Both Electrical Engineering and Computer Engineering students must choose a primary (includes 8 courses) and a secondary (includes 4 courses) technical core. Electrical Engineering students must choose their primary technical core from the Electrical Engineering technical cores listed below; Computer Engineering students must choose theirs from the Computer Engineering technical core. For the secondary technical core, students may choose any technical core, including Academic Enrichment.

IMPORTANT NOTES:

- Courses in brackets [ ] denote general prerequisite requirements, which are subject to change. Refer to the Registrar’s official online course schedule for the most accurate course information and prerequisite requirements. Also please consult the department offering the course if you have any questions about their prerequisite requirements.
- Check with the CS Department / Advisor for ALL prerequisite requirements and class seat availability. The CS department has the right to refuse enrollment to any non-major student.
- All Advanced Labs have the minimum co-requisite of EE 333T. You may take 333T with a different Engineering Department pending that department’s approval. Please check with them for being added to their waiting lists for non-majors.
- If you are choosing Software Engineering and Design along with Academic Enrichment, please see the course requirements note in the Software Engineering section.

**ELECTRICAL ENGINEERING TECHNICAL CORES**

**COMMUNICATION, SIGNAL PROCESSING, NETWORKS AND SYSTEMS**

This technical core considers the analysis, simulation and design of wired and wireless systems, from the physical layer (modems) through the networking layers (e.g. Internet protocols) and finally to the application layers. Applications include speech, audio, image and video processing, as well as robotics and controls.

<table>
<thead>
<tr>
<th>Advanced Math</th>
<th>Core</th>
<th>Core</th>
<th>Core Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Co-requisite:</strong> M 427L</td>
<td>OR</td>
<td><strong>Co-requisites:</strong> EE 351K &amp; EE 333T</td>
<td></td>
</tr>
<tr>
<td></td>
<td>362K Introduction to Automatic Control</td>
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</tbody>
</table>

Students must pick 4 additional electives from the following Technical Core courses:

- EE 325K Antennas and Wireless Propagation [EE 325]
- EE 351M Digital Signal Processing [EE 313; co-requisite: EE 351K]
- EE 360C Algorithms [EE 312 or CS 312, and M 325K or CS 313K]
- EE 362K Introduction to Automatic Control [EE 313 and M 340L]
- EE 363M Microwave and Radio Frequency Engineering [EE 325]
- EE 471C Wireless Communications Laboratory [EE 445S (or 345S), 351M or 360K; co-requisite: EE 333T]
- EE 371R Digital Image and Video Processing [Credit or registration for EE 351K]
- EE 372N Telecommunication Networks [EE 351K]
- EE 361M Intro to Data Mining [EE 422C (or 322C or CS 314) and 351K or M 362K; M 340L]
- M 325K Discrete Mathematics [M 408D, M 408L or M 408S]
- M 362M Introduction to Stochastic Processes [M 362K]
- M 365C Real Analysis I [At least two of the following: M 325K, M 328K, M 340L/341; consent of undergraduate advisor]
# Electronics and Integrated Circuits
This core trains students for careers involving design of electronics and integrated circuits including analog and digital integrated circuits, radio frequency circuits, power electronics, and biomedical electronics.

**Required:**

<table>
<thead>
<tr>
<th>Advanced Math</th>
<th>Core</th>
<th>Core</th>
<th>Core Lab</th>
<th>Additional Elective</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 427L</td>
<td>EE 325 Electromagnetic Engineering</td>
<td>EE 339 Solid-State Electronic Devices</td>
<td>EE 438 Fundamentals of Electronic Circuits I Laboratory</td>
<td>EE 316 Digital Logic Design</td>
</tr>
<tr>
<td>Co-requisite: M 427L</td>
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</tr>
</tbody>
</table>

Students must pick 3 additional electives from the following Technical Core courses:

