APPROVED TECHNICAL ELECTIVES FOR ELECTRICAL ENGINEERS

You are required to complete eighteen (18) semester credit hours of Technical Electives.

- Twelve (12) credits of electives must be from the lists of EE/CprE electives below, **including one approved sequence**
- The remaining six (6) credits required can be chosen from the lists of EE/CprE or Non-EE/CprE technical electives

Courses not on these lists may be counted as technical electives only if approved by the ECpE 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 may be 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.

IMPORTANT NOTATIONS (Please Read):

@ EE 422 and EE 423 must be take at the same time

* Course is cross-listed (same course). Can only apply one towards graduation EE, CprE, SE, or ComS

✔ Will need to check "Schedule of Classes" at http://classes.iastate.edu/ for class availability

Math 489 & ME 484 are not allowed as EE or Non-EE Technical Electives - They can be used as a general education course

ENGR/EE/CprE 467, EE 442 & EE 448 **cannot** be used to fulfill any elective requirements

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

Only one course either MatE 273 or MatE 392 may be applied as a technical elective

LIST OF APPROVED SEQUENCES

Need to have one approved sequence

The semester the courses are offered may change

COURSES	DESCRIPTION	SEM	CR	PREREQUISITES (Check latest catalog for complete lists)
ELECTROMAGNETIC, FIELDS, ANTENNAS AND PROPAGATION (SELECT TWO)				
EE 414	Microwave Engineering	F	4	EE 311, EE 230
EE 417	Electromgntc Radiation, Antennas & Prop	S	4	EE 311
*EE/CprE 418	Msrmnt & Test for High Speed Syst Engr	F	4	CprE 311, EE 230
COMMUNICATIONS (SELECT ALL THREE FOR SEQUENCE)				
EE 321	Communication Systems I	F	3	EE 224
EE 422@	Communication Systems II	S	3	EE 421, EE 423+
EE 423@	Communication Systems Lab	S	1	EE 421, EE 422+
ANALOG/DIGITAL ELECRONICS (EE 330 cannot be technical elective, but is required for this sequence)				
*EE/CprE 435 w/ EE/CprE 330	Analog VLSI Circuit Design	S	4	EE 324, EE 330, EE 332 & EE 322 or Stat 330
(or)				
*EE/CprE 465 w/ EE/CprE 330	Digital Integrated Circuit Design	F	4	EE 330
SEMICONDUCTOR DEVICES (SELECT TWO)				
EE 432	Microelectronics Fabrication Techniques	S	4	Phys 222, Math 267, EE 332 or MatE 334
EE 438	Optoelectronic Devices & Applications	S	3	EE 311, EE 332
EE 439	Nanoelectronics	F	3	EE 332 or MatE 331
POWER SYSTEMS (SELECT EE 456 AND ONE OTHER FOR SEQUENCE)				
EE 456	Power Systems Analysis I	F	3	EE 303, Cr/E EE 324
and EE 455	Intro to Energy Distribution Systems	✔	3	EE 303, Cr/E EE 324
or EE 457	Power Systems Analysis II	S	3	EE 303, Cr/E EE 324
or EE 458	Econ Systms for Electrical Pwr Planning	✔	3	EE 303 or Econ 301

COURSES	DESCRIPTION	SEM	CR	PREREQUISITES (Check latest catalog for complete lists)
LINEAR SYSTEMS				
EE 475	Automatic Control Systems	F	3	EE 324
EE 476	Control Systems Simulation	S	3	EE 475
COMPUTER ENGINEERING (SELECT 381 AND ONE OTHER FOR SEQUENCE)				
CprE 381	Computer Organization and Design	F/S	4	CprE 288
CprE 308	Software Systems Integration	F/S	4	CprE 381, CprE 310
CprE 388	Embedded Systems ll. Mobile Platforms	F	4	CprE 288

OTHER APPROVED EE/CPRE COURSES

These courses cannot be used to fulfill sequence requirements

The semester the courses are offered may change

SIGNALS & SYSTEMS				
EE 324	Signals and Systems ll	F/S	4	EE 224
COMMUNICATIONS				
EE 323	Intro to Digital Signal Processing	S	4	EE 224
POWER SYSTEMS				
EE 452	Elecrical Machines & Pwr Electronic Dr	S	3	EE 303, EE 330 or EE 332, Cr/E EE 324
EE 459	Electrom. Wind Energy Conv. & Grid Integ.	✔	3	Cr/E EE 452, EE 456
INDEPENDENT STUDY (ONLY 2 CREDITS OF EE 490 CAN APPLY TO TECH ELECTIVES & BSEE DEGREE)				
EE 490	Independent Study	F/S/SS	1-2	Senior Classification
COMPUTING & NETWORKING SYSTEMS				
CprE 310	Theoretical Foundations of Cpr Engr.	F/S	3	Cr/E CprE 288, ComS 228
CprE 388	Embedded Systems II: Mobile Platforms	✔	4	CprE 288
CprE 450	Distributed Systems & Middleware	S	3	CprE 308 or ComS 352
CprE/ComS 454	Distributed & Ntwk Operating Systems	✔	3	ComS 311, ComS 352
CprE 480	Graphics Processing and Architecture	✔	4	CprE 381 or ComS 321
CprE 483	Hardware Software Integration	✔	4	CprE 381
CprE 488	Embedded Systems Design	✔	4	CprE 381 or ComS 321
CprE 489	Cpr. Ntwking and Data Communications	F/S	4	CprE 381 or EE 324
SECURE & RELIABLE COMPUTING				
CprE 431	Basics of Information Systems Security	S	3	Cr/E CprE 489 or ComS 454
SOFTWARE SYSTEMS				
CprE/ComS 425	High Perform Cmpting for Sci & Engr App	S	3	ComS 311, ComS 330
CprE/ComS 426	Intro to Parallel Algorithms & Prgming	✔	4	CprE 308 or ComS 321, ComS 311
CprE/ComS 444	Introduction to Bioinformatics	F	4	Math 165 or Stat 401 or equivalent
CprE 458	Real Time Systems	F	3	CprE 308 or ComS 352
SOFTWARE ENGINEERING				
*SE/ComS 319	Software Construction & User Interface	✔	3	ComS 228
*CprE/SE 329	Software Project Management	✔	3	ComS 309
*CprE/SE 339	Software Architechure & Design	✔	3	SE 319
*SE/ComS 409	Software Requirements Engr	✔	3	ComS 309
*CprE/SE 416	Software Evolution and Maintenance	✔	3	ComS 309
*SE/ComS 417	Software Testing	✔	3	ComS 309, ComS 319
*CprE/SE 419X	Software Tools for Large Scale Data Analysis	✔	4	CPR E 308 or COM S 352, COM S 309

