APPROVED TECHNICAL ELECTIVES FOR ELECTRICAL ENGINEERS
2007-2009 and 2009-2011 CATALOG

March, 2011

Twenty one (21) semester credit hours of technical electives are required by the '07-'09 and '09-'11 catalogs. 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 advisor. 500-level courses are open to "qualified undergraduate students" (students in the upper half of their class). **NO Graduate or Undergraduate Seminars** are allowed for tech elective credit. Graduate Special Topics courses require ECpE Curriculum Committee review.

- Twelve (12) credits of electives must be from the lists of EE/CprE electives below, **including one approved sequence**.
- Three (3) credits must be from the list of math electives.
- The remaining six (6) credits required can be chosen from the lists of EE/CprE or Non-EE/CprE technical electives.

NOTE: Math 489, EE/ES 351X, ME 484 are not allowable as EE or Non-EE technical electives – they can be used in the GEC. ENGR/EE/CprE 467X, EE442 and EE 448 **cannot** be used to fulfill any elective requirements.

LIST OF APPROVED SEQUENCES
Need to have one approved sequence
The semester 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	EE 311, EE 230
COMMUNICATIONS (SELECT ALL THREE FOR SEQUENCE)				
EE 421	Communication Systems I	F	3	EE 224, Cr/E EE 322
EE 422+	Communication Systems II	S	3	EE 421, EE 423+
EE 423+	Communication Systems Lab	S	1	EE 421, EE 422+
ANALOG/DIGITAL ELECTRONICS (EE 330 cannot be technical elective, but is required for this sequence)				
*EE/CprE 435 (with EE/CprE 330)	Analog VLSI Circuit Design	S	4	EE 324, EE 330, EE 332, & EE 322 or Stat 330
(or)				
*EE/CprE 465 (with 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 recommended
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 Systems for Electrical Power Planning	✔	3	EE 303 or Econ 301
LINEAR SYSTEMS				
EE 475	Automatic Control Systems	F	3	EE 324
EE 476	Control Systems Simulation	S	3	EE 475
COMPUTER ENGINEERING				
CprE 381	Computer Organization and Design	F/S	4	CprE 281
CprE 308	Software Systems Integration	F/S	4	CprE 381, CprE 310

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

The semester courses are offered may change

COURSES	DESCRIPTION	SEM	CR	PREREQUISITES (Check latest catalog for complete lists)
SIGNALS & SYSTEMS				
EE 324	Signals and Systems II	F/S	4	EE 224
COMMUNICATIONS				
EE 424	Intro to Digital Signal Processing	S	4	EE 324
POWER SYSTEMS				
EE 452	Electrical Machines & Power Electronic Dr	S	3	EE 303, EE 330 or EE 332, Cr/E EE 324
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 Computer Engr.	F/S	3	Cr/E CprE 288, ComS 228
CprE 388X	Embedded Systems I	✔	4	CprE 288
CprE 450	Distributed Systems & Middleware	S	3	CprE 308 or ComS 352
CprE/ComS 454	Distributed & Network Operating Systems	✔	3	ComS 311, ComS 352
CprE 480X	Graphics Processing and Architecture	✔	4	CprE 381 or Com S 321
CprE 483	Hardware Software Integration	✔	4	CprE 381
CprE 488	Embedded Systems Design	✔	4	CprE 381 or ComS 321
CprE 489	Cpr. Networking and Data Communications	F/S	4	CprE 381 or EE 324
SECURITY & 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. Computing for Sci & Engr Appl.	S	3	ComS 311, ComS 330
CprE/ComS 426	Intro to Parallel Algorithms & Programming	✔	4	CprE 308 or ComS 321, ComS 311
CprE/ComS 444	Introduction to Bioinformatics	F	4	Math 165 or Stat 401
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 Architecture & Design	✔	3	SE 319
* SE/ComS 409	Software Requirements Engr	✔	3	ComS 309, SE 319
*CprE/SE/ComS 412	Formal Aspects of Specific. & Verification	✔	3	ComS 309, SE 319
*CprE/SE 416	Software Evolution and Maintenance	✔	3	ComS 309, SE 319
*SE/ComS 417	Software Testing	✔	3	ComS 309, SE 319
*CprE/SE 420X	Model Based Software Engineering	✔	3	SE 339
INTERDISCIPLINARY/OTHER COURSES	(ONLY ONE OF EE 408/409 MAY BE APPLIED TO TECH ELECTS)			
#EE 408	Interdisciplinary Problem Solving	F/S	3	Junior or Senior Classification
#EE 409	Interdisciplinary Systems Effectiveness	F/S	3	Junior or Senior Classification
EE 336X	Biomedical instrumentation	✔	3	EE 188X, EE 224, and EE 230
EE 388	Sustainable Engineering & Int'l Development	F	3	Junior Classification
EE 477X	Networked Cooperative Robots	✔	3	CprE 288, EE324, or permission instructor
EE 488	Eddy Current Nondestructive Evaluation	✔	3	Math 265 and (Mat E 216 or 272 or E E 311 or Phys 364)
EE 496	Modern Optics	✔	3	Credit or enrollment in Phys 322 and 365
*CprE/EE 466	Multidisciplinary Engineering Design	F/S	3	Senior classification, within 2 semester of graduation

