-4
EE 259	Principles of Sensing for Autonomy	3
EE 260A	Principles of Robotic Autonomy (same as EE 160A and CS 237A/AA174A/274A)	3-4
EE 260B	Principles of Robot Autonomy II (same as CS 237B and AA 174B/AA 274B)	3-4
EE 261	The Fourier Transform and Its Applications	3
EE 262	Three-Dimensional Imaging (GEOPHYS 264)	3
EE 263	Introduction to Linear Dynamical Systems	3
EE 264	Digital Signal Processing	3-4
EE 267	Virtual Reality	3
EE 268	Economics of Energy Markets (same as ECON 261)	3
EE 269	Signal Processing for Machine Learning	3
EE 270	Large Scale Matrix Computation, Optimization and Learning	3
EE 277	Reinforcement Learning: Behaviors and Applications (same as MS&E 237A)	3
EE 278	Probability and Statistical Inference	3
EE 355	Imaging Radar and Applications	3
EE 364A	Convex Optimization I (same as CME 364A)	3
EE 364B	Convex Optimization II (same as CME 364B)	3
EE 367	Computational Imaging (CS 448I)	3
EE 368	Digital Image Processing	3
EE 369A	Medical Imaging Systems I	3
EE 369B	Medical Imaging Systems II	3
EE 369C	Medical Image Reconstruction	3
EE 373A	Adaptive Signal Processing	3
EE 377	Information Theory and Statistics (same as STATS 311)	3
EE 378A	Statistical Signal Processing	3
EE 378B	Inference, Estimation and Information Processing	3
EE 378C	Information-Theoretic Lower Bounds in Data Science	3
EE 381	Sensorimotor Learning for Embodied Agents (CS 381)	3
EE 469B	RF Pulse Design for Magnetic Resonance Imaging	3
ENGR 205	Introduction to Control Design Techniques	3
ENGR 209A	Analysis and Control of Nonlinear Systems	3
MS&E 310	Linear Programming	3
MS&E 311	Optimization	3
MS&E 321	Stochastic Systems	3
MS&E 322	Stochastic Calculus and Control	3
MS&E 351	Dynamic Programming and Stochastic Control	3
Music 422	Perceptual Audio Coding	3
Psych 221	Image Systems Engineering	3
Stats 315A	Modern Applied Statistics: Learning	3

Stats 315B	Modern Applied Statistics: Data Mining	3

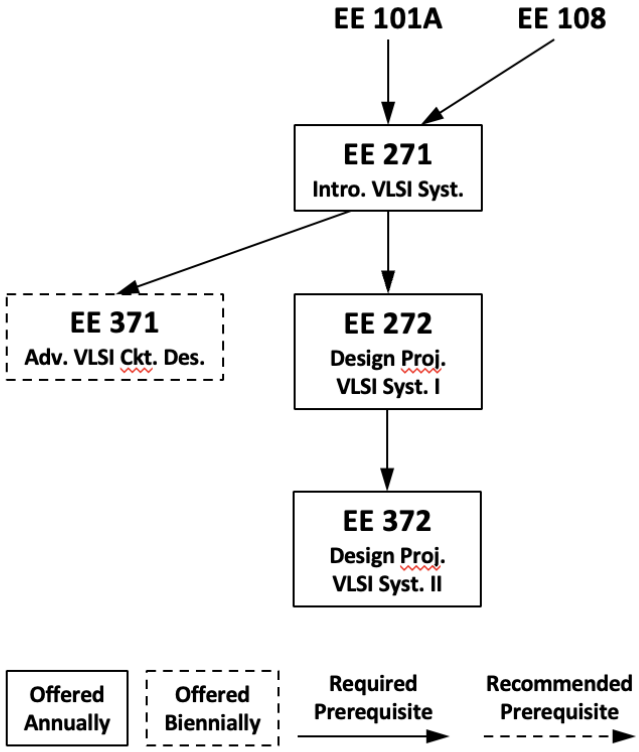
EE Graduate Curriculum Flow Charts

The following diagrams show 200-, 300- and 400-level EE courses and their prerequisites. EE-owned ENGR courses are also shown. Not shown are: (a) seminars, (b) entrepreneurship or technology management courses, and (c) most temporary courses (EE 292 and EE 392 series). The diagrams show CS courses that are tightly integrated with EE in the areas of architecture, embedded systems and networking. They do not show CS courses in other areas, including operating systems, software and algorithms. The first ten diagrams are organized approximately corresponding to the MSEE Depth Areas, which are numbered one through five. The final two diagrams, BioEE and Energy, cut across multiple areas. *These diagrams are not a complete or definitive representation of the MSEE Depth Areas. Please refer to the listings elsewhere in this Handbook.*

