

Department of

Computer Science and Electrical Engineering



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Introduction

The curricula in the Department of Computer Science and Electrical Engineering are designed to provide a broad background in the theory and practice of computer software, computer hardware, and electrical systems. Students learn how to combine scientific knowledge and engineering methods with practical technical skills to help prepare them for life-long learning and rewarding employment.

Six degree programs are offered:

1. A.A.S. in Electrical and Computer Engineering
2. A.A.S. in Computer Programming
3. B.S. in Computer Science
4. B.S. in Software Engineering
5. B.S. in Electrical Engineering
6. B.S. in Computer Engineering

Graduates in the Department of Computer Science and Electrical Engineering will:

1. Have a thorough grounding in the fundamental principles and practices of their respective degree programs
2. Have learned how to learn
3. Be prepared for a successful career
4. Be ethical and responsible employees who make a difference

The Department of Computer Science and Electrical Engineering continually strives to evaluate, improve, and modernize its curricula to keep pace with today's technological innovations. Advisors can help students determine the best sequence of courses to meet all graduation requirements within eight semesters. To qualify for graduation, students must achieve at least a C- grade in all major required classes.

A.A.S. in Electrical and Computer Engineering (384)

The A.A.S. in Electrical and Computer Engineering provides a solid foundation in basic computer and electronic systems. This includes knowledge and skills in computer programming, computer system design, and analog electronics. Students will be taught problem solving skills that will allow them to debug and correct electronic system errors. The primary target audience for this degree is Pathway and online degree students.

A.A.S. in Computer Programming (385)

The A.A.S. in Computer Programming provides a solid foundation in both the breadth and depth of computer programming. This includes knowledge and skills in several programming languages as well as the principles and practices of software development. Students will be taught problem solving skills that will allow them to debug and correct software system errors. The primary target audience for this degree is Pathway and online degree students.

B.S. in Computer Science (440)

As a computer scientist, imagine creating the next search engine, the next social web site, or even the next "must have" mobile app. The Computer Science program at BYU-Idaho offers a solid background in computer science by providing experiences in algorithm development, procedural and object-oriented design and programming, software engineering practices, computer security, web engineering, technical communication, and theoretical foundations of computing. Graduates are prepared for high paying employment as software engineers or to continue their education at graduate school.

B.S. in Software Engineering (443)

The B.S. Software Engineering Degree is a subset of the B.S. Computer Science Degree. This program provides students with a solid foundation in both the breadth and depth of the principles and practices of software engineering as well as skills in computer programming. In this program of study, students learn and practice the industry standard approach to the design, development and implementation of complex software systems. The B.S. Software Engineering Degree is designed for students who want a strong background in software development coupled with a minor or two clusters in another subject (CS majors are not allowed to declare a minor).

B.S. in Electrical Engineering (445)

As an electrical engineer, imagine creating the next generation of consumer electronic devices, the next generation of robotics, or the next electronic medical device that saves lives. The Electrical Engineering program at BYU-Idaho prepares you to use electricity and electronics in novel ways to help solve some of the world's greatest scientific challenges. The program balances scientific and engineering theory with technical laboratory experiences in order to develop practical knowledge and skills that working electrical engineers need. Graduates are prepared for high paying employment as electrical engineers or to continue their education at graduate school.

The Program Educational Objectives for the Electrical Engineering program are that graduates of this program will:

1. Be disciple leaders with a strong testimony
2. Maintain a broad and rigorous understanding of the fundamentals of electrical engineering
3. Possess well developed design and problem solving skills
4. Continually develop and learn
5. Possess strong communication and interpersonal skills
6. Make a positive difference in their family, their workplace, and their community

The Electrical Engineering Program is fully accredited by the EAC Accreditation Commission of ABET.

Computer Science and Electrical Engineering

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B.S. in Computer Engineering (450)

As a computer engineer, imagine creating the next super computer, the next revolutionary tablet computer, or even the next control system for the latest Air Force fighter jet. The Computer Engineering program at BYU-Idaho balances scientific and engineering theory with technical laboratory experiences in order to develop practical knowledge and skills that working computer engineers need.

The curriculum is balanced to make you adept at designing and developing both computer hardware and computer software. In addition, throughout your computer engineering education, you will gain in-depth knowledge and skills in the design and development of many different types of computer systems: from small MP3 players to large parallel computer systems. Graduates are prepared for high paying employment as computer engineers or to continue their education at graduate school.

The Program Educational Objectives for the Computer Engineering program are that graduates of this program will:

1. Be disciple leaders with a strong testimony
2. Maintain a broad and rigorous understanding of the fundamentals of computer engineering
3. Possess well developed design and problem solving skills
4. Continually develop and learn
5. Possess strong communication and interpersonal skills
6. Make a positive difference in their family, their workplace, and their community

The Computer Engineering Program is fully accredited by the EAC Accreditation Commission of ABET.