EE/ME 451	Engineering Acoustics	S	3	Phys 221, Math 267

IMPORTANT NOTATIONS:

+ EE 422 and EE 423 must be taken at the same time.
# Only one of EE 408 or EE 409 may be applied as a technical elective.
* 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

NON-EE/CPRE ELECTIVES - *The semester 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 (or Biol 201 & Lab)	Principles of Biology I	F/S	3	HS Bio & Chem, or Cr/E in Chem 163 or Chem 177
Biol 211L	Principles of Biology I Lab	F/S	1	Credit or enrollment in Biol 211
Biol 212 (or Biol 202 & Lab)	Principles of Biology II	F/S	3	Biol 211
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 103 or ComS 207 or ComS 227
ComS 208	Programming II	F/S	3	ComS 207, Cr/E Math 165
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 336X	Introduction to Computer Graphics	✔	3	ComS 229, Cr/E Math 307 or Math 317
ConE 241	Construction Materials & Methods	F/S	3	ConE 221
EM 274	Statics of Engineering	F/S/SS	3	Cr/E Math 166, Cr/E Phys 221
MatE 215	Intro to Materials Science & Engr	F	5	Chem 167 or Chem 177
MatE 272	Principles of Materials Science & Engr	F/S/SS	2	Chem 167 or Chem 177, Math 165, Sophomore
MatE 273X	Principles of Materials Science & Engr Lab	F/S/SS	1	Enrollment in MatE 272
ME 231	Engineering Thermodynamics I	F/S	3	Math 265, Chem 167, Phys 222
ME 330	Thermodynamics	F/S	3	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 267
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:
201, 202, 325, 341, 341L, 352, 411, 428, 450, 450L
Check catalog for prerequisites required for courses

Allowable Nuclear Engineering (NucE) courses:
401, 402, 405, 410, 411
Check catalog for prerequisites required for courses

MATH ELECTIVES (3 cr.)

These courses can only be applied as Math electives - ***The semester courses are offered may change***

COURSES	DESCRIPTION	SEM	CR	PREREQUISITES (Check latest catalog for complete lists)
Math 307	Theory of Matrices	F/S/SS	3	Math 165, Math 166
Math 314	Graphs and Networks	S	3	Math 166, Math 201 or equivalent
Math 317	Theory of Linear Algebra	F/S	4	Math 166, Cr/E Math 201
Math 365	Complex Variables with Applications	F/S	3	Math 265
Math 373	Intro to Scientific Computation	F/S/SS	3	Math 265, knowledge of MATLAB
Math 385	Intro to Partial Differential Equations	F/S	3	Math 265, Math 267
Math 465	Advanced Calculus for Applied Math	F/SS	4	Math 265, not offered after Summer 09
Math 471	Cmp. Linear Algebra & Fixed-pt. Iteration	F/S	3	Math 265, Math 267, programming knowledge
Math 481	Numerical Soln. of Diff. Eq. & Interpolation	S/SS	3	Math 265, Math 267, programming knowledge