

APPROVED TECHNICAL ELECTIVES FOR COMPUTER ENGINEERS

Twenty-four (24) semester credit hours of Technical Electives are required. **Courses not on these lists may be counted as Technical Electives only if they are approved by the Curriculum Committee.** A written request must be submitted and approved **before** the course is taken. For 500-level technical elective options, see your academic adviser. A 500-level course is open to “qualified undergraduate students” (students in the upper half of their class). **NO Graduate or Undergraduate Seminars** are allowed for Technical Elective credit. Graduate Special Topics courses require ECpE Curriculum Committee review.

- At least nine (9) credits must be from the list of CprE electives
- Six (6) credits must be taken from the list of Computational Thinking electives
- Nine (9) credits can be taken from the Non-CprE/EE Technical Elective List

IMPORTANT NOTATIONS (Please Read):

1. * Course is cross-listed (same course). Can only apply one towards graduation EE, CprE, SE, or ComS
2. Only one course either MatE 273 or MatE 392 may be applied as a technical elective
3. Math 489 & ME 484 are not allowed as EE or Non-EE Technical Electives - They can be used as a general education course.
4. ENGR/EE/CprE 467, EE 442 & EE 448 **cannot** be used to fulfill any elective requirements.
5. EE 351 and EE 388 may be used to fulfill International Perspective requirements - You must choose if you want the course applied to either a general education or technical elective requirement, but not both
6. ENGR/EE/CprE 467, EE 442 & EE 448 **cannot** be used to fulfill any elective requirements
7. ENV S 324 (cross-listed with ENSCI, GEOL, MTEOR) -You must choose if you want the course applied to either a general education OR technical elective requirement but not both
8. A maximum of 2 credits of EE/CprE/SE 490, Independent Study can be applied towards technical electives

COMPUTER ENGINEERING ELECTIVES (9 cr.)

| COURSES | DESCRIPTION | CR | PREREQUISITES (Check latest catalog) |
|------------|--|----|---|
| CprE 329* | Software Project Management | 3 | ComS 309 |
| CprE 330* | Integrated Electronics | 4 | EE 201, Cr/E EE 230, CprE 281 |
| CprE 331* | Appl of Cryptographic Concepts to Cyber Security | 3 | CprE/CybE 231 |
| CprE 339* | Software Architecture & Design | 3 | SE 319 |
| CprE 388 | Embedded Systems II: Mobile Platforms | 4 | CprE 288 |
| CprE 412* | Formal Methods in Software Engineering | 3 | Com S 311, Stat 330 |
| CprE 414 | Intro to Software Systmes for Big Data Analytics | 4 | ComS 363; CprE 315 or 308; Com S 311 or 352 |
| CprE 416* | Software Evolution and Maintenance | 3 | ComS 309 |
| CprE 418* | High Speed Sys. Engr. Meas. & Test. | 4 | EE 230, EE 311 |
| CprE 419* | Software Tools for Large Scale Data Analysis | 4 | CprE 308, ComS 228 |
| CprE 421* | Software Analysis & Verification for Safety & Security | 3 | ComS 309; CprE 310 or ComS 230 |
| CprE 424* | Introduction to High Performance Computing | 3 | Math 265; Math 207 or Math 317 |
| *CprE 425 | High Performance Computing for Scientific & Engineering Applications | 3 | ComS 311, Engl 250, SpCm 212 |
| CprE 426* | Intro to Parallel Algorithms and Program. | 4 | CprE 308 or ComS 321, ComS 311 |
| CprE 430 | Network Protocols and Security | 3 | CprE 308 or Com S 252 or ComS 352 |
| CprE 431 | Basics of Information Systems Security | 3 | Cr/E CprE 308 or ComS 352 |
| CprE 435* | Analog VLSI Circuit Design | 4 | EE 330 |
| CprE 436x* | Digital Forensics | 3 | CprE 331 or CprE 430 |
| CprE 440* | Operating System Security | 3 | CprE 308 or ComS 352 |
| CprE 444* | Introduction to Bioinformatics | 4 | Math 165 or Stat 401 or equivalent |
| CprE 450 | Distributed Systems & Middleware | 3 | CprE 308 or ComS 352 |
| CprE 454* | Distributed & Network Operating Systems | 3 | ComS 311, CprE 308 |
| CprE 458 | Real-Time Systems | 3 | CprE 308 or ComS 352 |
| CprE 459x* | Security & Privacy in Cloud Computing | 3 | CprE 308 |
| CprE 465* | Digital VLSI Design | 4 | EE 330 |
| CprE 480 | Graphics Processing and Architecture | 4 | CprE 381 or ComS 321 |
| CprE 487 | Hardware Design for Machine Learning | 4 | CprE 381 or Com S 321 |