- EE 438K Analog Electronics [EE 438]
- EE 338L Analog Integrated Circuit Design [EE 438]
- EE 440 Microelectronics Fabrication Techniques Laboratory [EE 339; credit or registration for EE 333T]
- EE 445L Embedded Systems Design Laboratory [EE 312, EE319K, EE 411 and EE313; credit or registration for EE 333T]
- EE 445S Real-Time Digital Signal Processing Laboratory [EE 312, EE319K, EE 313; credit or registration for EE 333T and 351K]
- EE 460M Digital Systems Design Using HDL [EE 319K, EE 312 and 316]
- EE 460N Computer Architecture [EE 306 or CS 429 and EE 312 or CS 312]
- EE 460R Introduction to VLSI Design [EE 316 and 438]
- EE 363M Microwave & Radio Frequency Engineering [EE 325]
- EE 374K Biomedical Electronic Instrument Design [EE 438]
- EE 374L Applications of Biomedical Engineering [EE 374K; credit or registration for EE 333T]

# Energy Systems and Renewable Energy
This technical core area provides the foundation for a career in electric power systems, generation, grid operation, motors and drives, and renewable energy sources.

**Required:**

<table>
<thead>
<tr>
<th>Advanced Math</th>
<th>Core</th>
<th>Core</th>
<th>Core Lab</th>
<th>Additional Elective</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 427L</td>
<td>EE 325 Electromagnetic Engineering</td>
<td>EE 368L Power Systems Apparatus &amp; Lab</td>
<td>EE 462L Power Electronics Laboratory</td>
<td></td>
</tr>
<tr>
<td>Co-requisite: M 427L</td>
<td>OR</td>
<td>EE 369 Power Systems Engineering</td>
<td></td>
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</tbody>
</table>

Students must pick 3 additional electives from the following Technical Core courses:

- EE 339 Solid-State Electronic Devices [M 427K or 427L; PHY 303L and 103N]
- EE 339S Solar Conversion Devices [Credit or registration for EE 339]
- EE 341 Electric Drives and Machines [EE 313]
- EE 362Q Power Quality and Harmonics [EE 313]
- EE 362R Renewal Energy and Power Systems [EE 313]
- EE 362S Development of a Solar-powered Vehicle [Upper-division Standing]
- EE 368L Power Systems Apparatus and Laboratory [EE 313; co-requisite: EE 333T]
- EE 369 Power Systems Engineering [Upper-division Standing; EE 313]
- ME 337C Intro to Nuclear Power System [Special Permission from the ME Department, ME 218; PHY 303L and 103N]
**FIELDS, WAVES AND ELECTROMAGNETIC SYSTEMS**

Students in this technical core area study different aspects of applied electromagnetics, including antennas, radio wave propagation, microwave and radio frequency circuits and transmission structures, optical components and lasers, and engineering acoustics.

**Required:**

<table>
<thead>
<tr>
<th>Advanced Math</th>
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<th>Core Lab</th>
<th>Additional Elective</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 427L</td>
<td>EE 325 Electromagnetic Engineering</td>
<td>EE 339 Solid-State Electronic Devices</td>
<td>EE 438 Fundamentals of Electronic Circuits I Laboratory or EE 462L Power Electronics Laboratory</td>
<td>EE 325K Antennas and Wireless Propagation OR EE 363M Microwave and Radio Frequency Engineering</td>
</tr>
</tbody>
</table>

Students must pick 3 additional electives from the following Technical Core courses:

- EE 325K Antennas and Wireless Propagation [EE 325]
- EE 334K Quantum Theory of Engineering Materials [M 427K or M 427]; PHY 303L and 103N]
- EE 341 Electric Drives and Machines [EE 313]
- EE 347 Modern Optics [EE 313 or 343, and 325]
- EE 348 Laser and Optical Engineering [EE 339]
- EE 363M Microwave and Radio Frequency Engineering [EE 325]
- EE 363N Engineering Acoustics [M 427K or M 427]
- EE 369 Power Systems Engineering [Upper-division Standing; EE 313]
- EE 374K Biomedical Electronic Instrument Design [EE 438]
- EE 374L Applications of Biomedical Engineering [EE 374K; co-requisite: EE 333T]

**NANOELECTRONICS AND NANOTECHNOLOGY**

Students in this technical core area learn about the materials and devices used in modern electronic and optoelectronic systems.