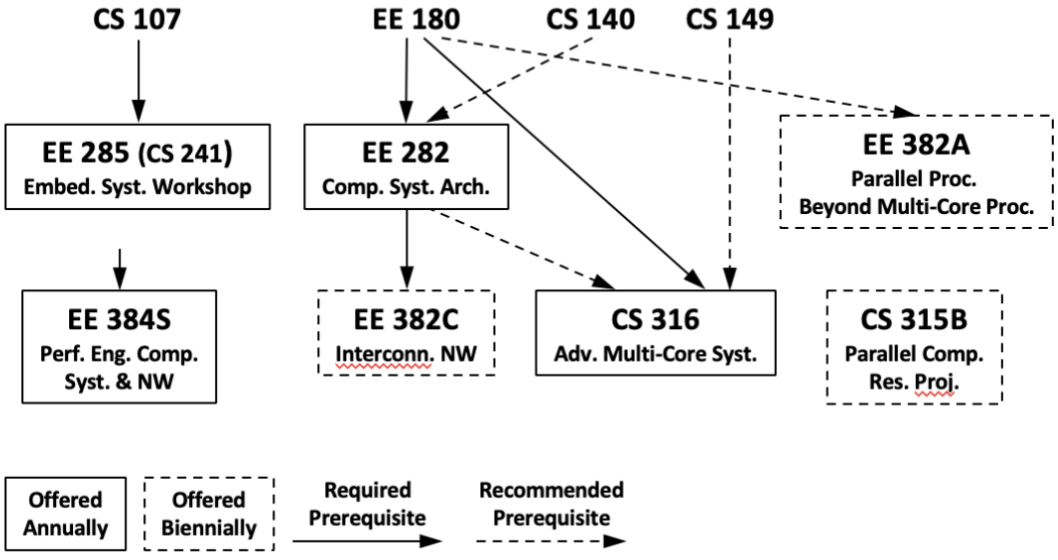
Depth Area 1, Circuits



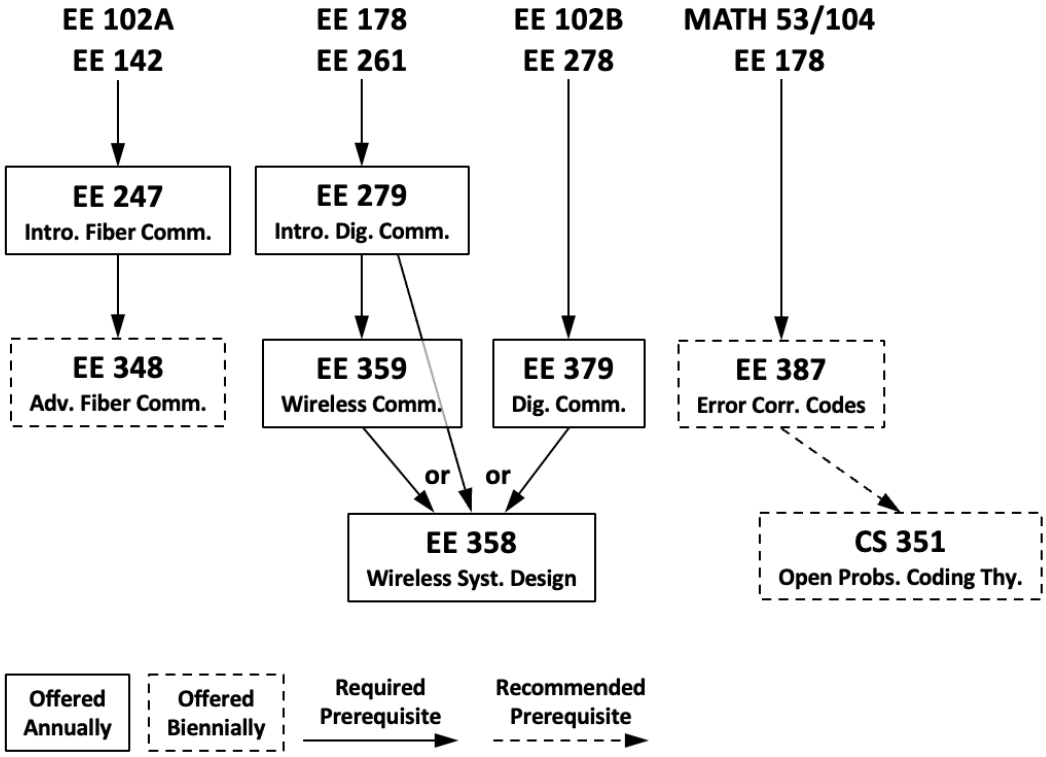
Depth Areas 1 and 2, VLSI



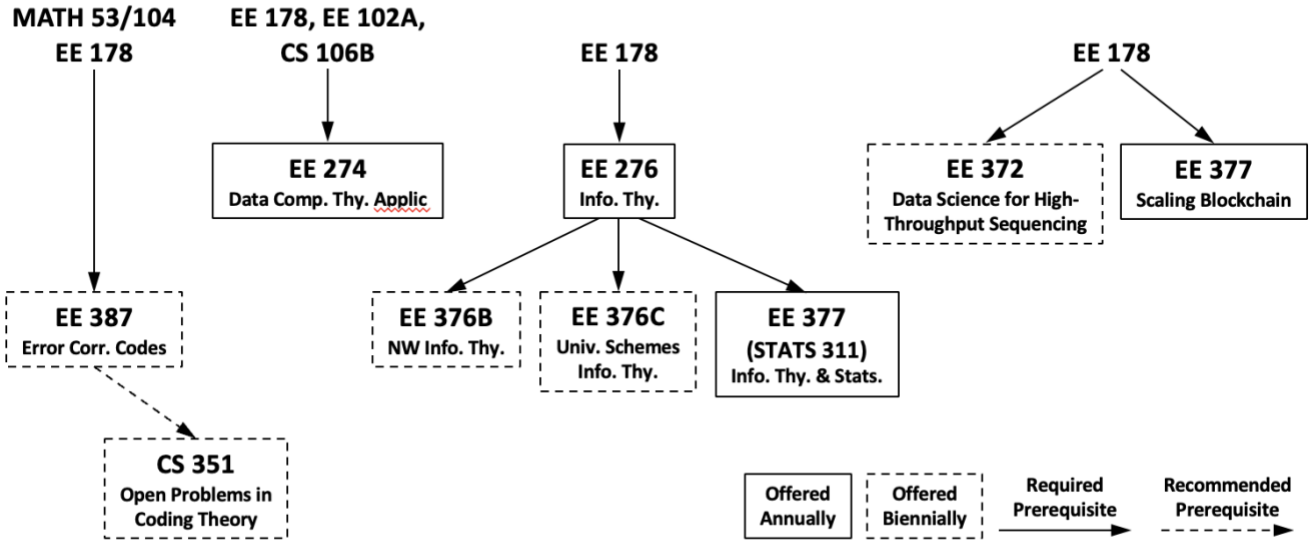
Depth Area 2, Architecture and Embedded Systems