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| CprE 488 | Embedded Systems Design | 4 | CprE 381 or ComS 321 |
| CprE 489 | Computer Networking & Data Comm | 4 | CprE 288 or ComS 327 |

COMPUTATIONAL THINKING ELECTIVES (6 cr.)

| COURSES | DESCRIPTION | CR | PREREQUISITES (Check latest catalog for complete lists) |
|-----------|---|----|---|
| ComS 331* | Theory of Computing | 3 | Min of C- in ComS 228, Math 166, & Engl 250; CprE 310 |
| ComS 342 | Principles of Programming Languages | 3 | Min of C- in ComS 228 & Math 165; CprE 310 |
| ComS 350* | Number Theory | 3 | Math 201 or CprE 310 |
| ComS 412* | Formal Methods in Software Engineering | 3 | ComS 311; Stat 330 |
| ComS 415 | Software System Safety | 3 | Com S 309 or Com S 311 |
| ComS 418 | Intro to Computational Geometry | 3 | ComS 311 |
| ComS 421* | Logic for Math & Computer Science | 3 | CprE 310 or Math 207 or 301 or 317 |
| ComS 426* | Intro to Parallel Algorithms and Programming | 4 | CprE 308; ComS 311 |
| ComS 435 | Algorithms for Large Data Sets: Theory and Practice | 3 | Com S 311 or equivalent |
| ComS 440* | Principles & Practices of Compiling | 3 | Com S 331 or 342; Com S 309; Engl 250 |
| ComS 441 | Programming Languages | 3 | ComS 342 or 440 |
| ComS 455 | Simulation: Algorithms & Implementation | 3 | ComS 311, Stat 330, Engl 250 |
| ComS 472 | Principles of Artificial Intelligence | 3 | Com S 311, Stat 330, Engl 250 |
| ComS 474 | Introduction to Machine Learning | 3 | Com S 311, Stat 330, Math 165, Engl 250 |
| ComS 481* | Numerical Mthds for Differential Equations | 3 | Math 265, Math 267 |
| EE 224 | Signals and Systems I | 4 | EE 201, Math 267 |
| EE 324 | Signals and Systems II | 4 | EE 224 |
| EE 425 | Machine Learning: A Signal Processing Perspective | 3 | Stat 330; Math 207 |
| IE 312 | Optimization | 3 | Credit or Enrollment in Math 267 |
| MATH 265 | Calculus III | 4 | C- or better in Math 166 |
| MATH 301 | Abstract Algebra I | 3 | Math 166, Math 317 or 407, C- in Math 201 |
| MATH 302 | Abstract Algebra II | 3 | Math 301 |
| MATH 304 | Combinatorics | 3 | Math 166; CprE 310 |
| MATH 314 | Graph Theory | 3 | Math 166; CprE 310 |
| MATH 342 | Intro to the Theory of Probability & Statistics II | 4 | Math 207; Stat 330; Stat 341 |
| MATH 350 | Number Theory | 3 | CprE 310 or Math 201 |
| MATH 365 | Complex Variables with Applications | 3 | Math 265 |
| MATH 373 | Introduction to Scientific Computing | 3 | Math 265 |
| MATH 385 | Introduction to Partial Differential Equations | 3 | Math 265 and Math 267 |
| MATH 407 | Applied Linear Algebra | 3 | Math 317 or Math 207 |
| MATH 414 | Analysis I | 3 | Min of C- in CprE 310 |
| MATH 415 | Analysis II | 3 | Math 265; Math 317 or 407; Math 414 |
| MATH 421 | Logic for Mathematics and Computer Science | 3 | CprE 310 |
| MATH 424 | Introduction to High Performance Computing | 3 | Math 265; Math 207 |
| MATH 435 | Geometry I | 3 | CprE 310; Math 207 |
| MATH 436 | Geometry II | 3 | CprE 310; Math 207 |
| Phys 422 | Foundations of Quantum Computing | 3 | Math 207 |
| Phys 423 | Molecular & Cell Biophysics | 3 | Chem 325 or Phys 304 |

