

APPROVED TECHNICAL ELECTIVES FOR ELECTRICAL ENGINEERS

Nineteen-Twenty (19-20) semester credit hours of Technical Electives are required. You need 20 credits if you CORE Electives total 6 credits (EE 321 & EE 332). **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. **NO Graduate or Undergraduate Seminars** are allowed for Technical Elective credit. Graduate Special Topics courses require ECpE Curriculum Committee review.

- Twelve (12 or 13) credits of electives must be from the lists of EE/CprE electives below, **including one approved sequence.**
- The remaining seven (7) credits required can be chosen from the lists of EE/CprE or Non-EE/CprE technical electives.

IMPORTANT NOTATIONS (Please Read):

1. If you take both EE 324 & EE 321 or EE 330 & EE 332, 1 will count as a core elective and one will count as a tech elective. Your Core Elective will be fulfilled first.
2. * Course is cross-listed (same course). Can only apply one towards graduation EE, CprE, SE, ComS, BME, ME, etc.
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. Only one course of the following sets of courses may be applied as a technical elective: either MatE273 or MatE392; either ComS207 or ComS227; either ComS208 or ComS 228.
7. ComS 227 may be used either to fulfill the EE 285 course requirement OR applied as tech elective credit, but not both.
8. 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
9. A maximum of 2 credits of EE/CprE/SE 490, Independent Study can be applied towards technical electives

LIST OF APPROVED SEQUENCES ****Must have one approved sequence to graduate**

<u>Analog/Digital Electronics (VLSI)</u>		<u>Electromagnetic, Fields, Antennas & Propagation</u>	
EE 330*	Required (can only count as core or tech elect) plus	EE 411	<i>select 2</i>
EE 403x	or	EE 414	
EE 435*	or	EE 417	
EE 465*	or	EE 418*	
<u>Biomedical Engineering</u>		<u>Linear Systems</u>	
BME 341		EE 475	Required
EE 450*		EE 476	Required
<u>Communications</u>		<u>Power systems</u>	
EE 321	Required (Can only count as core or tech elective)	EE 456	Required plus
EE 422	Required	EE 455	or
EE 423	Required	EE 457	or
<u>Computer Engineering</u>		EE 458	
CprE 381	Required plus	<u>Semiconductor Devices (select 2)</u>	
CprE 308	or	EE 432	
CprE 388	or	EE 436	
CprE 480	or	EE 438	
CprE 487	or	EE 439	
CprE 488			

LIST OF APPROVED EE/CprE TECH ELECTIVES 12/13 crs

COURSES	DESCRIPTION	CR	PRE-REQS
EE 321 ¹	Communication Systems I	3	EE 224
EE 324 ¹	Signals & Systems II	4	EE 224
EE 330* ¹	Integrated Electronics	4	CprE 281; EE 201; Cr/E in EE 230
EE 332* ¹	Semiconductor Materials & Devices	3	EE 230
EE 333	Electronic Systmes Design	4	CprE 281; EE 230
EE 341*	BioMEMs & Nanotechnology	3	BME 220
EE 341L*	BioMEMs & Nanotechnology Lab	1	BME 220 concurrent enrollment in EE 341
EE 351	Analysis of Energy Systems	3	Phys 232
EE 388*	Sustainable Engineering & International Development	3	Jr classification in Engineering
EE 403x	Introducation to Power Electronic Circuits	3	EE 230
EE 411	Wave Propagation and Transmission Lines	3	EE 311
EE 414	Microwave Engineering	4	EE 230; EE 311
EE 417	Electromagnetic Radiation, Antennas & Propagation	4	EE 311
EE 418*	High Speed System Engineering Measurement & Testing	4	EE 230; EE 311
EE 419*	Magnetism & Magnetic Materials	3	EE 311 or MatE 317 or Phys 364
EE 422	Communication Systems II	4	EE 321; EE 322; Enrollment in EE 423
EE 423	Communication Systems Laboratory	1	EE 321; Enrollment in EE 422
EE 424	Introduction to Digital Signal Processing	4	EE 224
EE 425	Machine Learning: A Signal Processing Perspective	3	EE 322 or Stat 330 or Stat 322; Math 207 or 407 or 507
EE 432*	Microelectronics Fabrication Techniques	4	EE 230
EE 435*	Analog VLSI Circuit Design	4	EE/CprE 330
EE 436	Physics of Transistors	3	EE 332
EE 437*	Electronic Properties of Materials	3	EE 332 or MatE 317 or Phys 322
EE 438	Optoelectronic Devices and Applications	3	EE 311; EE 332
EE 439	Nanoelectronics	3	EE 332 or MatE 334
EE 440x	Semiconductor Material & Device Characterization	3	EE 332
EE 443x	Microfabrication Process Design & Simulation using Computer Aided Design	3	EE 332
EE 450*	Biosensors	3	BME 220
EE 450L*	Biosensors Laboratory	1	BME 220 concurrent enrollment in BME 450
EE 451*	Engineering Acoustics	3	Phys 231 & 231L; Math 267
EE 452	Electrical Machines & Power Electronic Drives	3	EE 303; EE 324
EE 455	Introduction to Energy Distribution Systems	3	EE 303; Credit or Enrollment in EE 324
EE 456	Power System Analysis I	3	EE 303; Credit or Enrollment in EE 324
EE 457	Power System Analysis II	3	EE 303; Credit or Enrollment in EE 324
EE 458	Economic Systems for Electric Power Planning	3	EE 303 or Econ 301
EE 459	Electromechanical Wind Energy conversion and Grid Integration	3	Credit or enrollment in EE 452; 456
EE 465*	Digital VLSI Design	4	EE/CprE 330
EE 475	Automatic Control Systems	3	EE 324
EE 476	Control System Simulation	3	EE 475
EE 488*	Eddy current Nondestructive Evaluation	3	Math 265; EE 311
EE 489*	Survey of Remote Sensing Technologies	3	