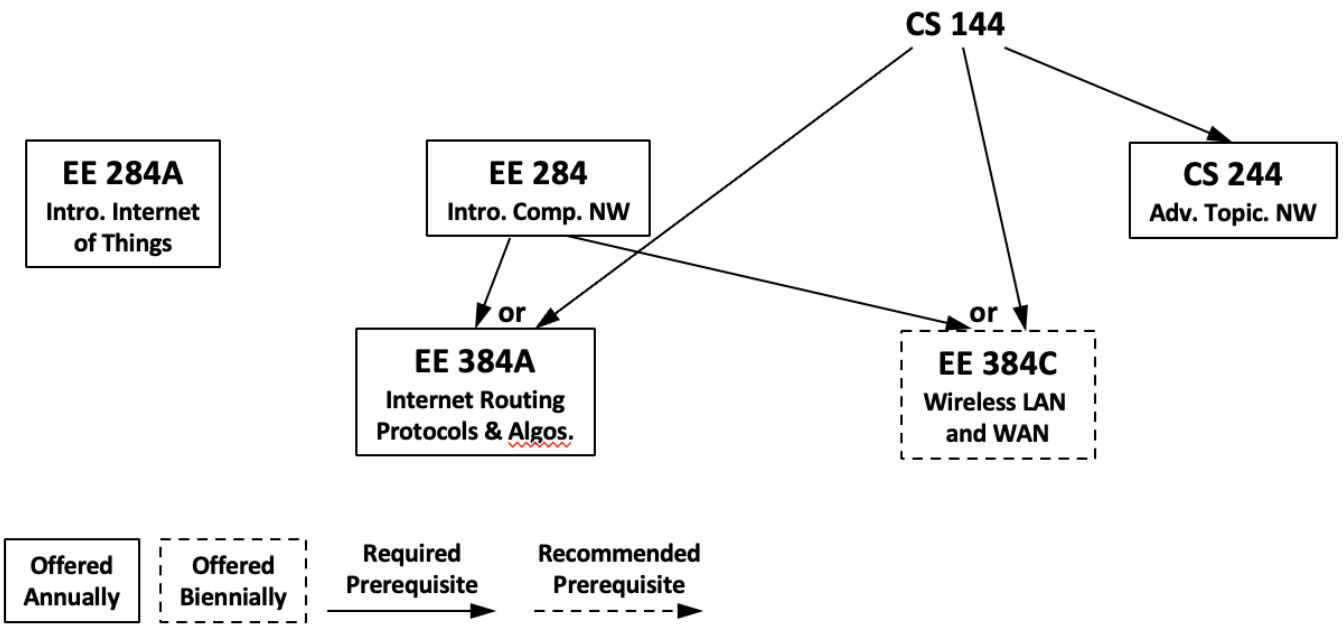
Depth Area 3, Communications



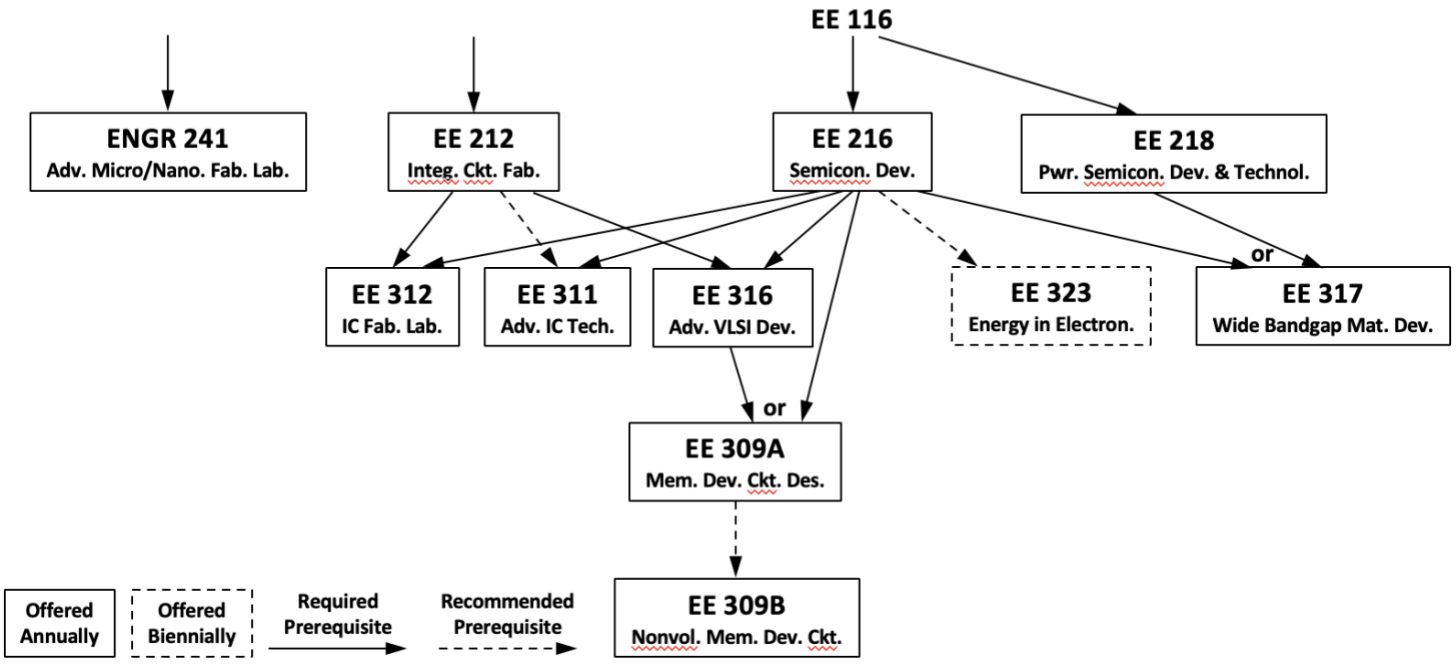
Depth Areas 3 and 5, Information Theory



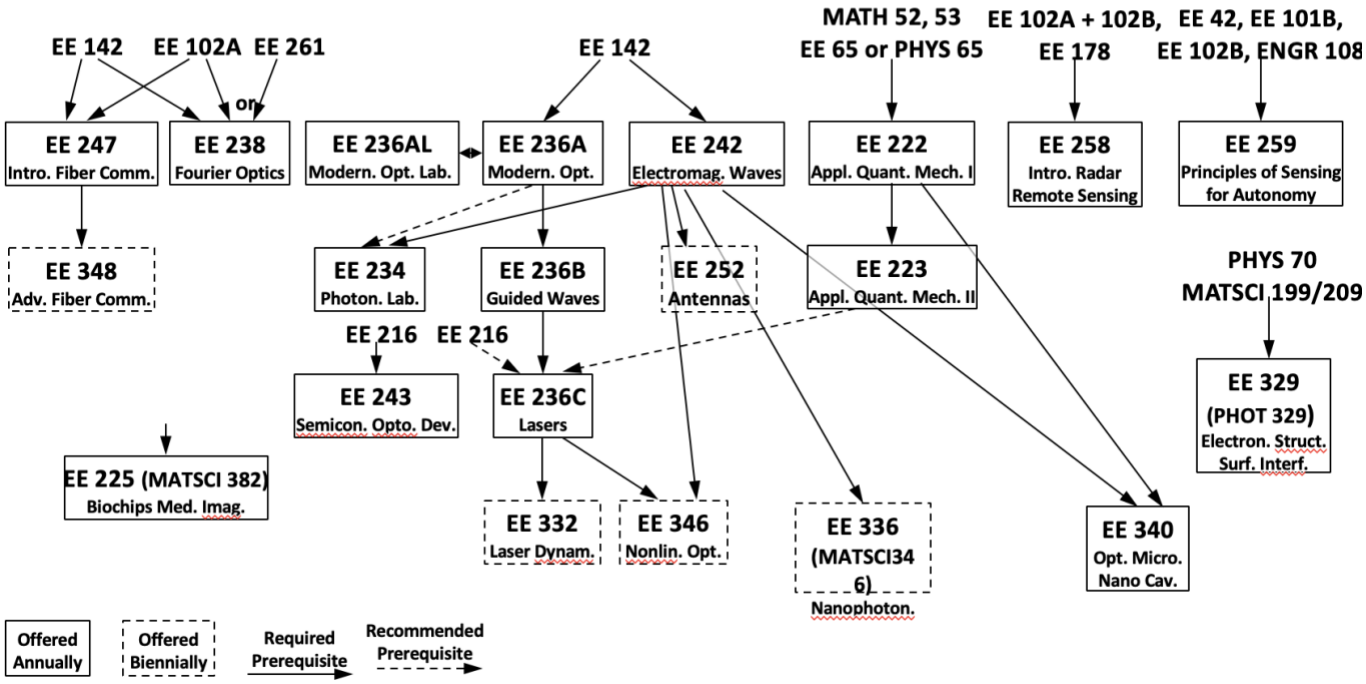
Depth Area 3, Networking



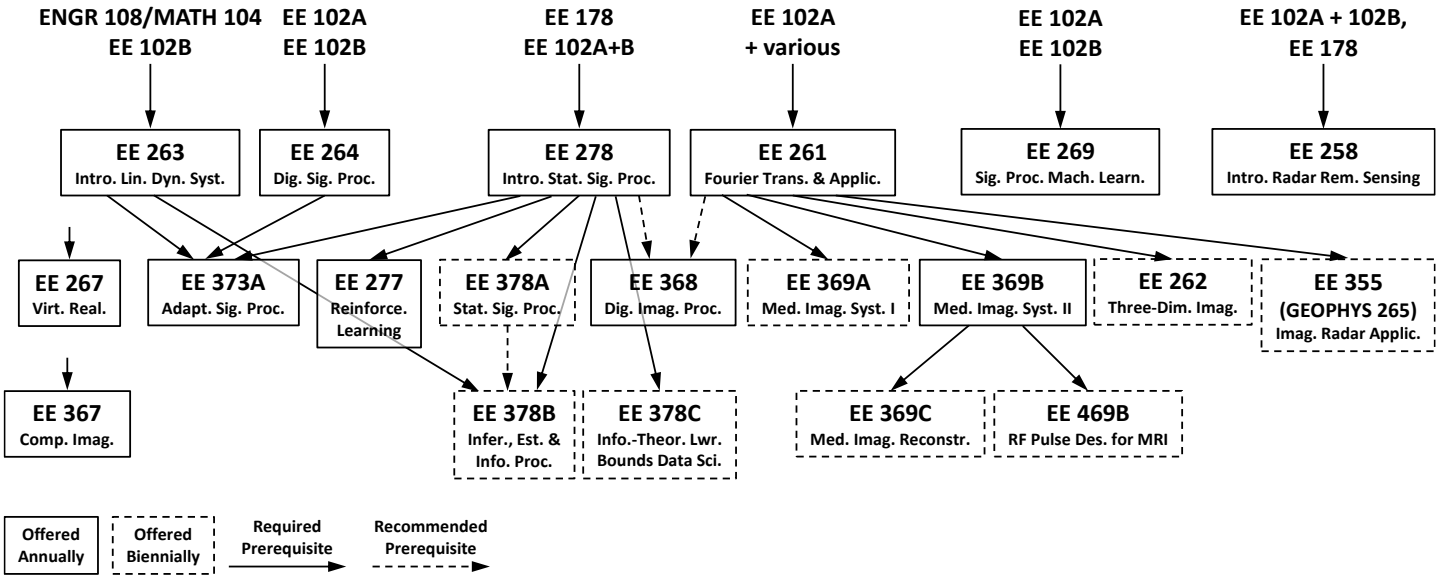
Depth Area 4, Semiconductors and Devices



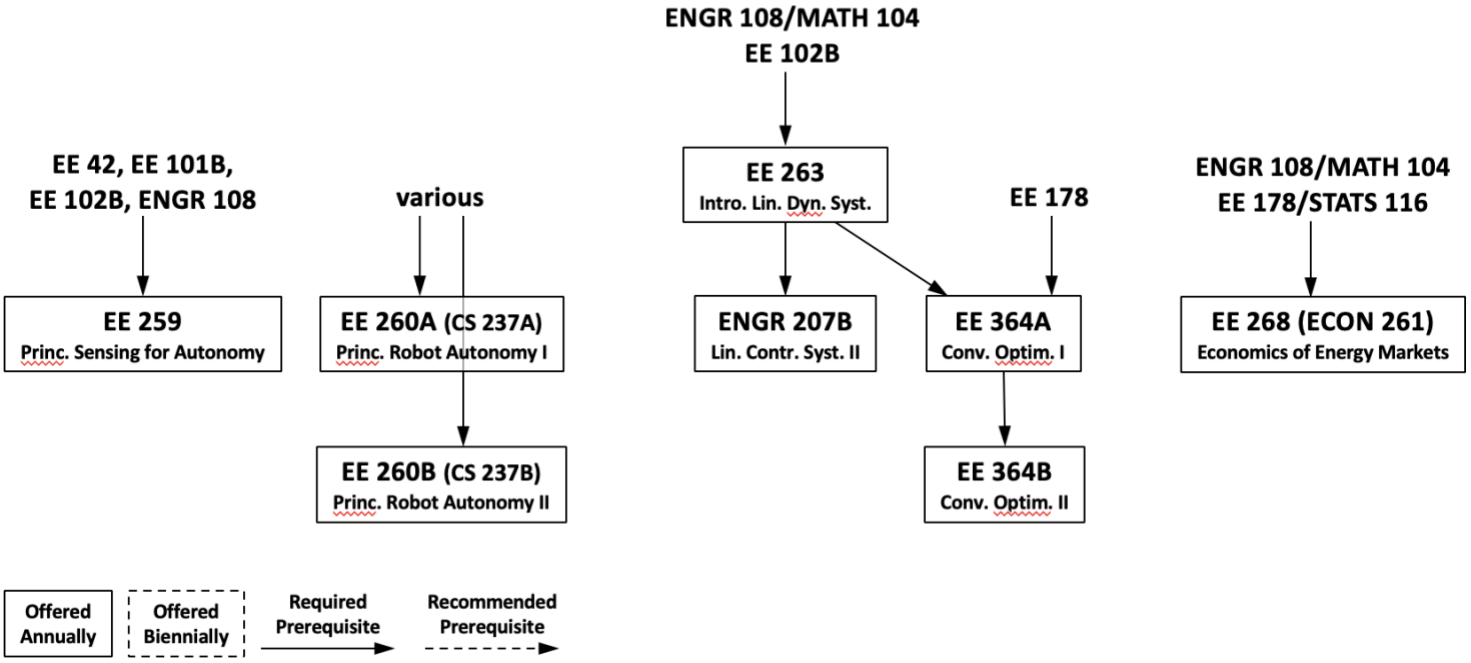
Depth Area 4, Electromagnetics, Photonics and Quantum Mechanics



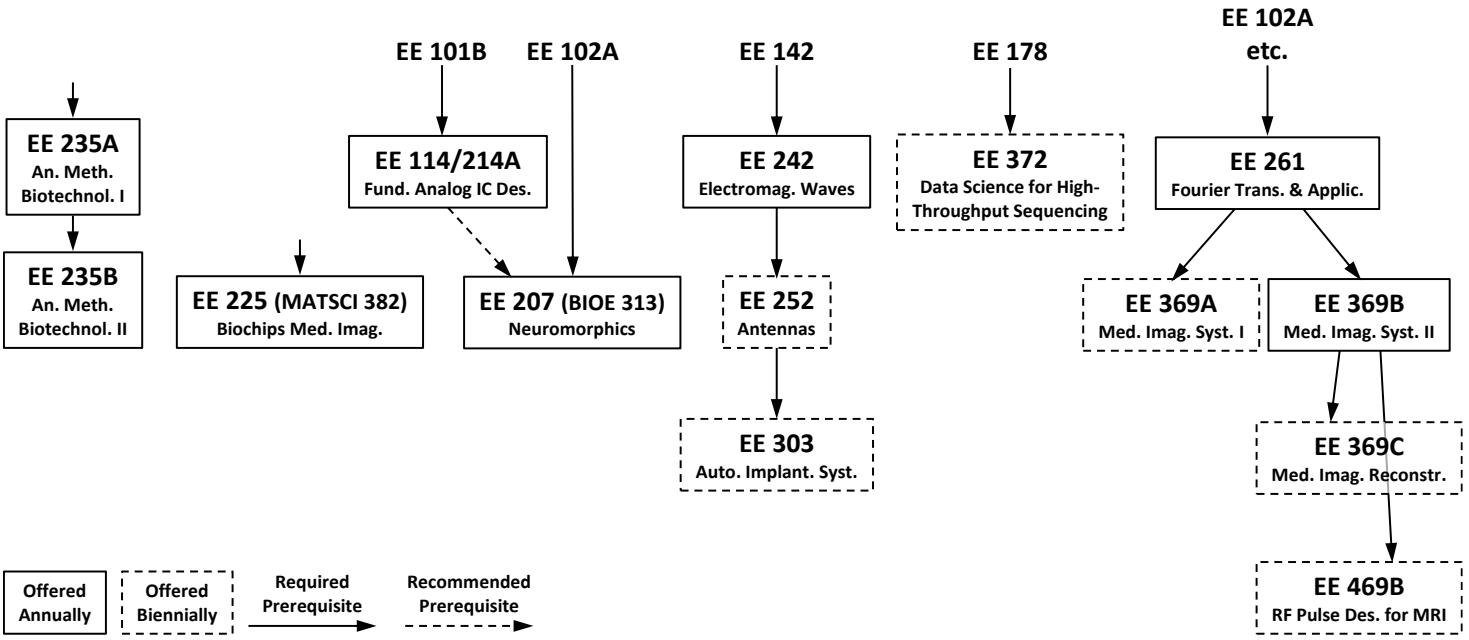
Depth Area 5, Signal and Image Processing