AAS in Electrical and Computer Engineering (384)

Core Courses <i>Take these courses:</i> CHEM 105 4 CS 124 3 CS 165 3 CS 235 3 CS 237 2 ECEN 150 3 <i>cont. in next column</i>	<i>cont. from previous column</i> ECEN 160 3 ECEN 160L 1 ECEN 250 4 ECEN 260 3 MATH 215 4 MATH 316 4 PH 121 3 PH 220 3 <hr style="width: 100%;"/> 43	Program Notes: •No Double Counting of Major Courses •No Grade Less Than C- in Major Courses
Credit Requirements:		Tracks Available:
Foundations	17	Fall-Winter Yes
Major	43	Winter-Spring Yes
Total	60	Spring-Fall Yes

AAS in Computer Programming (385)

Core Courses <i>Take these courses:</i> CS 124 3 CS 165 3 CS 235 3 ECEN 160 3 <hr style="width: 100%;"/> 12	<i>Take these courses:</i> CS 213 3 CS 246 3 CS 308 3 CS 313 3 CS 364 4 CS 371 3 <hr style="width: 100%;"/> 19	Elective Courses <i>Take 11 credits:</i> CIT 225 3 CIT 261 3 CIT 270 3 CIT 380 3 CS 416 2 CS 432 3 CS 470 3 ECEN 324 3 <hr style="width: 100%;"/> 11	Program Notes: •No Double Counting of Major Courses •No Grade Less Than C- in Major Courses
Credit Requirements:		Tracks Available:	
Foundations	17	Fall-Winter	Yes
Major	42	Winter-Spring	Yes
Elective	1	Spring-Fall	Yes
Total	60	Online	Yes

BS in Software Engineering (443)

Core Courses <i>Take these courses:</i> CS 124 3 CS 165 3 CS 235 3 ECEN 160 3 <hr style="width: 100%;"/> 12	<i>Take these courses:</i> CS 213 3 CS 246 3 CS 308 3 CS 364 4 CS 371 3 CS 398 1-4 CS 416 2 CS 432 3 CS 470 3 CS 499 3 <hr style="width: 100%;"/> 28	Elective Courses <i>Take 14 credits:</i> CS 237 2 CS 313 3 CS 345 3 CS 460 3 CS 490R 3 <i>cont. in next column</i>	<i>cont. from previous column</i> CIT 225 3 CIT 261 3 CIT 270 3 CIT 380 3 ECEN 324 3 ECEN 361 3 MATH 221A 3 <hr style="width: 100%;"/> 14	Program Notes: •No Double Counting of Major Courses •No Grade Less Than C- in Major Courses
Credit Requirements:		Tracks Available:		
Foundations	40	Fall-Winter	Yes	
Major	54	Winter-Spring	Yes	
Elective	26	Spring-Fall	Yes	
Total	120	Online	Yes	

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BS in Computer Science (440)				
Core Courses <i>Take these courses during your first 3 semesters:</i> CS 124 3 CS 165 3 CS 235 3 ECEN 160 —3 12	<i>Take these courses:</i> CS 213 3 CS 237 2 CS 238 4 CS 246 3 CS 306 3 CS 308 3 CS 345 3 CS 364 4 CS 416 2 CS 432 3 CS 470 3 ECEN 324 3 MATH 330 3 MATH 341 3 PH 150 —1 43	Supplemental Courses <i>Take 15 credits:</i> CIT 225 3 CS 312 3 CS 313 3 CS 371 3 CS 450 3 CS 460 3 CS 480 3 CS 490R 3 ECEN 260 3 ECEN 361 —3 15	Supplemental Courses <i>Take 1 course:</i> CS 398 1-4 CS 498R —1-4 1 <i>Take 3 credits:</i> CS 499 3 or CS 499A 2 CS 499B —1 3	Program Notes: •No Double Counting of Major Courses •No Grade Less Than C- in Major Courses
Credit Requirements: Foundations 42 Major 74 Electives 4 Total 120			Tracks Available: Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes	

Foundations Requirements for BS in Computer Science				
Eternal Truths		Academic Fundamentals		Cultural Awareness
Cornerstone Courses <i>Take these courses:</i> FDREL 200 2 FDREL 225 2 FDREL 250 2 FDREL 275 —2 8	Other Religion Courses <i>Take 6 credits:</i> FDREL 100 2 FDREL 130 2 FDREL 190 1-3 FDREL 211 2 FDREL 212 2 FDREL 215 2 FDREL 234 2 FDREL 235 2 FDREL 261 2 FDREL 301 2 FDREL 302 2 FDREL 324 2 FDREL 325 2 FDREL 327 2 FDREL 333 2 FDREL 341 2 FDREL 342 2 FDREL 343 2 FDREL 345 2 FDREL 351 2 FDREL 352 2 FDREL 390R 1-2 FDREL 397 2 FDREL 404 2 FDREL 431 2 FDREL 471 2 FDREL 475 —2 6	Reading, Writing, & Critical Thinking <i>Take this course:</i> FDENG 101 —3 3 Advanced Research Writing <i>Take either:</i> FDENG 301 3 OR <i>Take 1 course from the following list:</i> GEOL 316 3 B 320 3 HUM 305 —3 3 Quantitative Reasoning <i>Complete 1 option:</i> <i>Option 1</i> FDMAT 112 4 <i>Option 2</i> MATH 109 and 5 FDMAT 112 4 <i>Option 3</i> FDMAT 110 and 3 MATH 111 and 2 FDMAT 112 —4 4	Science Foundations <i>Take this course:</i> FDSCI 101 —2 2 Science Issues <i>Take these courses:</i> CHEM 105 4 PH 121 —3 7	American Foundations <i>Take 1 course:</i> FDAMF 101 3 FDCIV 101 —3 3 Humanities, International, Literature & World <i>Take 1 course:</i> FDHUM 110 3 FDWLD 101 —3 3 <i>Take 1 course:</i> FDHUM 214 3 FDHUM 299 3 FDINT 211 3 FDINT 212 3 FDINT 215 3 FDINT 299 3 FDLIT 216 3 FDLIT 299 3 FDWLD 201 —3 3
				Credits: 42

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BS in Electrical Engineering (445)

