



Bachelor of Science in  
**Computer Engineering**

Advising Brochure  
**2016 – 2017**

Department of  
Computer Science & Engineering  
College of Engineering

256 Avery Hall

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*<http://cse.unl.edu/advising>*

The B.S. Degree in Computer Engineering is accredited by the  
Engineering Accreditation Commission of ABET.  
*<http://www.abet.org>*

rev: May 30, 2016

## Computer Engineering Program – 126 hours

Course	Title	RAIK	Hrs
<b>Computer Science &amp; Engineering Courses:</b>			
CSCE 10	CSE Freshman Seminar		0
CSCE 155, 156	Intro to Comp Sci I,II	183,184	7
CSCE 230	Computer Organization		4
CSCE 235	Introduction to Discrete Struct	(283)	3
CSCE 236	Intro to Embedded Systems		3
CSCE 251	Unix Programming		1
CSCE 310	Data Structures & Algos	283	3
CSCE 335/ELEC 370	Digital Logic Design		3
CSCE 440	Numerical Analysis I		3
CSCE 351	Operating System Kernels		3
CSCE 361	Intro to Software Engineering	383	3
CSCE 462	Communication Networks		3
CSCE 488/ELEC 494	CE Professional Development	401	3
CSCE 489/ELEC 495	CE Senior Design Project	402	<u>3</u>
			42
<b>Electrical Engineering Courses:</b>			
ELEC 215, 235	Electronics & Circuits I, Lab		4
ELEC 216, 236	Electronics & Circuits II, Lab		4
ELEC 304	Cont Time Signals & Systems		3
ELEC 305	Probability Theory		3
ELEC 316	Electronics & Circuits III		<u>3</u>
			17
<b>Mathematics Courses:</b>			
MATH 106, 107, 208	Analytic Geom & Calc I,II,III		13
MATH 221	Differential Equations		3
MATH 314	Linear Alg (Matrix Theory)		<u>3</u>
			19
<b>Other Supporting Courses:</b>			
Natural Sciences			12-13
PHYS 211, 212 and 1 of CHEM 109 or PHYS 213 & lab	General Physics I,II (8 hr) General Chemistry (4 hr) or General Physics III & any lab (5 hr)		
Technical Communications			6-9
JGEN 200 and 1 of JGEN 300 or COMM 286 or ENGR 100	Tech Comm I (subst ENGL 150+151) Tech Comm II (3 hr) or Bus & Prof Comm (3 hr) or Interpersonal Skills for Engr (3 hr)	287/8 187/8	
ENGR 20	Soph Engr Seminar		0
CSCE/ELEC	Technical Electives	301,302,411,475	15
Open Elective	(to reach 126 hours)		0-3
ACE	LO's 5, 6, 7, 9	(LO 6): 182,282	<u>12</u>
			48

### Professional Admission to Computer Engineering

- Determined when 43-61 hours apply to the degree
- 2.500+ previous semester and cumulative GPA
- C+ min in MATH thru 208, PHYS thru 212, and ELEC thru 215/235
- C+ min in CSCE through 156, 230, 235 (or RAIK 183, 184, 283)
- Automatic for qualifying students, will be contacted if at risk

## Technical Electives Requirements - 15 hours

### Technical Electives include the following:

- any Focus course
- any 300+ level non-required CSCE excepting 390 and 490
- any 300+ level non-required ELEC
- any 300+ level RAIK (if equivalent to qualifying CSCE)

### Technical Electives constraints:

- I.  $\geq 9$  hours of CSCE and/or equivalent RAIK
- II.  $\geq 6$  hours lecture-based
- III.  $\leq 6$  hours practicum/internship (e.g. CSCE 301H, 302H, 491)
- IV.  $\leq 3$  hours independent study (e.g. CSCE 498)
- V.  $\geq 9$  hours 400-level
  - 9+ hours in one Focus area with minimum C grade qualifies as a **Focus**.
  - 15+ hours in one Focus area with minimum C grade qualifies for waiver of preceding Technical Electives constraints.

## ACE Student Learning Outcomes - 12 hours

- Maximum of 9 hrs in any one department for ACE 4-10.
- Asterisk (\*) indicates those not built into the major.
- See <http://ace.unl.edu/> for details and listings.