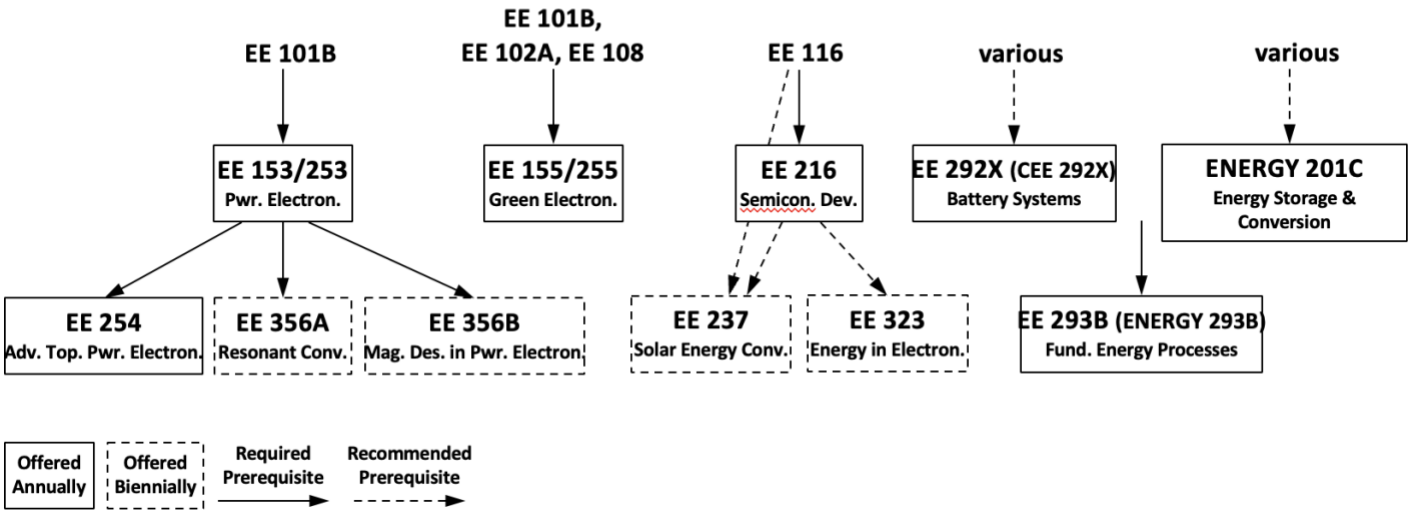
Depth Area 5, Control and Optimization



Multidisciplinary Area, Bio-EE



Multidisciplinary, Energy



Additional Courses Taught by Electrical Engineering Faculty

The following courses, while listed under other departments, are taught by faculty members jointly appointed in Electrical Engineering. Most of these courses appear in BSEE specialty areas or MSEE depth sequences. *This list is for informational purposes only. It does not relate to satisfaction of any degree requirements. Not all courses are offered every year. Introductory Seminars are not included*.

Course ID	Course Title	EE Instructor(s)
BIOE 123	Biomedical System Prototyping Laboratory	K. Boahen
BIOE 300B	Quantitative Physiology	P. Nuyujukian
CS 102	Working with Data: Tools and Techniques	J. Widom
CS 107E	Computer Systems from the Ground Up	C. Gregg
CS 110	Principles of Computer Systems	P. Levis
CS 140E	Operating System Design & Implementation	D. Engler
CS 142	Web Applications	M. Rosenblum
CS 144	Introduction to Computer Networking	K. Winstein
CS 149	Parallel Computing	K. Olukotun
CS 155	Computer and Network Security	D. Boneh
CS 161	Design and Analysis of Algorithms	M. Wootters
CS 217	Hardware Accelerators for Machine Learning	K. Olukotun
CS 221	Artificial Intelligence: Principles & Techniques	C. Finn, D. Sadigh
CS 229	Machine Learning	J. Duchi
CS 240	Advanced Topics in Operating Systems	D. Engler
CS 240E	Embedded Wireless Systems	P. Levis
CS 241	Embedded Systems Workshop	P. Levis
CS 244	Advanced Topics in Networking	P. Levis, K. Winstein
CS 244B	Distributed Systems	D. Engler
CS 251	Cryptocurrencies & Blockchain Technologies	D. Boneh
CS 255	Introduction to Cryptography	D. Boneh
CS 315A	Parallel Computer Arch. and Programming	K. Olukotun
CS 316	Advanced Multi-Core Systems	C. Kozyrakis
CS 330	Deep Multi-task and Meta Learning	C. Finn
CS 333	Safe and Interactive Robots	D. Sadigh
CS 343	Advanced Topics in Compilers	D. Engler
CS 349D	Cloud Computing Technology	C. Kozyrakis
CS 349F	Technology for Financial Systems	B. Prabhakar, M. Rosenblum
CS 351	Open Problems in Coding Theory	M. Wootters
CS 355	Advanced Topics in Cryptography	D. Boneh
GEOPHYS 385Z	Radio Remote Sensing	H. Zebker
MATSCI 312	New Methods in Thin-Film Synthesis	S. Wang
MATSCI 347	Mag. Matls. In Nanotech., Sensing & Energy	S. Wang

MS&E 111X/211X	Introduction to Optimization (Accelerated)	B. Van Roy
MS&E 130	Information Networks and Services	N. Bambos
MS&E 335	Queueing and Scheduling in Proc. Networks	N. Bambos
MS&E 351	Dynamic Programming & Stochastic Control	B. Van Roy
STATS 101	Data Science 101	J. Duchi
STATS 300A	Theory of Statistics I	A. Montanari
STATS 300B	Theory of Statistics II	J. Duchi
STATS 316	Stochastic Processes on Graphs	A. Montanari
STATS 369	Methods from Statistical Physics	A. Montanari
STATS 375	Inference in Graphical Models	A. Montanari

Joint Degree MS/JD Program

The Department of Electrical Engineering and the School of Law offer a joint degree program leading to an M.S. degree in EE combined with a J.D. degree. The J.D./M.S. program is designed for students who wish to prepare themselves for careers that involve both Law and Electrical Engineering.

Students interested in this joint degree program must apply to and gain admission separately from the Department of Electrical Engineering and the School of Law, and as an additional step, secure consent from both academic units to pursue both degrees simultaneously. Interest in the program should be noted on a student's application to each academic unit. A student currently enrolled in either the Department of Electrical Engineering or the School of Law may apply for admission to the other academic unit and for joint degree status after commencing study in that unit.

Joint degree students may elect to begin their study in either the Department of Electrical Engineering or the School of Law. Faculty advisors from each academic unit participate in the planning and supervising of the student's joint program. In the first year of the joint degree program, students must be enrolled full-time in the School of Law. Students must satisfy the requirements for both the J.D. and the M.S. degrees as specified in the Stanford Bulletin.

The Electrical Engineering Department approves courses from the Law School that may count toward the M.S. degree in Electrical Engineering, and the Law School approves courses from the Department of Electrical Engineering that may count toward the J.D. degree. In either case, approval may consist of a list applicable to all joint degree students or may be tailored to each individual student's program.

No more than 45 quarter hours of approved courses may be counted toward both degrees. No more than 36 quarter hours of courses that originate outside the School of Law may count toward the Law degree. To the extent that courses under this joint degree program originate outside of the School of Law but count toward the Law degree, the School of Law credits permitted under Section 17(1) of the Law School Regulations shall be reduced on a unit-per-unit basis but not below zero.

The maximum number of School of Law units that may be counted toward the M.S. degree in Electrical Engineering is the greater of:

1. 12 units, or
2. the maximum number of units from courses outside of the Department that M.S. candidates in Electrical Engineering are permitted to count toward the M.S. degree under general departmental guidelines, or as set forth in the case of a particular student's individual program.

Tuition and financial aid arrangements are typically administered through the school in which the student is enrolled.

Joint Degree MS/MBA Program

The Joint MS in Electrical Engineering /MBA Degree Program (EE/MBA) enables students to pursue simultaneously a Master of Business Administration at the Graduate School of Business (GSB) and a Master of Science in Electrical Engineering at the Stanford School of Engineering. Joint MS/MBA degree students will have interests in technology and leadership with a desire to become managers or entrepreneurs in technologically inclined businesses. The Joint MS/MBA Degree Program requires application to, and acceptance for admission by, both the Electrical Engineering Department (EE) and the GSB. Typically, MS/MBA students apply to and gain acceptance for admission to both programs within the same year. However, it is possible for current EE (or MBA) students, who previously did not apply for the joint degree option, to apply for and pursue the Joint MS/MBA Degree Program. EE students in the second year and MBA students in the second year may not apply for the Joint MS/MBA Degree Program.