Core Courses	<i>Take these courses:</i>	Supplemental Courses	Math and Science Courses	<i>Program Notes:</i>	
<i>Take these courses during your first 2 semesters:</i>	CS 237 2	<i>Take 6 courses:</i>	<i>Take 1 course:</i>	<ul style="list-style-type: none"> •No Double Counting of Major Courses •No Grade Less Than C- in Major Courses 	
CS 124 3	CS 308 3	ECEN 324 3	BIO 221 3		
CS 241 4	ECEN 250 4	ECEN 351 3	BIO 240 4		
ECEN 150 3	ECEN 260 3	ECEN 361 3	BIO 264 & 264L 4		
ECEN 160 3	ECEN 340 3	ECEN 410 3	CHEM 106 4		
ECEN 160L 3	ECEN 350 3	ECEN 420 3	CS 238 4		
<u>1</u>	ECEN 380 3	ECEN 430 3	MATH 341 3		
14	ECEN 390 3	ECEN 440 3	MATH 411 3		
	ECEN 398R 1	ECEN 451 3	MATH 423 3		
	ECEN 499 3	ECEN 461 3	PH 123 3		
	MATH 215 4	ECEN 470 3	PH 127 <u>3</u>		
	MATH 316 4	ECEN 480 3	3		
	MATH 330 3	ECEN 490R 3			
	PH 220 <u>3</u>	ME 310 <u>2</u>			
	42	17			
Credit Requirements:		Tracks Available:			
Foundations 42		Fall-Winter Yes			
Major 76		Winter-Spring Yes			
Electives <u>2</u>		Spring-Fall Yes			
Total 120					

Foundations Requirements for BS in Electrical Engineering

Eternal Truths		Academic Fundamentals		Cultural Awareness
Cornerstone Courses	Other Religion Courses	Reading, Writing, & Critical Thinking	Science Foundations	American Foundations
<i>Take these courses:</i>	<i>Take 6 credits:</i>	<i>Take this course:</i>	<i>Take this course:</i>	<i>Take 1 course:</i>
FDREL 200 2	FDREL 100 2	FDENG 101 <u>3</u>	FDSCI 101 <u>2</u>	FDAMF 101 3
FDREL 225 2	FDREL 130 2	3	2	FDCIV 101 <u>3</u>
FDREL 250 2	FDREL 190 1-3			3
FDREL 275 <u>2</u>	FDREL 211 2	Advanced Research Writing	Science Issues	Humanities, International, Literature & World
8	FDREL 212 2	<i>Take either:</i>	<i>Take these courses:</i>	<i>Take 1 course:</i>
	FDREL 215 2	FDENG 301 3	CHEM 105 4	FDHUM 110 3
	FDREL 234 2	OR	PH 121 <u>3</u>	FDWLD 101 <u>3</u>
	FDREL 235 2	<i>Take 1 course from the following list:</i>	7	3
	FDREL 261 2	GEOL 316 3		<i>Take 1 course:</i>
	FDREL 301 2	B 320 3		FDHUM 214 3
	FDREL 302 2	HUM 305 <u>3</u>		FDHUM 299 3
	FDREL 324 2	3		FDINT 211 3
	FDREL 325 2			FDINT 212 3
	FDREL 327 2	Quantitative Reasoning		FDINT 215 3
	FDREL 333 2	<i>Complete 1 option:</i>		FDINT 299 3
	FDREL 341 2	<i>Option 1</i>		FDLIT 216 3
	FDREL 342 2	FDMAT 112 4		FDLIT 299 3
	FDREL 343 2	<i>Option 2</i>		FDWLD 201 <u>3</u>
	FDREL 345 2	MATH 109 and 5		3
	FDREL 351 2	FDMAT 112 4		
	FDREL 352 2	<i>Option 3</i>		
	FDREL 390R 1-2	FDMAT 110 and 3		
	FDREL 397 2	MATH 111 and 2		
	FDREL 404 2	FDMAT 112 <u>4</u>		
	FDREL 431 2	4		
	FDREL 471 2			
	FDREL 475 <u>2</u>			
	6			Credits: 42

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BS in Computer Engineering (450)				
Core Courses <i>Take these courses during your first 2 semesters:</i> CS 124 3 CS 165 3 ECEN 150 3 ECEN 160 3 ECEN 160L 1 <hr/> 13	<i>Take these courses:</i> CS 235 3 CS 237 2 CS 246 3 CS 308 3 CS 345 3 ECEN 250 4 ECEN 260 3 ECEN 324 3 ECEN 340 3 ECEN 350 3 ECEN 361 3 ECEN 398R 1 ECEN 499 3 MATH 215 4 MATH 316 4 MATH 330 3 PH 220 3 <hr/> 51	Supplemental Courses <i>Take 3 courses:</i> ECEN 351 3 ECEN 380 3 ECEN 390 3 ECEN 410 3 ECEN 420 3 ECEN 430 3 ECEN 440 3 ECEN 451 3 ECEN 461 3 ECEN 470 3 ECEN 480 3 ECEN 490R 3 CS 313 3 CS 364 4 CS 371 3 CS 416 2 CS 432 3 CS 460 3 CS 470 3 CS 480 3 CS 490R 3 <hr/> 8	Math and Science Courses <i>Take 1 course:</i> BIO 221 3 BIO 240 4 BIO 264 & 264L 4 CHEM 106 4 CS 238 4 MATH 341 3 MATH 411 3 MATH 423 3 PH 123 3 PH 127 3 <hr/> 3	Program Notes: •No Double Counting of Major Courses •No Grade Less Than C- in Major Courses
Credit Requirements: Foundations 42 Major 75 Elective 3 <hr/> Total 120			Tracks Available: Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes	