1.	Written Communication	JGEN 200, ENGL 150+151, Raikes
2.	Oral Communication	ENGR 100, COMM 286, JGEN 300, Raikes
3.	Math & Computation	CSCE 155, Raikes
4.	Natural Sciences	CHEM 109, PHYS 211/212
5.*	Humanities/History	on your own!
6.*	Social Sciences	on your own! or Raikes
7.*	Fine Arts	on your own!
8.	Ethics	CSCE 488, RAIK 401
9.*	Human Diversity	on your own!
10.	Integrated Knowledge	CSCE 489, RAIK 402, ELEC 495

Careful: ELEC 494 does NOT substitute for CSCE 488 to meet ACE 8 requirement!

## Computer Engineering Focus Areas - 9-15 hours

### Embedded Systems and Robotics

		<b>Course Title</b>	<b>Frequency</b>
CSCE	430	Computer Architecture	s
	<u>436</u>	<u>Embedded Systems</u>	fo
	438	Sensor Networks	fo
	439	Robotics: Algos & Appls <b>OR</b>	fo
	476	Intro AI	s
ELEC	479	Data Sys Org and Design	??
MECH	453	Robotics: Kinematics & Design	fs

### VLSI Design

		<b>Course Title</b>	<b>Frequency</b>
ELEC	416	Mat & Dev for Comp Mem/Log/Disp	
	421	Princ of Semiconductor Mat & Def	f
	475	Digital Systems	s
CSCE	430	Computer Architecture	s
	<u>434</u>	<u>VLSI Design</u> <b>OR</b>	s18?
<u>ELEC</u>	<u>470</u>	<u>Digital &amp; Analog VLSI Design</u> (Phys 213/223 also required)	s fs

### Signal Processing & Communications

		<b>Course Title</b>	<b>Frequency</b>
ELEC	462	Communication Systems	f
	463	Digital Signal Processing	f
	464	Digital Comm Systems	so
	465	Intro to Data Compression	s
CSCE	438	Sensor Networks	fo
	463	Data and Net Security (not s16)	se
	472	Digital Image Processing (not f15)	f
	473	Computer Vision	so?

### High Performance Computing

		<b>Course Title</b>	<b>Frequency</b>
<u>CSCE</u>	<u>430</u>	<u>Computer Architecture</u>	s
	432	High-Performance Processor Architectures	??
	435	Cluster & Grid Computing	fo
	437	File & Storage Systems	??
	455	Distributed Operatings Systems	so!17
	456	Parallel Algorithms & Programming	fe

- The Focus is optional and can be customized.
- Grade of C or higher is required for a Focus.
- Underlining means course is required for the Focus.

## Computer Science Technical Electives

	<b>Course Title</b>	<b>Frequency</b>
CSCE 322	Programming Language Concepts	fssu
378	Human-Computer Interaction	s
399H	Honors Research (Ind Study)	fssu
413	Database Systems	f
421	Foundations of Constraint Sat Th	fe
423	Design & Analysis of Algorithms	s+fo
424	Computational Complexity Th	??
425	Compiler Construction	s
428	Automata, Computation and Formal Lang	f+so
430	Computer Architecture	s
432	High-Performance Comp Archs	??
434	VLSI Design	s18??
435	Cluster & Grid Computing	fo
436	Advanced Embedded Systems	fo
437	File & Storage Systems	??
438	Sensor Networks	fo
439	Robotics	fo
441	Approximation of Functions	??
447	Numerical Analysis II	so
451	Operating System Principles	s+fe
455	Distributed Operating Systems	so!17
456	Parallel Algo's and Programming	fe
457	Systems Administration	fo
458	Real-Time Systems	s
461	SOFT Adv Topics in Soft Engr	?
463	Data & Network Security	se
464	Internet Systems & Prog	fsu
465	Wireless Comm Nets	fe
466	SOFT Software Design and Arch	?
467	SOFT Testing, Verif and Anal	?
468	SOFT Req Elic, Modl and Anal	?
470	Computer Graphics	fe
471	Bioinformatics	se
472	Digital Image Processing	f
473	Computer Vision	so17?
474	Data Mining	se
475	Multiagent Systems	fo
476	Artificial Intelligence	s
477	Cryptography & Comp Security	fsu
478	Machine Learning	fe
491	Internship (practicum)	fssu
493	ILab Project (practicum)	fssu
496	Special Topics (varies)	fs
498	Computer Problems (Ind Study)	fssu