Program Requirements

The Joint MS/MBA Program requires a combined total of 129 units, enabling completion of the joint degree in a maximum of nine quarters.

a. Students must successfully complete 84 unduplicated units of instruction, 80 of which must be at the GSB, which includes successful completion of the Core and Distribution Requirements. Additionally, at least 70 GSB units for the MBA must be completed for a letter grade (not on a Pass/Fail basis). Rules concerning independent study, grade point average, the Global Experience Requirement, and so forth will match those set for students in the regular MBA Program, as specified annually on the MBA Policies and Standards tab on the MyGSB website.

b. Students must successfully complete at least 45 unduplicated units of instruction approved by EE. Some of these courses, not to exceed 12 units, may be applied from GSB coursework. Specific requirements include:

i. Depth: Completion of 12 units from one of the five (5) area lists (see Approved Depth and Breadth Area Courses for specific coursework and area lists). At least six (6) units must be at the 300 level or above. All depth units must be for a letter grade.

ii. Breadth: Completion of nine (9) additional units from other area lists. These units must be for a letter grade.

iii. Technical Courses: Completion of 15 units of 100-level (200 for EE) or higher courses in engineering, natural sciences, mathematics, or statistics. Nine (9) of the 15 units must be at the 200 level or above. All 15 units must be for a letter grade. Courses taken in GSB can follow the GSB grading system (H, HP, P, LP). The following courses may also count toward the technical course requirement:

- MGTECON 604: Econometric Methods II

- OIT 274: Data and Decisions – Base (Flipped Classroom)
- OIT 276: Data and Decisions – Accelerated (Flipped Classroom)
- OIT 367: Business Intelligence from Big Data
- FINANCE 350: Corporate Financial Modeling

iv. Other Courses: Completion of at least nine additional units. These units must be at the 100 level or above and may be CR/NC or letter graded in departments relevant to the EE MS degree. Suggested courses include:

- depth/breadth courses
- additional technical courses
- independent study (e.g., EE 391, EE 390)
- seminars
- Curricular Practical Training (e.g., EE 290A)

Courses not relevant to the EE-MS degree or practice of the EE profession are not acceptable. Consult with your EE program advisor or the Degree Progress Officer before selecting courses in categories not listed just above this paragraph.

Note: Athletics courses do not count toward the 45 units. EFSLANG (English for Foreign Students) courses do not count toward the 45 units. If the University requires you to take any of these classes, they are additional units above the required 45 units.

v. The 45 EE-MS units must include at least 36 units passed with a letter grade. Students must maintain a minimum grade point average of 3.0 on a 4.0 scale across all courses counting toward the MS.

- See below for a list of approved GSB courses.

c. Students are expected to complete the Joint MS/MBA Program in no more than nine consecutive quarters. **A different timeline requires approval from the MBA Program and is unlikely to be granted except for students who have received approval for a leave of absence or a childbirth accommodation. Students who do not meet the requirements according to the timeline stated above and do not have approval from the MBA Program for a different timeline, are disqualified and subject to immediate dismissal. See the section on Consequences for Falling Out of Good Academic Standing and Academic Probation.**

Approved GSB Courses

The following GSB courses have been approved to count towards MS requirements. Only up to 12 units may be counted.

- FINANCE 341 - Modeling for Investment Management (3 units)
- FINANCE 350 - Corporate Financial Modeling (4 units)

• FINANCE 385 - Angel and Venture Capital Financing for Entrepreneurs and Investors (3 units)
• FINANCE 620 - Financial Markets I (3 units)
• FINANCE 622 - Dynamic Asset Pricing Theory (4 units) (not offered AY 22-23)
• FINANCE 624 - Corporate Finance Theory (4 units)
• FINANCE 625 - Empirical Asset Pricing (3 units)
• FINANCE 626 - Advanced Corporate Finance (3 units)
• GSBGEN 392 - Financial Management for Entrepreneurs (3 units)
• GSBGEN 641 - Advanced Empirical Methods (3 units)
• GSBGEN 675 - Microeconomic Theory (3 units)
• MGTECON 602 - Auctions, Bargaining, and Pricing (4 units)
• MGTECON 604 - Econometric Methods II (4 units)
• MGTECON 608 - Multiperson Decision Theory (3 units)
• MGTECON 610 - Macroeconomics (4 units)
• OIT 367 - Business Intelligence from Big Data (3 units)
• OIT 556 - Electronic Business (2 units)
• STRAMGT 330 - Entrepreneurship and Venture Capital: Partnership for Growth (3 units)
• STRAMGT 353 - Entrepreneurship: Formation of New Ventures (4 units)
• STRAMGT 354 - Entrepreneurship and Venture Capital (4 units)
• STRAMGT 356 - The Startup Garage: Design (4 units)
• STRAMGT 366 - The Startup Garage: Testing & Launch (4 units)
• STRAMGT 572 - Strategic Management of Technology and Innovation (2 units)
• STRAMGT 573 - Strategic Thinking in Action - In Business and Beyond (2 units)

Coursework Planning

Joint MS/MBA degree students may begin the joint program at either the GSB or the Electrical Engineering Department. Joint MS/MBA degree students spend most of the first year at the GSB fulfilling the requirements of the MBA curriculum. Students may take EE courses once they begin taking electives, typically during Winter or Spring Quarter of their first year. During their second and third years, students have the opportunity to take a variety of electives at the GSB and the EE Department.

For assistance with program and course planning, please contact the EE Program Advisor.

Specific Policies for Students Who Begin the Joint MS/MBA Degree Program at the Electrical Engineering Department

A student in the Joint MS/MBA Degree Program who has matriculated and begun studies in the Electrical Engineering Department but has not yet begun studies at the GSB will be considered an MBA student with a plus (i.e., "MBA+"). Once MS/MBA students begin Autumn Quarter Core Requirements, they will be considered regular MBA students and subject to the applicable policies.

Other Course Policies

Other course policies set forth in the Policies and Standards apply.

Courses and Registration

Students will have two open programs (called "careers" in Axess) under which they may register for courses: the GSB career and the Graduate (EE) career. It is imperative that students pay close attention to and register for courses under the career in which they register for a course, i.e., degree, toward which they plan for them to count. All GSB courses (whether applied to the MBA or the MS) should be enrolled under the GSB career.

Fulfillment of the Core and Distribution Requirements will begin upon matriculation at the GSB in the second year. MBA+ students may not take Core and Distribution Requirements courses (including Advanced Core and Distribution Requirement courses that may be offered as electives) prior to matriculation at the GSB.

MBA+ students may register for GSB elective courses in Autumn, Winter or Spring Quarters via the Non-GSB Registration Site on a first come, first serve basis. These courses will count toward no more than 12 of the 84 required GSB units, and not toward fulfillment of the Core or Distribution Requirements.

Tuition and Financial Aid

In the first six quarters, students will pay the standard GSB tuition rates; students will then submit a Tuition Agreement for Students with Multiple Programs (TAGM) eForm via Axess in order to pay the appropriate graduate engineering tuition rate for the remaining three quarters.

Students in the Joint MS/MBA Degree Program are considered for GSB fellowship aid for a maximum of six quarters. After six quarters of fellowship eligibility, students must apply for additional financial aid, most of which will be in the form of loans and will continue to be coordinated through the GSB Financial Aid Office. Students with specific questions should contact the GSB Financial Aid Office.

For more information, contact the GSB Associate Director for Joint & Dual Degree Programs or the EE Degree Progress Officer.

Career Resources

- MBA+ students will have access to CMC resources including advising, workshops, on-campus interviewing (OCI), alumni directory, and the GSB job board. The timing of access to these resources will be consistent with the first-year MBA students, which means that most GSB CMC resources will not be available to MBA+ students until after the Autumn Quarter MBA1 Academic Adjustment Period (AAP).

- In communicating with potential employers, MBA+ students will be required to identify themselves as joint degree students who have not yet started the first-year MBA curriculum.
- Once MS/MBA students matriculate to the GSB, CMC access will be governed by the same policy that applies to regular MBA students, regardless of previous access, i.e., in the first year at the GSB, timing of access to CMC resources will continue to be restricted from the beginning of the Autumn Quarter Core Requirements until the end of the Autumn Quarter AAP.

Programs and Activities

- MBA+ students will be permitted to apply for GMIX before beginning the Autumn Quarter Core Requirements at the GSB, but it may not be counted toward fulfillment of the Global Experience Requirement (GER). Priority for projects and funding will be given to students who have completed the first-year MBA curriculum. MBA+ students will need to self-identify their status to the Associate Director, GMIX program before applying to the program. In communicating with potential employers, MBA+ students will be required to identify themselves as joint degree students who have not yet started the first-year MBA curriculum.
- MBA+ students will be permitted to apply for Study Trips only after beginning the Autumn Quarter Core Requirements at the GSB.
- MBA+ students will be permitted to join GSB clubs after the Autumn Quarter AAP of their first year as a matriculated student at the EE Department.
- Once MS/MBA students matriculate to the GSB, participation in GSB clubs will be governed by the policy that applies to regular MBA students, regardless of previous access.
- MS/MBA students will not be eligible for any leadership positions at the GSB until after having begun the Autumn Quarter Core Requirements at the GSB.

Students with any questions should contact the Associate Director for Joint & Dual Degree Programs or the EE Admissions and Student Services team.

Honors Cooperative Program

The Honors Cooperative Program (HCP) enables qualified working professionals to pursue the Master of Science in Electrical Engineering on a part-time basis, in partnership with the Stanford Engineering Center for Global & Online Learning (CGOE). HCP students are fully matriculated graduate students at Stanford University with full student privileges, rights, and responsibilities. As such, HCP students are graded by the same standards as full-time students and earn the same degree.

HCP students are required to fulfill the same MS degree requirements as outlined in this handbook, with the following exceptions:

- The deadline to submit the MS Program Proposal is the end of the **second** quarter of enrollment.
- There is a **five-year** limit from the first quarter of enrollment in the master's program to conferral of the degree.

HCP students should review the Honors Cooperative Program Policies, which includes details specific to CGOE students (e.g., how to access online course materials, submit homework, make tuition payments, etc.).

Requests to transfer from part-time to full-time are reviewed by the Department on a case-by-case basis. Final decisions are at the Department's discretion. These are the following limitations:

- Students must complete a minimum of two (2) quarters in the part-time program excluding summer quarter before requesting to transfer to full-time.
- Students must complete a minimum of 15 units of letter graded lecture or lab courses that meet requirements for the EE MS degree.
- Students are expected to have a GPA of 3.5 or above at the time they submit their request.
- Students can make a maximum of two (2) transfers during the program (e.g., transfer from part-time to full-time and back to part-time).
- Students may not transfer to full-time status for the last quarter of their degree program.

Students must submit the Student Transfer Request Form to CGOE. They will route the form to the EE Department for final review. Students will receive a formal notice from the CGOE office when a decision has been made.