Foundations Requirements for BS in Computer Engineering				
Eternal Truths		Academic Fundamentals		Cultural Awareness
Cornerstone Courses <i>Take these courses:</i> FDREL 200 2 FDREL 225 2 FDREL 250 2 FDREL 275 2 <hr/> 8	Other Religion Courses <i>Take 6 credits:</i> FDREL 100 2 FDREL 130 2 FDREL 190 1-3 FDREL 211 2 FDREL 212 2 FDREL 215 2 FDREL 234 2 FDREL 235 2 FDREL 261 2 FDREL 301 2 FDREL 302 2 FDREL 324 2 FDREL 325 2 FDREL 327 2 FDREL 333 2 FDREL 341 2 FDREL 342 2 FDREL 343 2 FDREL 345 2 FDREL 351 2 FDREL 352 2 FDREL 390R 1-2 FDREL 397 2 FDREL 404 2 FDREL 431 2 FDREL 471 2 FDREL 475 2 <hr/> 6	Reading, Writing, & Critical Thinking <i>Take this course:</i> FDENG 101 3 <hr/> 3 Advanced Research Writing <i>Take either:</i> FDENG 301 3 OR <i>Take 1 course from the following list:</i> GEOL 316 3 B 320 3 HUM 305 3 <hr/> 3 Quantitative Reasoning <i>Complete 1 option:</i> <i>Option 1</i> FDMAT 112 4 <i>Option 2</i> MATH 109 and 5 FDMAT 112 4 <i>Option 3</i> FDMAT 110 and 3 MATH 111 and 2 FDMAT 112 4 <hr/> 4	Science Foundations <i>Take this course:</i> FDSCI 101 2 <hr/> 2 Science Issues <i>Take these courses:</i> CHEM 105 4 PH 121 3 <hr/> 7	American Foundations <i>Take 1 course:</i> FDAMF 101 3 FDCIV 101 3 <hr/> 3 Humanities, International, Literature & World <i>Take 1 course:</i> FDHUM 110 3 FDWLD 101 3 <hr/> 3 <i>Take 1 course:</i> FDHUM 214 3 FDHUM 299 3 FDINT 211 3 FDINT 212 3 FDINT 215 3 FDINT 299 3 FDLIT 216 3 FDLIT 299 3 FDWLD 201 3 <hr/> 3
				Credits: 42

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Minor in Computer Science (147)			
Core Courses <i>Take these courses:</i> CS 124 3 CS 165 3 CS 235 3 CS 246 3 <hr/> 12	Supplemental Courses <i>Take 12 credits:</i> ECEN 160 3 ECEN 324 3 CS 213 3 CS 237 2 CS 238 4 CS 306 3 CS 312 3 CS 313 3 CS 345 3 <i>cont. in next column</i>	<i>cont. from previous column</i> CS 364 4 CS 371 3 CS 416 2 CS 432 3 CS 450 3 CS 460 3 CS 470 3 CS 480 3 CS 490R 3 <hr/> 12	Program Notes: •No Grade Less Than C- in Minor Courses
Credit Requirements:		Tracks Available:	
Total 24		Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes	

Minor in Electrical and Computer Engineering (245)	
Core Courses <i>Take these courses:</i> ECEN 150 3 ECEN 160 3 ECEN 160L 1 ECEN 260 3 ECEN 324 3 ECEN 340 3 ECEN 350 3 CS 124 3 CS 165 3 <hr/> 25	Program Notes: •No Grade Less Than C- in Minor Courses
Credit Requirements:	
Total 25	
Tracks Available:	
Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes	

Software Engineering Concentration (D 106)				
Core Courses <i>Take these courses:</i> CS 124 3 CS 165 3 CS 235 3 CS 246 3 <hr/> 12 Interdisciplinary Courses <i>Take these courses:</i> IDS 398R 1-3 IDS 499 2 <hr/> 3	Software Engineering-Module <i>Take these courses:</i> CS 308 3 CS 364 4 CS 371 3 CS 416 2 CS 432 3 <hr/> 15	Supplemental Courses <i>Take 6 credits of upper division courses not included in concentration core or selected emphasis area:</i> CS 306 3 CS 312 3 CS 313 3 CS 345 3 CS 398 1-4 CS 450 3 CS 460 3 CS 470 3 CS 480 3 CS 490R 3 CS 498R 1-4 <i>cont. in next column</i>	<i>cont. from previous column</i> ECEN 324 3 ECEN 340 3 ECEN 350 3 ECEN 351 3 ECEN 361 3 ECEN 380 3 ECEN 390 3 ECEN 398R 1 ECEN 420 3 ECEN 430 3 ECEN 440 3 ECEN 470 3 ECEN 480 3 ECEN 490R 3 <hr/> 6	Program Notes:
Credit Requirements:			Tracks Available:	
Total 36			Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes	

Computer Science and Electrical Engineering
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Computer Science Internet Concentration (D 107)				
Core Courses <i>Take these courses:</i> CS 124 3 CS 165 3 CS 235 3 CS 246 3 <hr/> 12 Internet Module <i>Take these courses:</i> CS 213 3 CS 313 3 CS 460 3 CS 470 3 <hr/> 12	Supplemental Courses <i>Take 9 credits of upper division courses not included in concentration core or selected emphasis area:</i> CS 306 3 CS 308 3 CS 312 3 CS 345 3 CS 364 4 CS 371 3 CS 398 1-4 CS 416 2 CS 432 3 CS 450 3 CS 480 3 CS 490R 3 <i>cont. in next column</i>	<i>cont. from previous column</i> CS 498R 1-4 ECEN 324 3 ECEN 340 3 ECEN 350 3 ECEN 351 3 ECEN 361 3 ECEN 380 3 ECEN 390 3 ECEN 398R 1 ECEN 420 3 ECEN 430 3 ECEN 440 3 ECEN 470 3 ECEN 480 3 ECEN 490R 3 <hr/> 9	Interdisciplinary Courses <i>Take these courses:</i> IDS 398R 1-3 IDS 499 2 <hr/> 3	Program Notes:
Credit Requirements: Total 36		Tracks Available: Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes		