## Raikes School Technical Electives

	<b>Course Title</b>	<b>Frequency</b>
RAIK 411H	Data Modeling for Sys Dev	s
475H	Multiagent Systems	s
DS	301H, 302H	f+s

## Electrical Engineering Technical Electives

EE Opt	Course Title	Frequency
	306 Electromag Field Theory	fs
	307 Elect Engr Lab I	fs
	317 Elect Engr Lab 2	fs
ECE	361 Adv Electronics & Circ	s
	399H Undergraduate Research (Ind Study)	fs
eps	406 Power Systems Analysis	fe
EFO	408 Engineering Electromagnetics	f
csp	410 Multivariate Random Processes	fo
md	417 Semiconductor Fundamentals II	s
md	420 Plasma Semiconductors	f
MD	421 Principles of Semiconductors	f
md	422 Intro to Phys & Chem of Solids	?
EPS	428 Power Electronics	f
eps	430 Wind Energy	f
eps	436 Electric Machines	s
EPS	438 Electric Power Engineering	s
	442 Analytical Techniques	so
eps	444 Linear Control Systems	f
ms	448 Decision Analysis	f
BIO	452 Bioinformatics	f
bio	460 LabView Programming	s
CSP	462 Communication Systems	f
CSP	463 Digital Signal Processing	f
csp	464 Digital Communication Systems	so
csp	465 Intro Data Compression	se
efo	467 Electromag Theory & Appl	?
efo	468 Microwave Engineering	?
ece	469 Analogue Integrated Circuits	f
ece	470 Digital & Analogue VLSI Design	s
ECE	475 Digital Systems	s
efo	480 Lasers & Laser Applications	s
efo	486 Applied Photonics	fo
	498 Special Topics	fs

## Electrical Engineering Dual Matriculation?

Include the Following Courses:	hrs
Two of CHEM 109, PHYS 213, LIFE 120/121	4
PHYS 222, ELEC 306, 307, 317, 222 or CSCE 236	8
Choice ELEC 494&495 or CSCE 488&489	0
EE Option 12 hrs from above list	6
(Need one from UPPER case, one from EiThEr case, one from a different Option, and one of any upper EE)	

### Electrical Engineering Major Options

CSP/csp	-	Communications & Signal Processing
EFO/efo	-	Electromagnetic Fields & Optics
ECE/ece	-	Electronics & Computer Engineering
EPS/eps	-	Energy & Power Systems
MD/md	-	Materials & Devices
BIO/bio	-	Bioengineering

## Recent CSCE 496 Special Topics Electives

Title	Frequency
Algorithms - Large Scale Data	fe
AI and Heuristics in Software Engr	s16
Computational Methods in Bioinfo	f
Genetically Engineered Sys	fe
Human-Robot Interaction	f
Molecular & Nanoscale Communication	se
Multiway Data Analysis	se
Queuing Models	fo
Self-Managing Comp Sys	fe

## Computer Science Dual Matriculation?

Add the Following Courses:	hrs
CSCE 322 as a Technical Elective	0
CSCE 423 or 428 as a Technical Elective	0
CDR A (a second ACE 1) or ENGL 150 & 151	3
CDR C (Hum/Hist)	3
CDR D (Soc Sci)	3
	9

Note  $120 + 30 = 150$  hrs needed for Dual Matriculation.

So  $150 - 126 - 9 = 15$  new totally elective hours.

Perhaps use hours for Physics minor or Math major.

## Engineering Mathematics Minor?

The minor includes MATH 106, 107, 208, 221 plus 12 advanced hours. Computer Engineering already includes MATH 314 and MATH 440 (cross-listed as CSCE 440). Simply add two more math courses.