**Required:**

<table>
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<th>Core</th>
<th>Core Lab</th>
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</thead>
<tbody>
<tr>
<td>M 427L</td>
<td>EE 325 Electromagnetic Engineering</td>
<td>EE 339 Solid-State Electronic Devices</td>
<td>EE 440 Microelectronics Fabrication Techniques Laboratory</td>
</tr>
</tbody>
</table>

Students must pick 4 additional electives from the following Technical Core courses:

- EE 334K Quantum Theory of Engineering Materials [M 427K or M 427]; PHY 303L and 103N] |
- EE 438 Fundamentals of Electronic Circuits I Laboratory [EE41; Credit or registration of EE 313 and EE 333T]
- EE 338L Analog Integrated Circuit Design [EE 438]
- EE 339S Solar Conversion Devices [Credit or registration for EE 339]
- EE 347 Modern Optics [EE 313 or BME 343, and 325]
- EE 348 Laser and Optical Engineering [EE 339]
- EE 460R Introduction to VLSI Design [EE 316 and EE 438]
- EE 379K High-Throughput Nanopatterning [Upper-division Standing]
COMPUTER ENGINEERING TECHNICAL CORES

COMPUTER ARCHITECTURE AND EMBEDDED SYSTEMS
This core involves understanding the operation and design of computers and embedded systems on many different levels, including the instruction set, microarchitecture, logic design, stand-alone systems, and software and hardware components of a larger system.

Required:

<table>
<thead>
<tr>
<th>Advanced Math</th>
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<th>Core Lab</th>
<th>Additional Elective</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 325K</td>
<td>EE 316</td>
<td>EE 460N</td>
<td>EE 445L Embedded Systems Design Laboratory</td>
<td>EE 360C Algorithms Pre-requisite M 325K</td>
</tr>
</tbody>
</table>

Students must pick 3 additional electives from the following Technical Core courses:

EE 422C Software Design & Implementation II [EE 312 or CS 312]
EE 445M Embedded and Real-Time Systems Laboratory [EE 445L or EE 445S; co-requisite: EE 333T]
EE 445S Real-Time Digital Signal Processing Laboratory [EE 312, EE 319K; EE 313 or BME 343; co-requisites: EE 333T and 351K]
EE 460M Digital Systems Design Using HDL [EE 312, EE 316, and 319K]
EE 360P Concurrent and Distributed Systems [EE 422C]
EE 460R Introduction to VLSI Design [EE 316, 438 and 339]
EE 362K Introduction to Automatic Control [Upper-division Standing; EE 313 and 340L]
CS 375 CompilerS [Only open to CS Double Majors, check with CS on prerequisites]
EE 379K Multicore Computing [Upper-division Standing]
EE 379K Architecture for Big Data Sciences [Upper-division Standing]

SOFTWARE ENGINEERING AND DESIGN
This core covers the engineering life cycle of software systems, including requirement analysis and specification, design, construction/programming, testing, deployment, maintenance, and evolution.

Required:

<table>
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<tr>
<th>Advanced Math</th>
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<th>Core</th>
<th>Core Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 325K</td>
<td>EE 422C</td>
<td>EE 360C</td>
<td>EE 461L Software Engineering and Design Laboratory</td>
</tr>
<tr>
<td>Discrete Mathematics</td>
<td>Software Design &amp; Implementation II</td>
<td>Algorithms Pre-requisite M 325K</td>
<td></td>
</tr>
</tbody>
</table>

Students must pick 4 additional electives from the following Technical Core courses:

