

## 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 &amp; 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 488		EE 438	
		EE 439	

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

COURSES	DESCRIPTION	CR	PRE-REQS
EE 321 <sup>1</sup>	Communication Systems I	3	EE 224
EE 324 <sup>1</sup>	Signals & Systems II	4	EE 224
EE 330* <sup>1</sup>	Integrated Electronics	4	EE 201; Cr/E in EE 230 & CprE 281
EE 332* <sup>1</sup>	Semiconductor Materials & Devices	3	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	Introduction 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 424	Introduction to Digital Signal Processing	4	EE 224
EE 425	Machine Learning: A Signal Processing Perspective	3	EE 322 or Stat 330; Math 207 or 407
EE 432*	Microelectronics Fabrication Techniques	4	Phys 232 & 232L; EE 230 or MatE 317
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; EE332
EE 439	Nanoelectronics	3	EE 332 or MatE 334
EE 440x	Semiconductor Material & Device Characterization	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	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	4 courses in phys or bio science or engr
EE 489L*	Satellite Remote Sensing Laboratory	1	Completion or enrollment in EE 489
EE 496*	Modern Optics	3	Enrollment 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

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

COURSES	DESCRIPTION	CR	PRE-REQS
CprE 381	Computer Org & Assembly Lvl Prgming	4	CprE 288
CprE 388	Embedded Systems II: Mobile Platforms	4	CprE 288
CprE 416*	Software Evolution and Maintenance	3	ComS 309
CprE 419*	Software Tools for Lrge Scale Data Anal	4	CPR E 308 or COM S 352, COM S 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, ComS 230, Engl 250, SpCm 212
CprE 426*	Intro to Parallel Algorithms & Program	4	CprE 308 or ComS 352, Com S 311
CprE 431	Basics of Information Systems Security	3	Co-req 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 & Ntwk Operating Systems	3	ComS 311, CprE 308 or ComS 352
CprE 458	Real Time Systems	3	CprE 308 or ComS 352
CprE 480	Graphics Processing & Architecture	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 381 or EE 324
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 Jr Class.
Astro 342	Introducation 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
ComS 207 <sup>6</sup>	Fundamentals of Computer Programming	3	Math 150 or placement into Math 140+
ComS 208 <sup>6</sup>	Intermediate Computer Programming	3	Coms 207, Co-req Math 151, 160, or 165
ComS 227 <sup>67</sup>	Introduction to Object-Oriented Programming	4	Placement in Math 143+;ComS 127 or CprE 185
ComS 228 <sup>6</sup>	Introduction to Data Structures	3	ComS 227 with C- or better, Co-req 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 <sup>8</sup>	Energy & The Environment	3	Chem 167 or 177
MatE 215	Intro to Materials Science & Engr	3	Chem 167 or Chem 177, Math 165

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**OR Other approved tech electives (cont.)**

<b>COURSES</b>	<b>DESCRIPTION</b>	<b>CR</b>	<b>PRE-REQS</b>
MatE 273 <sup>2</sup>	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 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	Credit or enrollment in 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 232L	Physics II Lab	1	Credit or enrollment in Phys 232