KU DEPARTMENT OF
ELECTRICAL ENGINEERING
& COMPUTER SCIENCE

The University of Kansas

School of Engineering

EECS Department

Undergraduate Handbook

Lawrence Campus Programs

Bachelor of Science Degrees in:

Electrical Engineering
Computer Engineering
Computer Science
Interdisciplinary Computing

For students admitted to the EECS Department for Fall 2022

Electrical Engineering and Computer Science

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School of Engineering

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Is engineering or computer science for me?

To find out, ask yourself:

- Do I like to design and build things?
- Am I a creative thinker who likes to solve complex problems?
- Do I enjoy math and science?
- Am I curious about how things work?
- Do I budget my time so I can finish all the work required of me?
- Do I have a history of performing well academically?
- Am I ready to enter a demanding curriculum?

What degrees are offered?

The School of Engineering offers Bachelor of Science (BS) degrees in 12 disciplines. They are aerospace engineering, architectural engineering, chemical engineering, civil engineering, computer engineering, computer science, electrical engineering, engineering physics, environmental engineering, interdisciplinary computing, mechanical engineering, and petroleum engineering.

What can I do with an engineering or computer science degree?

Whatever your major, you will find many job opportunities. Most KU graduates earn more than the national average starting salary. Many companies and governmental agencies are aware of the high quality of KU graduates, so they are eager to hire them and pay premium salaries. The School's Career Services Center will help put you in touch with potential employers. The Center schedules interviews and conducts workshops on

What is the faculty like?

Engineering faculty members are nationally recognized leaders in education and research. KU faculty members are leaders in many engineering societies. Their work is widely published in professional journals. You will get the change to interact with faculty members outside the classroom and lab. Engineering faculty members participate in a variety of activities with students.

Why is there an engineering fee?

You will pay a special feed in additional to regular tuition and fees for School of Engineering courses. The fee, which is on a per-credit hours basis for all School of Engineering courses, helps the School maintain and operate lab equipment and computers and provide other student services. Because you will tend to take more School of Engineering courses each semester as you advance, the fee you pay will tend to

How Do I get into the School?

First-year students may enter the School of Engineering, but admission is selective. Applications are judged on several factors including, but not limited to, high school record, scores on national tests, academic record at college or

university level, and trend of grades. High school transcripts and ACT scores are required, Equivalent SAT scores may be substituted.

You must have graduated in the top half of your high school class and have a mathematics score of 28 or higher on the ACT exam (or be otherwise eligible to take Math 125) to be directly admitted into the EECS Department. You should take the standard college-preparatory curriculum in high school, including courses in chemistry, economics, English, physics, and mathematics (through trigonometry).

Transfer Admission Standards

Applications from transfer students either from other KU units or from other institutions are evaluated on a case-by-case basis.

In general, students with a grade-point average under 2.5 are not considered for admission. Students must submit mathematics ACT or SAT scores or proof of competence in calculus for consideration.

Can I get a scholarship?

The School of Engineering offers scholarships to incoming freshmen and transfer students with outstanding academic credentials. Entering first-year Scholarships, available online at www.admissions.ku.edu, to the University of Kansas Office of Admissions and Scholarships, KU Visitors Center, 1520 Iowa St., Lawrence, KS 66045, (785)864-3911. The office will see that applicants are considered for any scholarships for which they are eligible. The application deadline to be considered is November 1.

The Engineering Diversity Program also makes scholarships available to students who are African American, Hispanic American or Native American. Call 785-846-4700 for more information.

For more information about grants, loans, and other need-based financial aid, write or call the University of Kansas Office of Financial Aid & Scholarships, KU Visitors Center, Lawrence, KS 66045, 785-864-4700 or visit their website at affordability.ku.edu

Where can I get more information?

Write, email, or call the University of Kansas School of Engineering, Mario Medina, Associate Dean for Engineering Academic Affairs, 1520 West 15th Street, Lawrence, KS, 66045, kuengr@ku.edu, 785-864-3881; or visit the website: www.engr.ku.edu

With so many engineering and computer science programs available, why choose KU?

♦ **Program Quality**

ABET is the recognized accrediting organization for college and university programs in applied science, computing, engineering and technology. ABET accreditation ensures programs meet standards set by the profession. The Bachelor of Science in Electrical Engineering and Bachelor of Science in Computer Engineering programs are accreditation by the Engineering Accreditation Commission of ABET (http://www.abet.org). The Bachelor of Science in Computer Science program and Bachelor of Science in Interdisciplinary Computing program are accredited by the Computing Accreditation Commission of ABET (http://www.abet.org).

♦ **Your Overall Education**

The overall quality and breadth of your education is one great reason for coming to KU. The College of Liberal Arts & Science offered hundreds of courses and has excellent teachers. You will meet many international students and teaching who bring a cultural richness to campus and who will expose you to the divers viewpoints and customs so important to your undergraduate education.

♦ **Student Organizations**

Student can supplement and advance their academic programs by participating in student chapters of national engineering and computer science societies. The School has active support groups for women and minority students, and all student groups can participate in the annual Engineering Exposition, creating exhibits that describe and demonstrate principles of engineering and computer science.

♦ **Research Opportunities**

Undergraduates can participate in KU's top-flight research programs in computer-aided aircraft design, architectural lighting and visibility, enhanced oil recovery, structural mechanics and stress analysis, telecommunications and information science, radar remote sensing, computer-integrated manufacturing, automatic control systems, and other fields.