Computer Science Hardware Concentration (D 108)				
Core Courses <i>Take these courses:</i> CS 124 3 CS 165 3 CS 235 3 CS 246 3 <hr/> 12 Interdisciplinary Courses <i>Take these courses:</i> IDS 398R 1-3 IDS 499 2 <hr/> 3	Hardware Interface Module <i>Take these courses:</i> CS 345 3 ECEN 160 3 ECEN 324 3 ECEN 361 3 <hr/> 12	Supplemental Courses <i>Take 9 credits of upper division courses not included in concentration core or selected emphasis area:</i> CS 306 3 CS 308 3 CS 312 3 CS 313 3 CS 364 4 CS 371 3 CS 398 1-4 CS 416 2 CS 432 3 CS 450 3 CS 460 3 CS 470 3 <i>cont. in next column</i>	<i>cont. from previous column</i> CS 480 3 CS 490R 3 CS 498R 1-4 ECEN 340 3 ECEN 350 3 ECEN 351 3 ECEN 380 3 ECEN 390 3 ECEN 398R 1 ECEN 420 3 ECEN 430 3 ECEN 440 3 ECEN 470 3 ECEN 480 3 ECEN 490R 3 <hr/> 9	Program Notes:
Credit Requirements: Total 36		Tracks Available: Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes		

Computer Science Theory Concentration (D 109)				
Core Courses <i>Take these courses:</i> CS 124 3 CS 165 3 CS 235 3 CS 246 3 <hr/> 12 Interdisciplinary Courses <i>Take these courses:</i> IDS 398R 1-3 IDS 499 2 <hr/> 3	Theory Module <i>Take these courses:</i> CS 237 2 CS 238 4 CS 306 3 CS 480 3 <hr/> 12	Supplemental Courses <i>Take 9 credits of upper division courses not included in concentration core or selected emphasis area:</i> CS 308 3 CS 312 3 CS 313 3 CS 345 3 CS 364 4 CS 371 3 CS 398 1-4 CS 416 2 CS 432 3 CS 450 3 CS 460 3 CS 470 3 <i>cont. in next column</i>	<i>cont. from previous column</i> CS 490R 3 CS 498R 1-4 ECEN 324 3 ECEN 340 3 ECEN 350 3 ECEN 351 3 ECEN 361 3 ECEN 380 3 ECEN 390 3 ECEN 398R 1 ECEN 420 3 ECEN 430 3 ECEN 440 3 ECEN 470 3 ECEN 480 3 ECEN 490R 3 <hr/> 9	Program Notes:
Credit Requirements: Total 36		Tracks Available: Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes		

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Electrical and Computer Engineering Concentration (D 143)

Core Courses: <i>Take these courses:</i> CS 124 3 CS 165 3 ECEN 150 3 ECEN 160 3 ECEN 160L 1 ECEN 260 3 ECEN 324 3 ECEN 340 3 ECEN 350 3 ECEN 351 3 ECEN 361 3 <hr/> 31	Interdisciplinary Courses: <i>Take these courses:</i> IDS 398R 1-3 IDS 499 2 <hr/> 3	Program Note:
Credit Requirements: Total 34		Tracks Available: Fall-Winter Yes Winter-Spring Yes Spring-Fall Yes

Programming - Computer Science Certificate (C 118)

Core Courses: <i>Take these courses:</i> CS 124 3 CS 165 3 CS 213 3 CS 235 3 CS 246 3 <hr/> 15	Program Note: <ul style="list-style-type: none"> •Grade of C- or higher required in all Certificate Courses •Certificates are not available to DAY students.
Credit Requirements: Total 15	

Computer Science and Electrical Engineering Predefined Clusters

Computer Science		6600
<i>Take these courses:</i>		
CS 124	Introduction to Software Development	3
CS 165	Object-Oriented Software Development	3
<i>Take 2 courses:</i>		
CS 213	Web Engineering I	3
CS 235	Data Structures	3
CS 237	Discrete Mathematics I	2
CS 238	Discrete Mathematics II	4
CS 246	Software Design and Development	3
CS 312	Computer Graphics	3
CS 371	Human-Computer Interaction	3
CS 460	Computer Communication & Networks	3
ECEN 160	Fundamentals of Digital Systems	3
ECEN 324	Computer Architecture	3
	Total Credits	12

Electrical and Computer Engineering		6603
<i>Take these courses:</i>		
CS 124	Introduction to Software Development	3
CS 165	Object-Oriented Software Development	3
ECEN 150	Electric Circuit Analysis I	3
ECEN 160	Fundamentals of Digital Systems	3
	Total Credits	12
Data Science Computational		6604
<i>Take these courses:</i>		
CIT 225	Database Design and Development	3
CS 124	Introduction to Software Development	3
CS 241	Survey of Object Oriented Programming/Data Structures	4
CS 450	Machine Learning and Data Mining	3
	Total Credits	13

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Course Descriptions

Credits*

CS 101 Introduction to Programming

(2:2:0:0)

This course provides an introduction to computer programming intended for people with no programming experience. This course is recommended for non-majors in order to get an overview of programming principles and techniques. This course covers the basics of programming in Python including elementary data types (numeric types, strings, lists, dictionaries and files), control flow, functions, objects, methods, fields, and mutability. (Fall, Winter, Spring)