TECHNICAL ELECTIVES (9 cr.) Select from the CprE tech electives and/or the below lists**300 & 400+ level courses from the following majors**

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|------|------|------|------|------|
| AE | BME | ComS | EE | Math |
| ABE | CE | ConE | EnvE | ME |
| AerE | ChE | CprE | IE | Phys |
| BSE | Chem | CybE | MatE | SE |

OR Other approved tech electives

| COURSES | DESCRIPTION | CR | PREREQUISITES (Check latest catalog for complete lists) |
|------------------------|--|-------|---|
| AerE 494 | M2I | 1...3 | |
| ArtIS 408 | Principles of 3D Animation | 3 | ARTIS 308 (see adviser for form) |
| ArtIS 409 | Computer/Video Game Design & Dvmt | 3 | ComS 227, 228; Artis 230 & 308 |
| Astro 342 | Introduction to Solar System Astronomy | 3 | Phys 232 & 232L |
| Astro 344L | Astronomy Laboratory | 3 | Phys 232 & 232L |
| Astro 346 | Introduction to Astrophysics | 3 | Phys 232 & 232L |
| Astro 405 | Astrophysical Cosmology | 3 | Astro 346 |
| BME 220 | Introduction to Biomedical Engineering | 3 | Biol 212, ENGR 160 or equiv, Math 166, Chem 167 or 177, Phys 232 & 232L |
| Biol 211 | Principles of Biology I | 3 | HS Biol |
| Biol 211L | Principles of Biology I Lab | 1 | Credit or enrollment in Biol 211 |
| Biol 212 | Principles of Biology II | 3 | HS Biol; HS Chem or Cr/E in Chem 163/177 |
| Biol 212L | Principles of Biology II Lab | 1 | Credit or enrollment in Biol 212 |
| C E 274 | Statics of Engineering | 3 | Phys 231 & 231L; Co-req Math 166 |
| Com S 252 | Linux Operating System Essentials | 3 | CprE 185 or ComS 207 or 227 |
| ConE 241 | Construction Materials & Methods | 3 | Completion of Basic Program |
| ENV S 324 ⁷ | Energy & The Environment | 3 | Chem 167 or 177 |
| MatE 273 ² | Principles of Materials Science & Engr | 3 | Chem 167 or Chem 177, Math 165 |
| ME 231 | Engineering Thermodynamics I | 3 | Math 166; Chem 167; Phys 231 & 231L |
| ME/FSHN 373x | Science and Practice of Brewing | 3 | Chem 167 or 177 and Phys 231 or Biol 211 or 212 |
| Mteor 342 | Atmospheric Physics II | 3 | Mteor 341 |
| Mteor 435 | Radar Applications in Meteorology | 3 | Credit or enrollment in MTEOR 341 |
| NS 320 | Naval Ship Systems I - Engineering | 3 | Phys 231; Phys 231L; Sophomore |
| NS 330 | Naval Ship Systems II - Weapons | 3 | Phys 231, Sophomore |
| Phys 232 | Classical Physics II | 4 | Phys 231 |
| Phys 232L | Classical Physics II Lab | 1 | credit or enrollment in Phys 232 |
| Stat 231 | Probability & Statistical Inference for Engr | 4 | Cr/E in Math 265 |
| Stat 322* | Probabilistic Methods for Elec. Engineers | 3 | EE 224 |

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