COURSES	DESCRIPTION	SEM	CR	PREREQUISITES (Check latest catalog for complete lists)
INTERDISCIPLINARY/ OTHER COURSES				
CprE 315	Application of Algorithms in Computer Engr.	✔	3	CprE 310
*CprE/EE 466	Multidisciplinary Engineering Design	F/S	3	Senior classification, within 2 semesters of graduation
EE 336	Biomedical Instrumentation	✔	3	EE 188, EE 224, and EE 230
EE 351	Analysis of Energy Systems	✔	3	Math 165
EE 388	Sustainable Engineering & Int'l Devlmt	F	3	Junior Classification
EE 488	Eddy Current Nondestructive Evaluation	✔	3	Math 265 and MatE 216 or 272 or EE 311 or Phys 364
EE 496	Modern Optics	✔	3	Cr/E Phys 322, Phys 365, Phys 480
EE/ME 451	Engineering Acoustics	✔	3	Phys 221, Math 266 or Math 267

NON-EE/CPRE ELECTIVES

The semester the courses are offered may change

EE students may select up to six credits of Non-EE/CprE Electives from 300- and 400-level courses open for nonmajor graduate credit (see catalog) in the following areas: Computer Science, Mathematics, Physics, and other Engineering departments (e.g. ConE 380 or EM 351). **The courses listed below are approved exceptions to these guidelines**

COURSES	DESCRIPTION	SEM	CR	PREREQUISITES (Check latest catalog for complete lists)
Biol 211	Principles of Biology I	F/S	3	HS Bio
Biol 211L	Principles of Biology I Lab	F/S	1	Credit or enrollment in Biol 211
Biol 212	Principles of Biology II	F/S	3	HS Bio; HS Chem or Cr/E in Chem 163/177
Biol 212L	Principles of Biology II Lab	F/S	1	Credit or enrollment in Biol 212
ComS 252	Linux Operating System Essentials	F	3	ComS 107 or ComS 207 or ComS 227
ComS 207	Fundamentals of Computer Programming	F/S	3	Math 150 or placement in Math 140/141/142 or higher
ComS 208	Programming II	F/S	3	Coms 207, Cr/E Math 151, 160, or 165
ComS 227	Introduction to Object-Oriented Programming	F/S	4	None
ComS 228	Intro to Data Structures	F/S	3	ComS 227, Cr/E Math 165
ComS 229	Advanced Programming Techniques	F/S	3	ComS 228, Cr/E Math 166
ComS 309	Software Development Practices	F/S	3	ComS 228 with C- or better
ComS 336	Introduction to Computer Graphics	✔	3	ComS 229, Cr/E Math 207 or Math 317
ConE 241	Construction Materials & Methods	F/S	3	ConE 222
EM 274	Statics of Engineering	F/S/SS	3	Cr/E Math 166, Cr/E Phys 111 or Phys 221
Engr 340	Intro to Wind Energy: Syst Dsgn & Delvry	✔	3	Math 166, Phys 222
MatE 215	Intro to Materials Science & Engr	F	5	Chem 167 or Chem 177, Math 165
MatE 273 (see notation)	Principles of Materials Science & Engr	F/S/SS	3	Chem 167 or Chem 177, Math 165, Sophomore
MatE 392 (see notation)	Principles of Materials Science & Engr	✔	3	MatE 391, Chem 167 or Chem 177
ME 231	Engineering Thermodynamics I	F/S	3	Math 265, Chem 167, Phys 222
ME 433	Alternative Energy Conversion	F	3	Phys 221/222 & Chem 167
NS 320	Naval Ship Systems I	F	3	NROTC students only - Phys 221, Sophomore
NS 330	Naval Ship Systems II	S	3	NROTC students only - Phys 221, Sophomore
Phys 321	Introductory to Modern Physics I	S	3	Phys 222, Cr/E Math 266
Phys 321L	Introductory Lab to Modern Physics I	S	1	Cr/E Phys 321
Phys 322	Introductory to Modern Physics II	F	3	Phys 321
Phys 322L	Introductory Lab to Modern Physics II	F	1	Cr/E Phys 322

Allowable Bioengineering (BioE) courses:

220, 325, 341, 341L, 352, 411, 428, 440, 450, 450L, 456

Check catalog for prerequisites required for courses

Allowable Nuclear Engineering (NucE) courses:

401, 402, 405, 410, 411, 430, 441, 461

Check catalog for prerequisites required for courses