CS 124 Introduction to Software Development

(3:3:0:0)

This course is the first step in the computer science and software engineering major tract. The goal of this course is that each student will be able to solve problems in C++ and have a solid foundation in software development methodology. (Fall, Winter, Spring)

CS 165 Object-Oriented Software Development

(3:3:0:0)

Prerequisite: CS 124

Software design and development using the object-oriented paradigm, algorithm formulation and object-oriented programming (Fall, Winter, Spring)

CS 213 Web Engineering I

(3:3:0:0)

Prerequisite: CS 165

Internet and web basics, web fundamentals, web browsers, web servers, and web terminology. This course teaches the concepts behind the fundamental tools used for building client-side web applications. It emphasizes client side programming standards and programming tools used to create dynamic web applications. (Fall, Winter, Spring)

CS 235 Data Structures

(3:3:0:0)

Prerequisite: CS 165

Builds on the foundation of CS 124 and CS 165 to introduce the fundamental concepts of data structures and the algorithms that proceed from them. (Fall, Winter, Spring)

CS 237 Discrete Mathematics I

(2:2:0:0)

Prerequisites: CS 165 or CS 241

Introduces the mathematical topics needed to provide a solid theoretical foundation for computer science and computer and electrical engineering. (Fall, Winter, Spring)

CS 238 Discrete Mathematics II

(4:4:0:0)

Prerequisite: CS 237

Reviews and continues the mathematical topics needed to provide a solid theoretical foundation for computer science (Fall, Winter)

CS 241 Survey Object Oriented Programming/Data Structures

(4:4:0:0)

Prerequisite: CS 124

This course provides an introduction to object-oriented programming and common data structures for those not requiring the depth of CS 165 and CS 235. (Fall, Winter, Spring)

CS 246 Software Design and Development

(3:3:0:0)

Co-requisite: CS 235

Advanced object-oriented designs and software development. (Fall, Winter, Spring)

CS 290 Special Topics

(1-3:1:0:0)

Repeatable Course: May earn maximum of 6 credits

Course Requirement: Instructor Approval Required

Faculty/Student consultation will determine an area of study/research that will give an advanced student greater appreciation and experience in this field. Terms of enrollment, credit, etc., will be determined by the instructor. (Fall, Winter, Spring)

CS 306 Algorithms and Complexity

(3:3:0:0)

Prerequisites: CS 235 and CS 237

Introduces formal techniques to support the design and analysis of algorithms, focusing on both the underlying mathematical theory and practical considerations of efficiency. Topics include asymptotic complexity bounds, techniques of analysis, and algorithmic strategies. (Fall, Spring)

CS 308 Technical Communication

(3:3:1:0)

Prerequisites: CS 165 or CS 241 or CIT 260 or CIT 336

Technical writing and presentation to technical audiences; professional communication including resumes' and job interview; collaboration (Fall, Winter, Spring)

CS 312 Computer Graphics

(3:3:0:0)

Prerequisite: CS 235

Effectively use freely available source tools and JavaScript programming API's including WebGL and the graphical JavaScript library THREE.js (Winter)

CS 313 Web Engineering II

(3:3:0:0)

Prerequisites: CS 213 or CIT 336

Co-requisites: CS 246 or CIT 260

This course builds upon Web Engineering I, allowing students to create more advanced web applications and services. The emphasis of this course will be on server-side technologies and n-tier applications using relational database technology. Different server-side technologies will be used for creating dynamic n-tier web applications. Client-side technologies will be enhanced and combined with server-side technologies to create rich web applications. (Fall, Winter, Spring)

CS 345 Operating Systems

(3:3:0:0)

Prerequisite: ECEN 324

Analysis of methods used by operating systems to perform typical system services, including: process control, memory management, scheduling, I/O, file management, concurrency, and parallelism (Winter, Spring)

CS 364 Software Engineering I

(4:3:1:0)

Prerequisite: CS 308

Software engineering overview; software requirements engineering including elicitation and specification; software design (Fall, Winter, Spring)

CS 371 Human-Computer Interaction

(3:3:0:0)

Course Requirements: Junior and Senior Standing Only

This class will follow the development lifecycle of a single user interface (UI) intensive project building a new UI for the windows media player. During this process, we will identify a target user, build a scenario in which this user will interact with the product, create a paper prototype of the UI, develop a functional specification, build the project into a workable media player skin, conduct a usability study with people matching the target user (and a few who do not), and redesign and rebuild the project to account for findings of the study. (Fall, Winter, Spring)

CS 398 Internship

(1-4:0:0:0)

Repeatable Course: May earn maximum of 4 credits

Internship Fees: \$81.50 (LDS) \$163 (non-LDS) per credit

Exempt from tuition, but charged this independent course fee

Prerequisite: CS 308

Planned and supervised practical experience in vocational or educational settings where interns acquire practical skills while applying classroom theory and principles. (Fall, Winter, Spring)

CS 416 Software Engineering II

(2:2:0:0)

Prerequisite: CS 308

There are two parts of CS 416: software quality engineering and software cost estimation. The first part relates to testing, verification, and validation. The second relates to estimating the cost of developing software. (Fall, Winter, Spring)

CS 432 Software Engineering III

(3:3:0:0)

Prerequisite: CS 308

There are two parts of CS 432: software development models and project management. The first part relates to the software process, software life cycles, and processes used to guide the development of software systems. The second relates to how to work with the human members of the team. (Fall, Winter, Spring)