EE 316* Digital Logic Design [EE 306 or CS 429]
EE 445L* Embedded Systems Design Laboratory [EE 312 and 319K; EE 411 and 313; co-requisite: EE 333T]
EE 445M* Embedded and Real Time Systems Laboratory [EE 445L; EE 445S; co-requisite: EE 333T]
EE 360F Intro to Software Engineering [EE 422C or CS 314]
EE 460N Computer Architecture [EE 306 or CS 429, EE 312 or CS 312]
EE 360P Concurrent and Distributed Systems [EE 422C]
EE 360T Software Testing [EE 422C or CS 314]
EE 361M Introduction to Data Mining [EE 422C or CS 314; EE 351K or M 326K; M 340L]
EE 361Q Requirements Engineering [EE 312 or CS 312]
EE 372N Telecommunication Networks [EE 351K]
EE 379K Software Evolution [Upper-division standing]
EE 379K Architecture for Big Data Sciences [Upper-division Standing]
EE 379K Operating Systems [Upper-division Standing]
EE 379K Engineering Programming Languages [Upper-division Standing]

*If you are choosing Software Engineering and Design along with Academic Enrichment, and your EE 464 design project does NOT have a significant hardware component, you MUST take two of the following Technical Core Electives: EE 316, EE 445L OR EE 445M
If the 464 design project involves a significant hardware component, then the electives they choose must include at least one of EE 316, EE 445L, OR EE 445M.
ACADEMIC ENRICHMENT TECHNICAL CORE (SECONDARY ONLY)

A student may choose the Academic Enrichment as his or her secondary technical core only. For this core, the student selects 14 hours of coursework to support his or her personal or career goals. Before registering for these courses, the student must prepare a career plan statement and a list of relevant electives; the Undergraduate Advisor Dr. Valvano must review and approve this plan via the advising offices.

These electives may include traditional upper-division technical courses in Electrical Engineering and other engineering fields; courses in other fields at the University, such as business, economics, communication, music (non-performance), and philosophy; or research done with a faculty member in EE X60 Special Problems in Electrical and Computer Engineering. The courses must be completed in residence; courses in an approved exchange study abroad program require the approval of the Undergraduate Advisor. A minimum of 3 of the 14 hours must be an upper division math/science course, this cannot be an EE course. Students may include up to three hours of EE 325L Cooperative Engineering, EE 225M Cooperative Engineering, and EE 125S Internship in Electrical and Computer Engineering.

ALTERNATIVE ADVANCED MATH COURSES

**If a student chooses BOTH Electrical Engineering Technical Core Areas**

M 325K Discrete Mathematics [M 408D, 408L or 408S]
M 328K Introduction to Number Theory [M 340L or 341]
M 346 Applied Linear Algebra [M 340L or 341]
M 348 Scientific Computing [M 341 or 340L; CS 303E or 307]
M 358K Applied Statistics [M 362K or 351K]
M 361 Theory of Functions of Complex Variables [M 427K or 427L]
M 362M Introduction to Stochastic Processes [M 362K or EE 351K]
M 372K Partial Differential Equations and Applications [M 427K]
M 374 Fourier and Laplace Transforms [M 427K]
M 374M Mathematical Modeling in Science and Engineering [M 427K, M 340L or 341]

ALTERNATIVE ADVANCED MATH COURSES

**If a student chooses BOTH Computer Engineering Technical Core Areas**

M 427L Advanced Calculus for Applications II [M 408D or 408M]
M 328K Introduction to Number Theory [M 341]
M 343K Introduction to Algebraic Structures [Consent of undergraduate advisor or 2 of the following: M 325K or PHL 313K, M 328K and M 341]
M 344K Intermediate Logic
M 348 Scientific Computation in Number Analogy [M 341 or 340L; CS 303E or 307]
M 358K Applied Statistics [M 362K]
M 374M Mathematical Modeling in Science and Engineering [M 427K and M 340L / M 341]
CS 341 Automata Theory [Only open to CS Double Majors, check with CS on prerequisites]
CS 346 Cryptography [Only open to CS Double Majors, check with CS on prerequisites]