LIST OF APPROVED EE/CprE TECH ELECTIVES (cont.) 12/13 crs

COURSES	DESCRIPTION	CR	PRE-REQS
EE 489L*	Satellite Remote Sensing Laboratory	1	EE 489
EE 496*	Modern Optics	3	C/E in Phys 322; Phys 365; Phys 480
CprE 308	Operating Systems: Principles & Practice	4	CprE 381 or ComS 321
CprE 310	Theoretical Foundations of Cpr Engr.	3	ComS 228
CprE 329*	Software Project Management	3	ComS 309
CprE 339*	Software Architechure & Design	3	SE 319
CprE 381	Computer Org & Assembly Lvl Prgming	4	CprE 288
CprE 388	Embedded Systems II: Mobile Platforms	4	CprE 288
CprE 414*	Introduction to Software Systems for Big Data Analytics	4	CprE 308
CprE 416*	Software Evolution and Maintenance	3	ComS 309
CprE 419*	Software Tools for Lrge Scale Data Anal	4	CPR E 308; ComS 228
CprE 421*	Software Analysis & Verification for Safety & Security	3	CprE 310; ComS 309
CprE 424*	Intro to High Perform Computing	3	Math 265; Math 207 or 317
CprE 425*	High Perform Cmpting for Sci & Engr App	3	ComS 311, Engl 250, SpCm 212
CprE 426*	Intro to Parallel Algorithms & Program	4	CprE 308 or ComS 352, Com S 311
CprE 430*	Network Protocols & Security	3	CprE 288
CprE 431	Basics of Information Systems Security	3	C/E CprE 308 or ComS 352
CprE 440*	Operating System Security	3	CprE 308 or Com S 352
CprE 450	Distributed Systems & Middleware	3	CprE 308 or ComS 352
CprE 454*	Distributed & Ntwk Operating Systems	3	ComS 311, CprE 308 or ComS 352
CprE 458	Real Time Systems	3	CprE 308 or ComS 352
CprE 459x*	Secuirty & Privcy in Cloud Computing	3	Com S 352 or CprE 308
CprE 480	Graphics Processing & Architecture	4	CprE 381 or ComS 321
CprE 487	Hardware Design for Machine Learning	4	CprE 381 or ComS 321
CprE 488	Embedded Systems Design	4	CprE 381 or ComS 321
CprE 489	Cpr. Ntwking and Data Communications	4	CprE 288 or Com S 327
SE 319*	Software Construction & User Interface	3	ComS 228
SE 412*	Formal Methods in Software Engr	3	Com S 311, Stat 330
SE 417*	Software Testing	3	ComS 309; CprE 310; Engl 250; Sp Cm 212

Tech Electives 7crs - select from the EE/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	PRE-REQS
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	Engineering Statics	3	Phys 231 & 231L; Co-req Math 166
ComS 207 ⁶	Fundamentals of Computer Programming	3	Math 150 or placement into Math 140+
ComS 227 ⁶⁷	Introduction to Object-Oriented Programming	4	Placement in Math 143+; ComS 127 or CprE 185
ComS 228 ⁶	Introduction to Data Structures	3	ComS 227 with C- or better, C/E Math 165
ComS 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 ⁸	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/FS HN 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 232L	Physics II Lab	1	Credit or enrollment in Phys 232