APPROVED TECHNICAL ELECTIVES FOR COMPUTER ENGINEERS

Twenty-seven (27) 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 twelve (12) 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 (12 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	ComS 363 orCprE 308 or ComS 352, 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 S & E Apps	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, ComS 352
CprE 458	Real-Time Systems	3	CprE 308 or ComS 352
CprE 465*	Digital VLSI Design	4	EE 330
CprE 466*	Multidisciplinary Engineering Design	3	Sr within 2 sem of graduation, instructor perm
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
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, & CprE 310 or ComS 230; Engl 250
ComS 342	Principles of Programming Languages	3	Min of C- in ComS 228 & Math 165; Com S 230 or CprE 310
ComS 350*	Number Theory	3	Math 201 or ComS 230
ComS 412*	Formal Methods in Software Engineering	3	ComS 311; Stat 330
ComS 415	Software System Safety	3	Com S 309 or Com S 11
ComS 418	Intro to Computational Geometry	3	ComS 311 or permission from instructor
ComS 421	Logic for Math & Computer Science	3	Math 301 or 207 or 317 or ComS 230
ComS 426*	Intro to Parallel Algorithms and Programming	4	CprE 308 or ComS 321, CprE 315 or 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	ComS 331, ComS 342, Engl 250, SpCm 212
ComS 441	Programming Languages	3	ComS 342 or 440
ComS 455	Simulation: Algorithms & Implementation	3	ComS 311, ComS 230, Stat 330, Engl 150, Sp Cm 212
ComS 472	Principles of Artificial Intelligence	3	Com S 311, Stat 330 or 305, Engl 250, Sp Cm 212
ComS 474	Introduction to Machine Learning	3	Com S 311, Stat 330 or 305, Math 165, Engl 250, Sp Cm 212
ComS 481*	Numerical Mthds for Differential Equations	3	Math 265, Math 266 or 267
EE 224	Signals and Systems I	4	EE 201, Math 267, Phys 222
EE 324	Signals and Systems II	4	EE 224
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; Math 201 or experience with proofs
MATH 314	Graph Theory	3	Math 166; Math 201 or experience with proofs
MATH 331	Topology	3	Math 201; Math 301, 317, 414 or 435
MATH 342	Introduction to the Theory of Probability and Statistics II	4	Stat 201 or equivalent; Stat 341; Math 207 or 317
MATH 350	Number Theory	3	Math 201 or Com S 230
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 266 or 267
MATH 407	Applied Linear Algebra	3	Math 317 or Math 207 and experience with proofs
MATH 414	Analysis I	3	Min of C- in Math 201
MATH 415	Analysis II	3	Math 414; Math 265; Math 317 or 407
MATH 421	Logic for Mathematics and Computer Science	3	Math 301 or 207 or 317 or ComS 230
MATH 424	Introduction to High Performance Computing	3	Math 265; Math 207 or 317; or perm of the instr
MATH 435	Geometry I	3	Math 201; Math 207 or 317
MATH 436	Geometry II	3	Math 201; Math 207 or 317
MATH 474	Mathematics of Finance	3	Check catalog for prereqs

TECHNICAL ELECTIVES (9 cr.) Select from the CprE tech electives and/or the below lists

300 & 400+ level courses from the following majors

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	Permission of Instructor, ComS 227, ComS 228, ComS 229, Artis 230, Artis 208
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 l	3	HS Biol
Biol 211L	Principles of Biology l Lab	1	Credit or enrollment in Biol 211
Biol 212	Principles of Biology ll	3	HS Biol; HS Chem or Cr/E in Chem 163/177
Biol 212L	Principles of Biology ll 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	ConE 222
ENV S 324[7]	Energy & The Environment	3	Chem 167 or 177
MatE 215	Introduction to Materials Science and Engineeering I	3	Math 165 and Chem 177 or 167
MatE 273[2]	Principles of Materials Science & Engr	3	Chem 167 or 177, Math 165, Soph class
ME 231	Engineering Thermodynamics I	3	Math 166, Chem 167, Phys 231
ME 273x	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	Mteor 341
NS 320	Naval Ship Systems I - Engineering	3	NROTC students only – Phys 231, Sophomore
NS 330	Naval Ship Systems II - Weapons	3	NROTC students only – 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