Program Planning: Ph.D. Degree

Ph.D. Academic Requirements and Milestones
Milestones Timeline: Ph.D. Degree
Qualifying Exam
Applying for Doctoral Candidacy
Course Unit Requirements
Reading Committee
Terminal Graduate Registration (TGR)
Oral Examination
Dissertation
Graduation Quarter Petition

Ph.D. Academic Requirements and Milestones

To meet the requirements of the Ph.D. program, every student must meet Department and University requirements:

- Find a research topic and advisor.
- Pass the Department's qualifying examination.
- Complete the candidacy form (complete the courses listed).
- Form a dissertation reading committee.
- Pass the Oral Examination, in which dissertation results are presented and defended.
- Submit the dissertation to the University.

Word of Advice: New students are strongly advised not to undertake a heavy academic program in their first quarter at Stanford, as they are adjusting to their new environment and the demanding nature of graduate work. Three regular courses (8-10 units) provide a full-time workload, particularly during the first quarter at Stanford. The student's advisor should be consulted for further guidance on this and other course-enrollment questions.

Ph.D. Milestones Timeline

Important Points:

☐ The University's minimum requirement for the doctoral degree is 135 unduplicated units of coursework done at Stanford. Please see below for information on course unit requirements and transferring credits from another institution.

☐ Students must maintain a minimum cumulative GPA of 3.0 to maintain good academic standing in the program.

☐ All units must be at the 100 level or higher. No courses numbered below 100 count toward a graduate degree.

☐ Every student should be familiar with the University's requirements for minimal progress as outlined in the Graduate Academic Policies and Procedures GAP handbook.

☐ Students are required to be admitted to candidacy by the end of their second year in the program. More information on candidacy can be found below.

☐ Candidacy is valid for five years from the date of approval by the Department unless terminated by the Department (e.g., for unsatisfactory progress). The candidacy end date is listed on the student's record in Axess.

☐ Students who are unable to graduate before their five years of candidacy expire may request a maximum of one additional year of candidacy per extension. Extensions require review of a dissertation progress report, a timetable for completion of the dissertation, and any other factors regarded as relevant by the Department. Students must file a request for candidacy extension before the end of their program's time limit. The Department is not obligated to grant an extension. Please submit your request for extension to the EE Degree Progress Officer. Extensions are subject to final approval by the Associate Chair of Graduate Education.

☐ During your final quarter in the program, you must "Apply to Graduate" in Axess.

Ph.D. Qualifying Exam

Students in the Ph.D. program wishing to advance to candidacy must first pass the Electrical Engineering Qualifying Examination prior to the end of winter quarter of their second year of study. **Students must be registered in the quarter they take the qualifying exam.**

Procedures

The qualifying exam is an oral examination intended to provide the examination committee with evidence of your research preparedness and capabilities and allow the committee to give you useful feedback on your research direction.

Examination Committee

Your committee consists of three members, your advisor and two others. All committee members must be members of the Academic Council, and at least two members must be EE faculty (joint or full appointment only, not by courtesy).

You will be responsible for forming your exam committee and scheduling the exam date and room. Once the details of your exam are finalized, bring the Application for Qualifying Examination form to the Degree Progress Officer.

Room Scheduling

You are responsible for reserving a room for your exam. After you have located a room, check with your faculty administrator to book the room in Packard building or AllenX building as the Registrar rooms may not be open. You can also reserve a room yourself in 25Live.

Examination Format

- 15 minutes for student to present background and proposed research.
- 15 minutes for committee to ask questions. Question topics can include the presented research or related general topics.
- (Optional) 15 minutes for committee members to make suggestions.
- The faculty committee will then deliberate.
- Students will be notified of the examination results by email.

Final Reporting Procedures

After concluding the exam, the committee members will vote at the Qualifying Exams voting link. Students must remind their committee to vote. If there is a split vote (2-1 for or against) the Degree Progress Officer will give the results to the Associate Chair for Graduate Education, who will make the final decision.

Applying for Doctoral Candidacy

Students who have passed the Department's qualifying examination may file the Application for Candidacy for PhD Degree form.

When to apply for candidacy

The Department recommends that the *Application for Candidacy* be completed by the end of the spring quarter of the academic year in which the student has passed the qualifying exam. The application is due to the Department on **May 1st** in the second year. **The University requires that all Ph.D. students file the *Application for Candidacy* by the end of the second year of their doctoral study at Stanford.** On the form, the student will list courses that total 135 units including the optional 45-unit M.S. program of study (earned at Stanford or transfer credit received for a masters earned at another institution) to be used for the Ph.D. degree. It includes courses already completed (if any) and courses to be completed.

The Application for Candidacy must be signed by the student's Principal Dissertation Advisor and the Second Reader. The form is then submitted to the EE Degree Progress Officer, who will obtain the Associate Chair's signature.

Finding a Dissertation Advisor and Second Reader

The dissertation advisor is the primary faculty member who will supervise the student's research and fund the length of his/her study until graduation (unless the student receives an outside fellowship). The second reader is an additional faculty member who agrees to review and sign off on the student's dissertation. The dissertation advisor and second reader must be regular Stanford faculty on the Academic Council (not an Adjunct Professor, University Medical Line Faculty or a Senior Research Associate). The dissertation advisor and/or second reader must have either a full or a joint appointment in the Electrical Engineering Department. The appointing of emeritus faculty to a student's committee is subject to department approval. Please see the EE Degree Progress Officer for more information.

Changing Dissertation Advisors

Students should be aware of the University's policies regarding minimum progress requirements for graduate students as spelled out in the Stanford Bulletin in the section titled "Graduate Degrees." In the rare event that an advisor or student decide to terminate their relationship, the student retains candidacy and remains in the Ph.D. program. However, the Department requires the student to actively seek and find a new advisor within one quarter, to satisfy minimum progress requirements of the Department and the University and continue enrolling. If a student fails to secure a new dissertation advisor by the end of the quarter, the Department will initiate procedures for dismissal per the "Guidelines for Dismissal of Graduate Students for Academic or Professional Reasons" in the Stanford Bulletin: https://studentservices.stanford.edu/more-resources/student-policies/academic-progress/graduate-degrees-degree-progress. Please see the EE Degree Progress Officer immediately if you have any questions or concerns about this.

Course Unit Requirement

The Ph.D. in Electrical Engineering is a specialized degree, built on a broad base of science, mathematics, and engineering skills. The course program must reflect competency in Electrical Engineering and specialized study in other areas relevant to the student's research focus. Students should discuss their course selection with their dissertation advisor.

Students in the Ph.D. program are required to complete 135 units of unduplicated coursework. Note that up to 45 units of a master's degree earned at Stanford or another institution in Electrical Engineering or other science/engineering/math fields may be counted toward the 135 units required for the doctoral degree.

The proposed program of study must be listed on the Application for Candidacy for Ph.D. Degree. Any deviations from these guidelines must be accompanied with an explanation

and the approval of the dissertation advisor. All deviations must be approved by the Associate Chair of Graduate Education (submit all requests for program deviations to the Degree Progress Officer).

The Ph.D. program must satisfy the following minimum unit guidelines:

- One unit of seminar course EE 301 (Introductory Research Seminar in Electrical Engineering). Students must take this course in autumn quarter of their first year.
- 21 units of letter graded lecture/lab courses at the 200 level or above in STEM fields - engineering, natural sciences, math or statistics.
- Students who want to earn a Master's degree in Electrical Engineering should choose courses that fulfill the EE MS Depth and Breadth requirements described in the EE Graduate Handbook (see the MS section of the EE Graduate Handbook for the complete list of degree requirements).

The remaining units required to complete the 135 total units may be comprised of:

- Special Studies (e.g., EE 390 or EE 391)
- research units (e.g., EE 400)
- seminar units
- additional lecture/lab courses taken CR/NC or for letter grades.
- non-departmental units in nontechnical areas

Students who wish to receive a Master's degree in Electrical Engineering from Stanford may count the 21 units of lecture/lab courses mentioned above toward the requirements for that degree (45 total units are required to earn a Master's degree). They must submit the Graduate Authorization Petition in Axess to open the degree and then submit the MS Proposal form that lists the courses taken in fulfillment of that degree. Ph.D. students that wish to open the Master's degree must confer the degree within three years of the first Master's degree quarter.

Students wishing to earn an MS degree in a different science or engineering department at Stanford instead of EE in partial fulfillment of the 135 units may submit a request to the Degree Progress Officer, to be reviewed by the Associate Chair of Graduate Education.

Transfer of Credit

After completing at least one full-time quarter of work at Stanford, students who have completed graduate work at another institution may submit an Application for Graduate Residency Credit eForm on the Student tab in Axess. The Registrar's Office will determine the admissibility of residency credit to be transferred. A maximum of 45 units may be transferred in to count toward the 135-unit requirement needed to complete the Ph.D. program.

In order to transfer units to the Ph.D. program:

- The course work must have been completed after the conferral of the Bachelor's degree.

- Courses must have a letter grade of B or better (or its equivalent).
- One semester unit typically converts to 1.5 quarter units.

Please refer the Graduate Residency Transfer Credit page for more information.

Students who want to transfer coursework done at another institution and plan to complete the EE MS program at Stanford should check the Minimum Residency Requirements for Graduate Degree before submitting the coursework transfer request.

Reading Committee

Who can be on my dissertation reading committee?

A dissertation reading committee in the Electrical Engineering Department consists of three faculty members.

- Your dissertation advisor.

  He or she must be a member of the Academic Council. University Medical Line faculty in the School of Medicine are not on the Academic Council and thus are not eligible to be dissertation advisors. The University does not permit Adjunct Professors to serve as principal dissertation advisors (see Stanford University GAP: Other Teaching Titles not permitted: Acting, Visiting, Adjunct, By Courtesy, and Voluntary Clinical Appointments)
- The second reader.
- The third reader.