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CS 450 Machine Learning and Data Mining (3:3:0:0)
Prerequisites: CS 246 or (MATH 325 and [CS 165 or CS 241])
This course is an introduction to the process of using machine learning to mine knowledge and patterns from data. Students will be introduced to several different algorithms spanning both supervised and unsupervised learning, and learn how to appropriately apply them in data mining. This course will examine methods that have emerged and proven to be of value in recognizing patterns and making predictions from an applications perspective. This course will survey applications and provide an opportunity for hands-on experimentation with algorithms for data mining using easy-to-use software and cases. (Winter)

CS 460 Computer Communication and Networks (3:3:0:0)
Prerequisite: CS 246
Introduction to computer networking and network programming with an Internet focus, including: applications, protocols, transport services, IP, routing, LANs, wireless, and security. (Winter Spring)

CS 470 Computer Security (3:3:0:0)
Prerequisite: CS 308
This course is essentially a research class. The purpose of this class is to help each student develop the skills necessary to become a security expert in whatever domain of computer security that is important to their job when they enter the work force. (Fall, Winter, Spring)

CS 480 Computational Theory (3:3:0:0)
Prerequisite: CS 306
This course explores finite automata, regular expressions, grammars, languages, Turing machines, computability, complexity, and P and NP problems. (Winter)

CS 490R Special Topics (3:3:0:0)
Repeatable Course: may earn a maximum of 6 credits
This course covers current topics in Computer Science. (Fall, Winter, Spring)

CS 498R Internship (1-4:0:0:0)
Repeatable Course: may earn maximum of 4 credits
Internship Fees: \$81.50 (LDS) \$163 (non-LDS) per credit
Exempt from tuition, but charged this independent course fee
Prerequisite: CS 398
This course involves planned and supervised practical experience in vocational or educational settings where interns acquire practical skills while applying classroom theory and principles. (Fall, Winter, Spring)

CS 499 Senior Project (3:3:0:0)
Prerequisites: CS 364 or CS 416 or CS 432
In this course students will gain experience with directed individual or group research and study of a topic in computer science not covered by the curriculum. The student will demonstrate he/she has learned how to learn and apply material covered by the curriculum to understand a new topic. (Fall, Winter, Spring)

CS 499A Senior Project, Part A (2:2:0:0)
Prerequisite: CS 364 or CS 416 or CS 432
In this course students will gain experience with directed individual or group research and study of a topic in computer science not covered by the curriculum. Part A of the senior project includes proposal preparation, research, requirements specification, and other activities as specified in the proposal. (Fall, Winter, Spring)

CS 499B Senior Project, Part B (1:1:0:0)
Prerequisite: CS 499A
This course is the completion of the senior project started in CS 499A as specified in the proposal and requirements specification. (Fall, Winter, Spring)

CS 499S Senior Project Supplemental (1-2:0.5:0:0)
Corequisite: CS 499 or CS 499A or CS 499B
Course Requirements: Instructor Approval Required
An extension of CS 499, Senior Project; allows the Senior Project student to engage in a more significant project by registering for an extra one or two credits. (Fall, Winter, Spring)

ECEN 150 Electric Circuit Analysis I (3:2:2:0)
This course provides an introduction to electrical and computer engineering. During this course you will analyze and design DC and AC circuits including: resistors, inductors, transformers and batteries. You will use Ohm's law, power and network theorems, and steady state and frequency domain analysis. A student project and presentation is required. Laboratory exercises are included. (Fall, Winter, Spring)

ECEN 160 Fundamentals of Digital Systems (3:2:2:0)
Prerequisite: CS 124
This course explores the fundamentals of digital systems including: number systems, truth tables, Boolean algebra, Karnaugh maps, combinational logic circuits (SSI, MSI and programmable circuits), sequential logic circuits (flip-flops, counters, and shift registers), and state machine design and analysis. Students must design and build a project that uses sequential logic and a digital simulation tool. A student presentation is required. (Fall, Winter, Spring)

ECEN 160L Fundamentals of Digital Systems Lab (1:0:2:0)
Corequisite: ECEN 160
This course consists of hands-on laboratory exercises to complement the fundamentals of digital systems course. Students must design and build combinational and sequential circuits primarily using a programmable logic device. Includes an introduction to, and use of, an HDL. (Fall, Winter, Spring)

ECEN 250 Electric Circuit Analysis II (4:3:2:0)
Prerequisite: ECEN 150
Corequisite: MATH 316
This course studies the analysis and design of DC and AC circuits. Transient analysis using differential equations will also be discussed. Laboratory exercises are included in this course. (Fall, Spring)

ECEN 260 Microproc Based-System Design (3:2:2:0)
Prerequisites: (CS 165 or CS 241) and ECEN 160
This course covers the architecture, applications, programming, and interfacing of commercial microprocessors and microcontrollers. In addition, students will learn about device driver development and other computer input/output systems. Laboratory exercises are included. (Fall, Winter)

ECEN 324 Computer Architecture (3:2:2:0)
Prerequisites: (CS 235 or CS 241) and ECEN 160
Computer system and processor architecture including: instruction sets, control unit and data path design, memory hierarchy, pipelining, I/O, and program performance optimization. Laboratory exercises are included in this course. (Fall, Winter, Spring)

ECEN 340 Digital Systems Design (3:2:2:0)
Prerequisite: ECEN 260 and ECEN 160L
This course studies the hierarchical design of digital systems, circuit synthesis, and simulation using the Verilog hardware description language. Circuit implementation field programmable gate arrays (FPGAs) will also be explored. A technical report and presentation is required. Laboratory exercises are included. (Fall, Spring)