## Recent Changes

**Fall 2009 through Fall 2010:** ACE General Studies formula replaced the old ES/IS. Technical Electives were 9 hours. Required courses CSCE 430, ELEC 307, 361, and 475 become electives in Fall 2011. CSCE 236 not yet created.

**Fall 2011:** Required courses reduced, CSCE 236 added, Technical Elective hours increased to 15. Technical Electives not restricted by type (ELEC, Raikes, etc.) but ELEC limited to only 8 courses that were most relevant, also a few theory oriented CSCE courses were not allowed.

**Fall 2012 through present:** Technical Elective hours now constrained by type, but choices expand to virtually any upper-level ELEC and CSCE courses.

Bulletin year defaults to year matriculated into the program. Updating to a more recent year (of matriculation) can be done. Make request through Chief Undergraduate Adviser to the Dean's Office.

### Example Eight Semester Schedule - 126 hours

<b>Fall 1</b>				<b>Spring 1</b>			
CSCE	155E	CS I	3	CSCE	156	CS II	4
MATH	106	Calc I	5	CSCE	235	Discrete	3
PHYS	211	Gen Phys I	4	CSCE	251	Unix	1
		ACE 5	3	MATH	107	Calc II	4
CSCE	10	Seminar	0	PHYS	212	Gen Phys II	4
			<u>15</u>				<u>16</u>
<b>Fall 2</b>				<b>Spring 2</b>			
CSCE	230	Comp Org	4	CSCE	236	Intr Em Sys	3
CSCE	310	Algos	3	CSCE	361	Soft Engr	3
MATH	208	Calc III	4	MATH	221	Diff Eq	3
ELEC	215,235	Elec Circ I	4	ELEC	216,236	Circuit II	4
ENGR	020	Seminar	0	JGEN	200	Tech Comm I	3
			<u>15</u>				<u>16</u>
<b>Fall 3</b>				<b>Spring 3</b>			
CSCE	351	Op Sys Ker	3	CSCE	335	Dig Logic	3
CHEM	109	Gen Chem	4	CSCE	462	Comm Net	3
ELEC	304	Sig & Sys	3	MATH	314	Linear Alg	3
ELEC	316	Circuit III	3	ELEC	305	Prob Th	3
		ACE 6	3	CS/EE		Tech Elec	3
			<u>16</u>				<u>15</u>
<b>Fall 4</b>				<b>Spring 4</b>			
CSCE	440	Num Anal	3	CSCE	489	CE Sr Des	3
CS/EE		Tech Elec	3	CS/EE		Tech Elec	3
CSCE	488	CE Prof	3	CS/EE		Tech Elec	3
JGEN	300	Tech Comm II	3	CS/EE		Tech Elec	3
		ACE 7	3			ACE 9	3
		free elective	3				<u>15</u>
			<u>18</u>				

#### Departmental Advising:

<http://cse.unl.edu/undergraduate-advising-center>

Charles Riedesel (Chief Advisor) 259 Avery, 472-3486, [chuckr@unl.edu](mailto:chuckr@unl.edu)  
(calendar at <http://cse.unl.edu/~riedesel> follow link to appointments)

Jeff Ifland (Advisor) 259 Avery Hallway, [jifland@cse.unl.edu](mailto:jifland@cse.unl.edu)

Ryan Patrick (Advisor) 365 Avery, 472-5089, [rypat@unl.edu](mailto:rypat@unl.edu)

Jenna Huttenmaier (Admin Coordinator) 269 Avery, [jenna.huttenmaier@unl.edu](mailto:jenna.huttenmaier@unl.edu)