Important Points about your dissertation reading committee:

☐ Two of the three must belong to the EE faculty (full or joint appointment), and the dissertation advisor and second reader must be on the Academic Council. EE Courtesy does not qualify as EE faculty for this requirement.

☐ The Department does not allow Adjunct and Visiting Faculty to be members of a student's reading committee.

☐ A Senior Research Associate, or, in some cases, an outside scientist or engineer may serve as the third reader. However, if a member of the proposed reading committee is not on the Academic Council, you must obtain approval from the Department by filling out a Petition for Non-Academic Doctoral Committee Members form, including the individual's curriculum vitae. This person must have a Ph.D. or equivalent.

☐ If the reading committee has four or five members, at least three members (comprising the majority) must be current members of the Academic Council.

Terminal Graduate Registration (TGR)

This is a reduced tuition rate available to advanced Ph.D. students who have completed all 135 units of coursework and who now only need to work on their dissertation. Students who are on TGR status must enroll in EE 802 or equivalent TGR course in their advisor's home department. To be eligible, students must have completed the following:

- Satisfactorily completed all courses listed on their Application for Candidacy form. If your plans for meeting the course requirements change (i.e., you enroll in classes that are not listed in your original candidacy form), you do not have to submit an updated form. The Degree Progress will check your coursework requirements when reviewing the TGR request.
- Completed 135 units of study at Stanford to fulfill the residency requirement. Credit for work completed elsewhere may be used to help meet this requirement.
- Have an approved Doctoral Dissertation Reading Committee form on file with the Department.
- Enroll in a TGR course, EE 802 or equivalent TGR course in the advisor's home department. Students can enroll in up to three units while on TGR.

University Oral Examination

Near the completion of the doctoral program, students must present a 30-45 minute public seminar on their dissertation research. Following the public presentation, the student is examined in private by a faculty committee of at least five examiners approved by the Electrical Engineering Department. Details about the oral examination are given here.

The oral examination is intended to verify that the student's research represents his or her own contribution to knowledge and understanding of the research. The oral examination is a dissertation defense in which the candidate is expected to:

- Demonstrate their ability to explain and defend the thesis and its contribution to knowledge before experts in the field.
- Present an understandable picture of the research and its setting to scholars whose special areas of interest lie outside the candidate's area of research.
- Answer satisfactorily any questions deemed pertinent by the examining committee.

What to expect during the Oral Examination

The examination begins with a public presentation of research results by the Ph.D. candidate, during which clarifying questions may be asked by members of the audience. This part of the examination is open to the public. After a brief recess, the examination continues in a private session with only the candidate and members of the examining committee in attendance. The examination, including the public portion, should not exceed three hours in length.

Members of the Oral Examination Committee

The Oral Examination committee consists of at least five members. All committee members should be members of the Academic Council.

- The University Chair is a faculty member who is not in the research area of the candidate's dissertation advisor. The Chair may be a faculty member of the Electrical Engineering Department or a faculty member from another department.

- The other members of the committee will usually be the members of the dissertation reading committee, and one additional examiner (five total oral exam committee members).
- The Department requires that at least two members of the Oral Examination committee be EE faculty members (this includes joint faculty members, but not EE courtesy). In special circumstances it is possible to include an examiner who is not an Academic Council member. Please see the Degree Progress Officer if a member of your committee is not an Academic Council member.

How to schedule the Oral Examination

For complete information and instructions about scheduling your oral examination, please go to: ee.stanford.edu/academics/graduate-degree-progress/oral-exam

Important Points:

☐ Students must be registered for the quarter in which the oral examination is given.

☐ The Doctoral Dissertation Reading Committee form must be on file with the Degree Progress Officer prior to the examination.

☐ Students are advised to pass the oral examination within one year of the date of completion of the other requirements for the degree.

☐ If the oral examination was passed more than one year prior to the date of graduation, the examination is void and the candidate may be asked to repeat the oral examination. The 12-month period of validity for the oral examination may be extended by petition to the Degree Progress Officer.

Dissertation

The single most important part of a Ph.D. program is the research for and writing of a doctoral dissertation, which must be approved by a reading committee. Students are encouraged to form their dissertation reading committee by the end of the third or fourth year of study.

Dissertation Submission

Make sure to carefully read the information on Dissertation and Thesis Submission provided by the University Registrar for specific instructions on how to submit your dissertation by the quarterly submission deadline. Students are not required to submit a copy of their dissertation to the Department.

Graduation Quarter Petition

Students must be registered in the term in which they submit a dissertation or have a degree conferred. Students who meet the following conditions are eligible to be assessed a special tuition rate for the quarter in which they are graduating.

There is currently a tuition fee of $150 for the Graduation Quarter; students will be assessed University health insurance (unless waived) and ASSU fees.

To be eligible for the reduced tuition rate, students must have:

- Completed all course work, degree requirements, and residency requirements.
- Passed the oral examination successfully (defend their dissertation) no later than the end of the quarter in which students receive this special tuition rate.
- Enrolled in the applicable TGR section in EE 802 or equivalent TGR course in the advisor's home department. Students cannot enroll in any other courses for the quarter.
- Applied to graduate via Axess.
- Enrolled or been on an approved leave of absence in the term immediately preceding the requested Graduation Quarter.

Students on Graduation Quarter are registered at Stanford and, therefore, have the rights and privileges of registered students.

Only one Graduation Quarter may be requested for each degree program. Students who, for whatever reason, do not graduate during the Graduation Quarter will be assessed a higher, standard tuition rate in subsequent terms. Students can request the Degree Progress Officer to put them back on TGR status if they cannot graduate in their Graduation Quarter.

The Graduation Quarter Petition eForm can be found in Axess under Student/Student eForm section. The eform must be submitted and approved by the first day of the intended quarter.

Program Planning: PhD Minor

A Ph.D. Minor is a program of study outside of the student's major department (i.e., a student's home department). A minor is not a requirement for any degree but is available when agreed on by the student and their home department and minor department.

Acceptance of the minor as part of the total Ph.D. program is determined by the student's home department.

The Application for the Ph.D. Minor must be approved by both the home department and the minor department.

List the course number, title, units and grade (if completed) of each course on the Ph.D. Minor application form.

For a minor in Electrical Engineering, the student must:

- Complete at least 20 units of Electrical Engineering (EE) lecture courses at the 200 level or above. If students want to use non-EE courses toward the EE PhD minor,

these courses must be from the approved depth and breadth area course list as outlined in this handbook.

- 15 of the 20 units must be letter graded.
- Seminars do not count toward the 20 units.
- Independent study units do not count toward the 20 units.
- A grade point average of at least 3.35 on these courses is required.

Additional Program Information

Leave of Absence

Students currently registered and wishing to take a leave from their degree program during the academic year must submit a Leave of Absence eForm. It is subject to the approval of the EE Degree Progress Officer.

Please note:

- Leaves of absence do not stop the time limit for degree completion or clearing incomplete grades.
- Leaves of absence are not allowed for pre-candidacy PhD students. Such students who do not wish to continue their studies must formally withdraw from the PhD program.

Extension of Candidacy

Students who are unable to graduate within the allotted candidacy period for their degree program may request a maximum of one additional year of candidacy per extension. The Department is not obligated to grant an extension. Extensions require advisor endorsement, and must include review of a progress report, a timetable for completion of any remaining degree requirements, and any other factors regarded as relevant by the Department. Students must submit the Application for Extension of Candidacy form to the EE Degree Progress Officer before the end of their program's time limit, which is listed in the student's record in Axess. Extensions are subject to final approval by the Associate Chair of Graduate Education.

Conferral of Degrees

Students who have met the requirements of their degree program are eligible to confer their degree. Students who intend to graduate must notify the University Registrar by applying to graduate via Axess. Students can apply to graduate during autumn, winter, spring or summer quarter.

Commencement ceremonies are held once a year in June for students who have received degrees in the previous summer, autumn, and winter quarters, and for students who are graduating in June or the following quarter (summer quarter).

Curricular Practical Training (EE 290)

EE 290 (A,B,C & D) offers course credit for EE students currently on an F-1 visa who would like to complete relevant work experience as part of their program of study. This is done in a manner consistent with the USCIS regulations and the Bechtel International Center. Such work must be relevant to the curricular program pursued by the student.

Students who wish to enroll in CPT courses have to complete at least one academic year (3 consecutive quarters) before they can be eligible to take CPT courses.

Instructions for receiving permission to engage in CPT

- Enroll in a CPT course and follow the departmental CPT Course Enrollment policies.
- Submit a Curricular Practical Training (F) request via Bechtel Connect (under Students section select Employment). Instructions on how to submit your CPT application and current policy information are provided at

bechtel.stanford.edu/immigration/employment/f-1-employment/curricular-practical-training-cpt

CPT Course Enrollment Policies

International students must enroll at least one academic year (three quarters) before they can be eligible for CPT.

Sign up for the appropriate EE 290 course (A, B, C or D) on your study list in the quarter during which you work.

MS students can take CPT for a maximum of two quarters (EE 290A and EE 290B).

PhD students can take CPT for three quarters (EE 290A, B, C) and a fourth by permission only (EE 290D).

EE 290A, B, C, D are taken only once.

- If you receive a No Credit ("NC") in any of these courses, you may not enroll in any additional CPT courses. Example: if you receive an "NC" in EE 290A, you may not take any further CPT courses for credit.

Course Number	Can be taken by…
EE 290A	EE MS and PhD students only.
EE 290B	EE MS and PhD students who have received a Satisfactory ("S") grade in EE 290A.
EE 290C	EE PhD students only. MS students may not enroll.

EE 290D	EE PhD students only. Requires permission of the Associate Chair of Graduate Education. Send an email to Prof. Brad Osgood at osgood@stanford.edu to obtain the approval. You must present strong reasons why a fourth quarter of internship is essential to your program of study. TGR students are not eligible to take CPT unless it is an essential part of the student's research.

