APPROVED TECHNICAL ELECTIVES FOR ELECTRICAL ENGINEERS

You are required to complete eighteen (18 or 19) semester credit hours of Technical Electives. You need 19 credits if your CORE Electives

- Twelve (12 or 13) 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

IMPORTANT NOTATIONS (Please Read):

1. @ EE 422 and EE 423 must be take at the same time.
2. * Course is cross-listed (same course). Can only apply one towards graduation EE, CprE, SE, ComS, BME, ME, etc.
3. ✓ Will need to check "Schedule of Classes" at http://classes.iastate.edu/ for class availability.
4. Math 489 & ME 484 are not allowed as EE or Non-EE Technical Electives - They can be used as a general education course.
5. ENGR/EE/CprE 467, EE 442 & EE 448 **cannot** be used to fulfill any elective requirements.
6. 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
7. 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.
8. ComS 227 may be used either to fulfill the EE 285 course requirement OR applied to technical elective credit, but not both.
9. Only Math 207 or Math 317 can apply toward graduation requirements, not both courses.
10 ENV S 324 (cross-listed with ENSCI, GEOL, MTEOR) -You must choose if you want the course applied to either a general education OR
11 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

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	High Speed Syst Engr Msrmnt & Test	F	4	EE 230, EE 311
COMMUNICATIONS (SELECT ALL THREE FOR SEQUENCE) (EE 321 cannot be both core & technical elective)				
EE 321	Communication Systems l	F	3	EE 224
EE 422@	Communication Systems ll	S	3	EE 321, EE 423+
EE 423@	Communication Systems Lab	S	1	EE 321, EE 422+
ANALOG/DIGITAL ELECRONICS (EE/CprE 330 & ONE OTHER FOR SEQUENCE / EE 330 cannot be both core & technical elective)				
*EE/CprE 330	Integrated Electronics	F/S	4	EE 201, EE 230, CprE 281
and *EE/CprE 435	Analog VLSI Circuit Design	S	4	EE 324, EE 330, EE 332 and EE 322 or Stat 330
or *EE/CprE 465	Digital VLSI Design	F	4	EE 330
SEMICONDUCTOR DEVICES (SELECT TWO)				
EE 432	Microelectronics Fabrication Techniques	F/S	4	EE 332
EE 436X	Physics of Transistors	S	3	EE 332
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 & ONE OTHER FOR SEQUENCE)				
EE 456	Power Systems Analysis l	F	3	EE 303, Co-req EE 324
and EE 455	Intro to Energy Distribution Systems	✓	3	EE 303, Co-req EE 324
or EE 457	Power Systems Analysis ll	S	3	EE 303, Co-req EE 324
or EE 458	Econ Systms for Electrical Pwr Planning	✓	3	EE 303 or Econ 301
LINEAR SYSTEMS (SELECT TWO)				
EE 475	Automatic Control Systems	F	3	EE 324
EE 476	Control Systems Simulation	S	3	EE 475
COMPUTER ENGINEERING (SELECT CprE 381 & ONE OTHER FOR SEQUENCE)				
CprE 381	Computer Org & Assembly Lvl Prgming	F/S	4	CprE 288
and CprE 308	Operating Systems: Principles & Practice	F/S	4	CprE 381 or ComS 321
or CprE 388	Embedded Systems ll: Mobile Platforms	F	4	CprE 288
or CprE 488	Embedded Systems Design	S	4	CprE 381 or ComS 321
BIOMEDICAL ENGINEERING				
*EE/BME 341	BioMEMS and Nanotechnology	✓	3	BME 220
*EE/BME 450	Biosensing	✓	3	BME 220

Note: *BIOL 212, EE 185 or equiv, Math 166, Chem 167 or 178, Phys 222 are prereqs to BME 220*

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OTHER APPROVED EE/CPRE COURSES -- These courses cannot be used to fulfill sequence requirements