#### General College Advising:

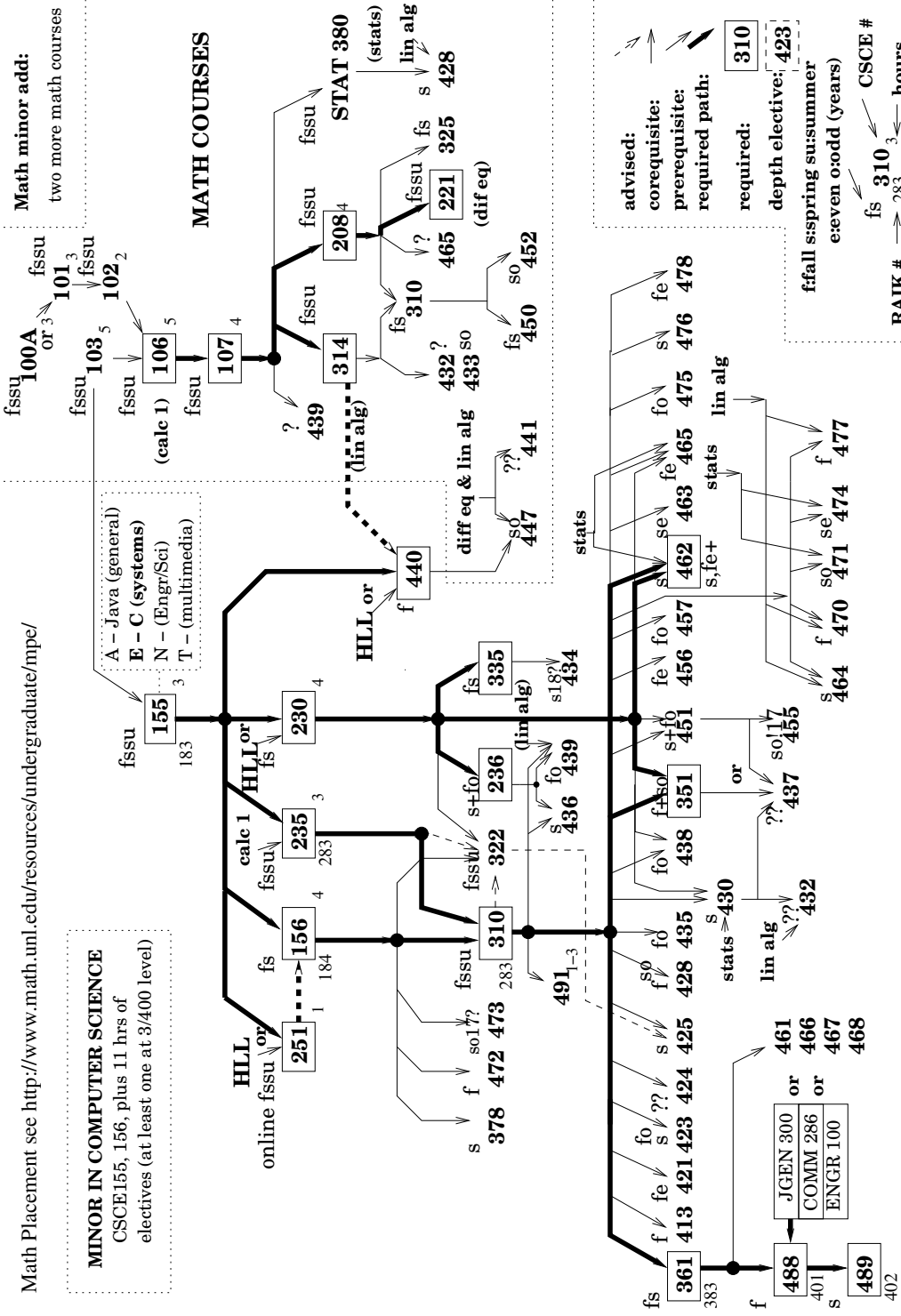
Engineering Library, W204 Nebraska Hall, 472-7072