Requirements for Completing the Course

1. The course is completed and a grade of "S" is assigned following submission and approval of a final report. The report should describe in competent English the work you performed and how it relates to your academic program (NOT your research).

2. The report should be three to five pages, single spaced, and should not contain company proprietary information.

3. The report cover page should include:
- the student's name
- Stanford ID number
- the course number (EE 290A, B, C or D)
- the quarter during which the course is taken
- the company you worked for

4. The report must have a section describing how your work improves your skills relating to SPECIFIC Stanford class(es) that you have taken (NOT how your work improves your research skills, and NOT how these classes help your work).

5. Papers resulting from the work can be added as an appendix, but do not alone fulfill the requirement.

6. Upload the report as a PDF file to the CPT database gradapps.stanford.edu/completeCPT/. Name the PDF file following this example:

Course number_last name, first name (e.g., EE 290A_Chan, Lisa)

CPT Database Workflow	
Step 1	Enroll in the appropriate CPT course in Axess. Enroll in section 2.
Step 2	At the beginning of the quarter, you will receive an email to log in to the CPT database. You must verify your basic information (e.g., email address, advisor name, etc).

Step 3	At the end of your CPT, upload your final report to the CPT database. Your report must be submitted by the last day of class.
Step 4	Your report routes for approval to the advisor whose name was entered by you in the CPT database. **You are responsible for ensuring that your advisor reviews and approves your report by the grade due deadline of that quarter.**
Step 5	Once your advisor approves your report, it routes to the Associate Chair of Graduate Education for final approval. *Please see note below.
Step 6	Final grades will be entered.

*An incomplete ("I") grade will be assigned if the report is not finally approved by the Associate Chair by the grade due deadline. There is a one-year maximum time limit for resolving incompletes. **If your report is not submitted and approved by both your advisor and the Associate Chair within the one-year time limit, the Registrar will automatically change the Incomplete to a final grade of NC (No Credit). There is no petition process to change the grade after the NC has been assigned.** Failure to complete this course will result in violation of USCIS CPT regulations.

Financial Support

Research Assistantships
Course (Teaching) Assistantships
Course Grader Appointments
Fellowships
How to Be Paid

Research Assistantships

Research assistantships are awarded by individual faculty members who have the necessary research funding to support students. In most cases, students who have successfully arranged for an RA appointment have secured it by contacting a faculty member directly. Research assistants typically receive 8-10 units of tuition coverage and a monthly salary in exchange for 20 hours of work per week.

Students who are hired as research assistants work on a research project under the supervision of a faculty member.

Important Points:

☐ All students holding assistantships must be enrolled in the quarter in which the assistantship appointment is held. For autumn, winter and spring quarters the student must be enrolled in 8, 9 or 10 units.

☐ Please make sure to carefully read the section on Assistantships in Stanford's Graduate Academic Policies and Procedures handbook online, to better understand the University's policies regarding assistantships.

☐ The typical assistantship appointment is for a maximum of 50% time (i.e., 20hrs/week), to allow students to make progress toward their degree.

☐ Students on a 50%-time assistantship may work only an additional eight (8) hours a week. *NOTE: International students on F or J visas may not work more than 50% time.*

Course (Teaching) Assistantships

Course assistantships (CAship) in the Electrical Engineering Department are available to students who have been at Stanford for at least one quarter. CAships typically provide recipients with tuition coverage of 8-10 units and a monthly salary, requiring 20 hours of work per week (the number of hours a student can work as a CA is determined by the number of students enrolled in a class). Students must apply for the course assistantship each quarter they wish to be considered. Information about becoming a course assistant in the EE Department can be found online.

Important Points:

☐ In addition to reading the information on our website, please make sure to carefully read the section on Assistantships in Stanford's Graduate Academic Policies and Procedures handbook, to better understand the University's policies regarding assistantships.

☐ All students holding assistantships must be enrolled in the quarter in which the assistantship appointment is held. For autumn, winter and spring quarters the student must be enrolled in 8, 9 or 10 units.

☐ The typical assistantship appointment is for a maximum of 50% time (i.e., 20hrs/week), to allow students to make progress toward their degree.

☐ Students on a 50%-time assistantship may work only an additional eight (8) hours a week. *NOTE: International students on F or J visas may not work more than 50% time.*

Course Grader Appointments

Course grader appointments in the Electrical Engineering Department are available to students quarterly. Course graders are paid hourly and can work for up to 20 hours per week (the number of hours a student can work as a grader is determined by the number of students enrolled in a class). Information about becoming a course grader can be found online.

Fellowships

Fellowships are a form of graduate student support that typically include a stipend to pay for living expenses and tuition support. No employment is expected in return for a fellowship (i.e., teaching or research work); it is awarded on a merit basis to assist a student in the pursuit of a degree.

Incoming PhD Students

The Electrical Engineering Department selectively awards fellowships to incoming PhD students every year. Each award comes with a quarterly stipend and a tuition allowance. The details of the fellowship will vary and be specified in the award

letter should you be selected to receive this type of funding. More information on how to be considered for a fellowship can be found on our website.

Current PhD Students

Fellowship opportunities for continuing students are mostly available through the office of the Vice Provost for Graduate Education. Information on the details of these fellowships can be found on their website. The EE Department will make announcements via email should fellowship opportunities become available to currently enrolled students.

Important Point:

☐ All students holding a University or Department fellowship must be enrolled in the quarter in which the fellowship is awarded. For autumn, winter and spring quarters, the student must be enrolled in 8, 9 or 10 units.

How to Be Paid

RAs and CAs receive a Stanford paycheck twice each month, on the same schedule as other University employees, and are subject to withholding of employment taxes with the exception of Social Security and Voluntary Disability Insurance.

Students on a fellowship receive a Stanford paycheck at the beginning of the quarter in one lump sum. Payments will be made in time for students to pay their University bill.

Important Points:

☐ All students holding assistantships or fellowships must be enrolled in the quarter in which the appointment is held. For autumn, winter and spring quarters, the student must be enrolled in 8, 9 or 10 units. ***You must be registered for classes in order to receive payment.***

☐ Students who have an assistantship in summer quarter must also be enrolled in units in order to receive payment (just as during the academic year). The percentage of the assistantship determines the number of units you should enroll in (e.g., a 90% RAship pays for 1-3 units of tuition).

☐ PhD students on TGR status must enroll in a TGR course in their advisor's course section, EE 802 or equivalent TGR course in the advisor's home department, in order to receive payment.

☐ We encourage every student who is receiving a paycheck through Stanford to enroll in direct deposit. Detailed information on how to set up direct deposit can be found online.

☐ Every student who works at Stanford should submit an I-9 form prior to the start of their appointment. Please submit this form as soon as possible to the Student Financial Officer prior to the start of the quarter in which you will begin employment.

Cardinal Care

Students who are enrolled in the Cardinal Care insurance program at Stanford, and who receive a fellowship or an assistantship stipend of at least 25% time, are eligible for a Cardinal Care subsidy. Please contact the Student Financial Officer for information on your fellowship or assistantship's appointment subsidy level (e.g., students who receive an assistantship appointment of 50% will receive a subsidy of half the cost of health insurance). More information regarding Cardinal Care can be found online.

International Students

Students holding an F-1 or J-1 visa are subject to many immigration restrictions related to employment. Working without proper authorization, even for one day, can have serious consequences with regard to your legal status in the U.S.

- Information on assistantship and fellowship policies as they relate to international students can be found online via the Bechtel International Center's website.

- Information on how to obtain a Social Security Number can also be found online.

Taxes and Tax Reporting

Student employee pay is subject to federal and state income tax withholding and is reported on Form W-2. Work performed in California is subject to withholding and reporting to California, regardless of the residency status of the student. Registered degree-seeking students do not pay FICA (Social Security and Medicare) taxes and California Voluntary Disability Insurance.

Tuition Allowance associated with assistantships is not subject to tax.

For further guidance related to taxes, students should consult the Stanford Student Financial Services Tax Information website.

International students should carefully read the information above as well as the information provided on the Bechtel International website to ensure timely tax reporting.

Computing Resources

For a complete description of the University computing resources, visit the Computing and Communication website at itservices.stanford.edu/.

- Terman Engineering Library
- Packard basement, Room 051

Most research groups have their own computing facilities, which are reserved for the use of those groups.

In recent years computer and network security have become extremely important to protect our systems and data from external attack. For advice and information on current security software and upgrades, see: uit.stanford.edu/security

Treatment of Students Sustaining Injuries

Students sustaining the following injuries should be directed to Stanford Hospital during all hours:

- Cyanide poisoning
- Ingestion of or skin contact with chemicals; inhalation of hazardous chemicals
- Head injuries that affect vision
- Significant burns, chemical or thermal (e.g., extensive, involving face)
- Significant lacerations (e.g., if more than just skin deep; over joints; possibly involving tendons)
- Significant fractures (e.g., long bones; open fractures)
- Significant dislocations (e.g., ankle, elbow, wrist, shoulder, hip)
- Significant crush injuries to bones, musculature, or abdomen
- Significant penetration injuries

Students sustaining most other work-related injuries should seek care at Vaden Health Center.

Injuries for which care is available at Vaden include, but are not limited to:

- Limited abrasions
- Limited contusions
- Superficial lacerations (skin only)
- Limited thermal and chemical burns
- Possible fracture

For occupational exposures to blood, body fluids, or other potentially infectious material (resulting from needle sticks, lacerations, etc.) immediately consult the Vaden Health Center or the Stanford Health Care Emergency Department.

Stanford Emergency Department is open 24 hours a day.

Campus Emergency Information

If there were a disaster or emergency affecting the Stanford community, you would be able to obtain updates and important instructions through the Emergency Information website at emergency.stanford.edu/.

If you need to report an accident or emergency situation on campus, dial 911. From a campus phone, dial 9-911.