ECEN 350 Electronic Devices and Circuits (3:2:2:0)
Prerequisite: ECEN 150
This course is an introduction to semiconductor devices. Principles of rectifiers, zener diodes, and other pn junction devices will be explored. Diode applications such as voltage rectifiers, voltage multipliers, voltage regulators, clippers, and clampers will also be studied. Students will also study principles, biasing, modeling, and small signal applications of bipolar junction transistors and field effect transistors. They must design, build, and demonstrate electronic equipment that meets given specifications. A student presentation is required. Laboratory exercises are included. (Fall, Spring)

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ECEN 351 VLSI System Design (3:2:2:0) Prerequisite: ECEN 340 This is an introductory course to VLSI design. CMOS is the dominant technology used for modern VLSI design, and will be the focus of this course. This course covers advanced digital design concepts including design methodologies, tools, and functional verification of HDL models. VLSI concepts are also covered, including the translation of HDL to gates, to transistors, and then to functional silicon. CMOS transistor concepts with special attention to the digital CMOS silicon manufacturing process are also stressed as well as formal validation of silicon components. The class meets for 135 minutes twice a week. Laboratories are integrated with lectures in this course. (Winter)	ECEN 440 Data and Computer Communications (3:2:2:0) Prerequisite: ECEN 250 This course explores the fundamentals of data and computer communications focusing on the physical and data link layers of the OSI architecture. Laboratory exercises are included. (Fall, Spring)
ECEN 361 Embedded Systems (3:2:2:0) Prerequisite: ECEN 260 This course covers hardware/software interface, real-time kernel internals, and implementation of high-level language constructs issues in real-time application software development. (Fall, Spring)	ECEN 451 Semiconductor Process Engineer (3:2:2:0) Prerequisite: ECEN 350 This course is an introduction to Semiconductor Process Engineering using a unique virtual wafer fab highlighting the C5 0.5 CMOS process of ON Semiconductor through video and manufacturing data. Students will learn the process steps for 200mm silicon wafers in manufacturing to fabricate SRAM memory arrays. (Winter)
ECEN 380 Signals and Systems (3:2:2:0) Prerequisite: ECEN 250 The main goal of this course is to develop the classical signals and systems analysis theory for both continuous and discrete-time cases. The course includes: signals and systems and their properties, linear time-invariant systems, stability analysis, sampling of continuous-time signals, z-transform, discrete Fourier transform, time and frequency domain representations of discrete-time signals and systems, and introductory concepts in controls and communications. (Fall, Winter)	ECEN 461 Advanced Embedded Systems (3:2:2:0) Prerequisites: ECEN 324 and ECEN 361 This course is intended to give students a deeper insight into system integration and the structure and functionality of system software for embedded systems. This course will give students insights into the challenges of real-time system development, including concepts like PID controllers, advanced real-time operating systems, and hardware connectivity. (Winter)
ECEN 390 Electricity and Magnetism (3:2:2:0) Prerequisites: ECEN 250 and MATH 316 This course is an introduction to electromagnetic waves and fields. Students will learn the properties of electric and magnetic field theories and their applications. These applications include transmission lines, capacitors, inductors, electrical motors and generators, photonics, and antennas. Laboratory experiments are included in this course. (Fall, Spring)	ECEN 470 Feedback Control of Dynamic Systems (3:2:2:0) Prerequisite: MATH 316 Dynamic modeling, dynamic response, and analysis and design of feedback control. (Fall, Spring)
ECEN 398R Internship (1:0:0:0) Prerequisite: CS 308 Internship Fees: \$81.50 (LDS) \$163 (non-LDS) per credit Exempt from tuition, but charged this independent course fee Repeatable course: may earn maximum of 7 credits or maximum of 7 enrollments Full-time employment as an electrical engineering or a computer engineering intern for one semester or more (at least 450 hours). (Fall, Winter, Spring)	ECEN 480 Digital Signal Processing (3:2:2:0) Prerequisite: ECEN 380 Time and frequency of discrete time systems subjected to periodic or non-periodic input signals; digital signal processing; fast Fourier transforms; digital filter design, and spectrum analysis and applications. Laboratory exercises are included in this course. (Winter)
ECEN 410 Power Systems (3:2:2:0) Prerequisite: ECEN 250 In this course you will be introduced to the elements and analysis of Power Systems, including a survey of the methods and tools used to study the generation and movement of electric power throughout a power grid. The course will both introduce the concepts that govern the generation and flow of power and the computer-based tools that are used in industry to understand them. This course will also cover the devices normally associated with renewable energy in the electric grid, for example wind and solar power sources. (Winter)	ECEN 490R Special Topics (3:2:2:0) Repeatable course: may earn a maximum of 6 enrollments Course Requirement: Instructor Approval Required This course covers current topics in computer and electrical engineering (As needed)
ECEN 420 RF Circuits (3:2:2:0) Prerequisite: ECEN 350 This course is an introduction to RF circuits. Students will learn the basics of key RF components including high frequency transistors, filters, mixers, oscillators, and phase locked loops. Students will also be introduced to laboratory test equipment, network analysis, and the fundamentals of transmission lines. Finally the students will understand basic high frequency test equipment. Laboratory experiments are included in this course. (Fall, Spring)	ECEN 499 Senior Project (3:2:2:0) Total Course Fees: \$120.00 Prerequisite: ECEN 398R Course Requirements: Instructor Approval Required This course develops culminating design experience based on skills learned in advanced technical courses. Students work in teams to plan, design, test and demonstrate a major project. Instructor consent is required and completion of an internship as well as at least two 400-level ECEN courses. (Winter, Spring)
ECEN 430 Power Electronics (3:2:2:0) Prerequisite: ECEN 250 This course is an introduction to power semiconductor devices, magnetic circuits, transformers, half-wave and full-wave diode and phase rectifiers, switching converters, and motor drivers. (Winter)	