ELECTROMAGNETIC, FIELDS, ANTENNAS AND PROPAGATION				
EE 437X	Electronic Properties of Materials	S	3	EE 332
SIGNALS & SYSTEMS	(EE 324 cannot be both core and technical elective)			
EE 324	Signals and Systems ll	F/S	4	EE 224
EE 424	Intro to Digital Signal Processing	S	4	EE 224
POWER SYSTEMS				
EE 452	Electrical Machines & Pwr Electronic Dr	S	3	EE 303, EE 324
EE 459 (check availability)	Electrom. Wind Energy Conv. & Grid Integ.	✓	3	Co-req EE 452, EE 456
SEMICONDUCTOR DEVICES				
EE 333	Electronic Systems Design	F	4	EE 230, Co-req CprE 288
INDEPENDENT STUDY	(ONLY 2 CREDITS OF EE 490 CAN APPLY TO TECH ELECTIVES & BSEE DEGREE)			
EE 490 (see notation)	Independent Study	F/S/SS	1-2	Senior Classification
COMPUTING & NETWORKING SYSTEMS				
CprE 310	Theoretical Foundations of Cpr Engr.	F/S	3	ComS 228
CprE 450	Distributed Systems & Middleware	S	3	CprE 308 or ComS 352
CprE/ComS 454	Distributed & Ntwk Operating Systems	S	3	ComS 311, CprE 308 or ComS 352
CprE 480	Graphics Processing & Architecture	S	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	Co-req CprE 308 or ComS 352
SOFTWARE SYSTEMS				
*CprE/ComS/Math 424	Intro to High Perfom Computing	F	3	Math 265, Math 207 or 317
CprE/ComS 425	High Perform Cmpting for Sci & Engr App	S	3	ComS 311, ComS 230, Engl 250, SPCM 212
CprE/ComS 426	Intro to Parallel Algorithms & Program	F	4	CprE 308 or ComS 352, Com S 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	F/S	3	ComS 228
*CprE/SE 329	Software Project Management	F/S	3	ComS 309
*CprE/SE 339	Software Architechure & Design	F/S	3	SE 319
*SE/ComS 409	Software Requirements Engr	F	3	ComS 309
SE/Com S/CprE 412	Formal Methods in Software Engr	S	3	Com S 330 or Cpr E 310, Com S 311, Stat 330
*CprE/SE 416	Software Evolution and Maintenance	S	3	ComS 309
*SE/ComS 417	Software Testing	S	3	ComS 309, ComS 319
*CprE/SE 419	Software Tools for Lrge Scale Data Anal	S	4	CPR E 308 or COM S 352, COM S 309
INTERDISCIPLINARY/ OTHER COURSES				
EE 351	Analysis of Energy Systems	S	3	Phys 222
*EE 451	Engineering Acoustics	Alt S	3	Phys 221 and Math 267
*EE 388 (see notations)	Sustainable Engineering & Int'l Devlmt	F	3	Junior Classification in Engineering
*CprE/EE 466	Multidisciplinary Engineering Design	F/S	3	Senior classification, within 2 semesters of graduation
EE 488	Eddy Current Nondestructive Evaluation	Alt F	3	Math 265 and Mat E 273 or EE 311 or Phys 364
EE 489	Survey of Remote Sensor Networks	F/S	3	4 courses in physical, biological sciences, or engineering
EE 496	Modern Optics	S	3	Co-req Phys 322, Phys 365, Phys 480

APPROVED TECHNICAL ELECTIVES FOR ELECTRICAL ENGINEERS

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 in the following areas: Computer Science, Mathematics, Physics, and other Engineering departments (e.g. ConE 380, or Aer E 494X). for Math 317--see notation #9. **The courses listed below are approved exceptions to these guidelines.**

COURSES	DESCRIPTION	SEM	CR	PREREQUISITES (Check latest catalog for complete lists)
BME 220	Introduction to Biomedical Engineering	S	3	Biol 212, ENGR 160 or equiv, Math 166, Chem 167 or 178, Phys 222
Biol 211	Principles of Biology l	F/S	3	HS Biol
Biol 211L	Principles of Biology l Lab	F/S	1	Credit or enrollment in Biol 211
Biol 212	Principles of Biology ll	F/S	3	HS Biol; HS Chem or Cr/E in Chem 163/177
Biol 212L	Principles of Biology ll Lab	F/S	1	Credit or enrollment in Biol 212
Chem 331	Organic Chemistry I	F/S/SS	3	Chem 178 or Chem 201
Chem 331L	Organic Chemistry I Lab	F/S/SS	1	Chem 177L; credit or enrollment in Chem 331
Chem 332	Organic Chemistry II	F/S/SS	3	Chem 331
Chem 332L	Organic Chemistry II Lab	F/S/SS	1	Chem 33L; credit or enrollment in chem 332
ComS 207 (see notation)	Fundamentals of Computer Programming	F/S	3	Math 150 or placement in Math 140/141/142 or higher
ComS 208 (see notation)	Intermediate Computer Programming	F/S	3	Coms 207, Co-req Math 151, 160, or 165
ComS 227 (see notation)	Introduction to Object-Oriented Programming	F/S	4	Placement in Math 143, 165 or higher
ComS 228 (see notation)	Introduction to Data Structures	F/S	3	ComS 227 with C- or better, Co-req Math 165
ComS 252	Linux Operating System Essentials	F	3	ComS 107 or ComS 207 or ComS 227
ComS 327	Advanced Programming Techniques	F/S	3	ComS 228, Co-req Math 166
ConE 241	Construction Materials & Methods	F/S	3	ConE 222
EE 391	Open Laboratory and Design Studio	F	2	**junior classification (<u>only</u> approved for non-EE tech elective)**
EM 274	Statics of Engineering	F/S/SS	3	Co-req Math 166, Co-req Phys 111 or Phys 221
Engr 340	Intro to Wind Energy: Syst Dsgn & Delvry	F	3	Math 166, Phys 222
ENV S 324 (see notation)	Energy & The Environment	S	3	No prereq.
MatE 215	Intro to Materials Science & Engr	F/S	3	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	SS	3	MatE 391, Chem 167 or Chem 177
ME 231	Engineering Thermodynamics l	F/S/SS	3	Math 265, Chem 167, Phys 222
NS 320	Naval Ship Systems l: Engineering	F	3	NROTC students only - Phys 221, Sophomore
NS 330	Naval Ship Systems ll: Weapons	S	3	NROTC students only - Phys 221, Sophomore