<http://engineering.unl.edu/current-undergraduate/index.shtml>



Math Placement see <http://www.math.unl.edu/resources/undergraduate/mppe/>

**MINOR IN COMPUTER SCIENCE**  
 CSCE155, 156, plus 11 hrs of  
 electives (at least one at 3/400 level)



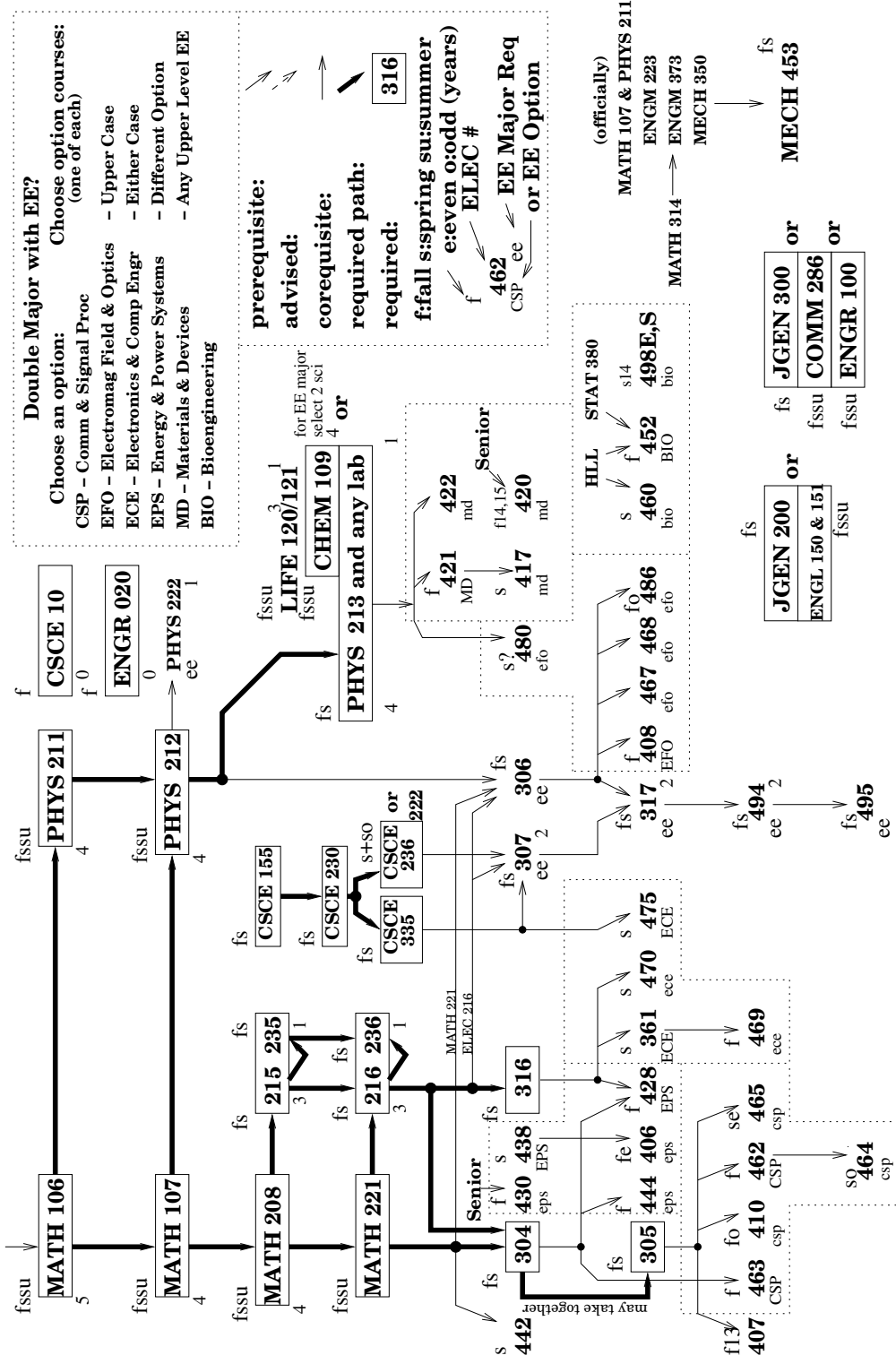
**Math minor add:**  
two more math courses

**MATH COURSES**

advised:   
 corequisite:   
 prerequisite:   
 required path:   
 required: **310**   
 depth elective: **423**   
 f:fall s:spring su:summer   
 e:even o:odd (years)   
 fs **310** <sub>3</sub> ← C SCE #   
 R A I K # → 283 ← hours   
 HLL: High Level Language

# COMPUTER ENGINEERING PROGRAM

## Computer Science & Engineering and Supporting Courses



# COMPUTER ENGINEERING PROGRAM

## Electrical Engineering and Supporting Courses