Electrical Engineering and Computer Science

Erik Perrins

The technological advances that have made our modern society what it is today are due largely to the efforts of electrical engineers, computer engineers, and computer scientists. Among these advances are radio, television, telephones, wireless communications, cellular telephones, personal computers, workstations, mainframe computers, aircraft avionics, satellite electronics, automobile electronics, office machinery, medical electronic equipment, video games, electric power generation and distribution systems, telecommunications, computer networks (including the Internet), home entertainment products, radar, defense electronics, artificial intelligence, and a wide range of software.

The EECS Department offers four Bachelor of Science degrees: Electrical Engineering (BSEE), Computer Engineering (BSCoE), Computer Science (BSCS), and Interdisciplinary Computing (BSIC). Each features a firm grounding in the fundamentals of mathematics, basic science, and computer science and/or engineering science, with advanced studies in the theory and design of systems of various kinds, as well as hands-on experience. All four Bachelor of Science degree programs are accredited.

Electrical engineers work with a broad range of electrical and electronic devices and systems. Electrical engineers may work in the areas of circuit design, electronic devices, electrical and optical communications, control and automation, electromagnetics, instrumentation, energy and power, or signal processing. While computers are involved in many of these areas, either as components or as design/analysis tools, an electrical engineer's work usually extends beyond the computing aspects of a problem or system. Electrical engineers can find professional opportunities in a multitude of environments. The telecommunications, computer, and power industries are obvious examples, but other industries using technology seek the expertise of electrical engineers for developing microelectronic integrated circuits, electrical and electronic consumer products, electrical power generation and distribution, industrial instrumentation and control systems, and radar.

Computer engineers focus on all aspects of computational devices and systems, including both hardware and software. In addition to the computer system aspects of the electrical engineering and computer science areas listed, computer engineers may work in the areas of computer elements and architectures, very large scale integrated (VLSI) circuits for data processing and storage, embedded and real-time computer systems, or computer networking. Computer engineering graduates can expect to find jobs in digital hardware design, software engineering, and the integration of hardware and software in developing microprocessors, personal computers, workstations, mainframe computers, embedded systems, and computer communication networks. The demand for engineers to design and implement a wide variety of sophisticated computing systems will likely continue to rise.

Computer scientists focus on the theory and practice of computing. They may pursue the design, analysis, and implementation of computer algorithms, study the theory of programming methods and languages, or design and develop new programming languages and software systems. Computer scientists may also work in the areas of artificial intelligence, database systems, parallel and distributed computation, human-computer interaction, computer graphics, operating systems, or computer systems analysis. Computer science graduates find jobs in many different industrial and governmental settings. The need for software system design, development, and maintenance is not restricted to those companies whose main business is software development. Virtually every major company and governmental agency has found the need to develop and maintain specialized software for specific purposes. This trend is sure to continue in the future.

Interdisciplinary computing couples a very strong computer science component with a thorough background in one of six concentrations: astronomy, biology, chemistry, economics, geography, journalism, or physics. Graduates will apply their computing expertise to a variety of large-scale problems of scientific importance. Interdisciplinary computing professionals are likely to collaborate with scientists or other professionals in industrial, government, or academic laboratories. The ever-increasing computational sophistication of scientific studies demands professionals who have computing expertise in addition to scientific training, which is exactly what Interdisciplinary Computing provides.

Career opportunities for graduates with electrical engineering, computer engineering, computer science, and interdisciplinary computing degrees are available in many areas of specialization, in many industrial, commercial, academic, and government environments, and in many geographic locations in this country and abroad. Expertise in any of these areas is of vital importance to any high technology organization. In addition, a Bachelor of Science degree in one of these areas prepares a student for continued technical studies at the graduate level or in other professional schools such as medicine or law.

The pages that follow outline the degree requirements for the BSEE, BSCoE, BSCS, and the BSIC degrees.

Vision

The Vision of the EECS Department is to provide a stimulating and challenging intellectual environment:
- to have our classes populated by outstanding students
- to be world-class in an increasing number of selected areas of research
- to have faculty with high visibility among their peers

Mission

The Mission of the EECS Dept. is:
- to educate the next generation of electrical engineers, computer engineers, computer scientists
- to discover, apply and disseminate knowledge
- to be an asset to the community and to society

Common Degree Requirements

The KU Core

The KU Core is designed to yield fundamental skills, build a broad background of knowledge, generate capacities and opportunities for blending and creating ideas, strengthen an appreciation and cultural and global diversity, and cultivate ethical integrity. It comprises three general education goals and three advanced education goals. Associated with each goal are one or more learning outcomes.

Details of the KU Core goal and learning outcomes can be found at http://kucore.ku.edu.

Some required courses in the EECS curricula satisfy a KU Core goal and/or outcome. For these courses, the goal/outcome code is given in parentheses after the course on the following Degree Requirements pages. Where required courses do NOT specifically satisfy KU Core goals (Goals 2, 3 and 4) students must choose from a list of several means to satisfy the required goals. Information about satisfying the KU Core goals can be found at http://kucore.ku.edu.

CODE	GOAL/ OUTCOME	DESCRIPTION
GE11	Goal 1/Outcome 1	Critical Thinking
GE12	Goal 1/Outcome 2	Quantitative Literacy
GE21	Goal 2/Outcome 1	Written Communication (2 units)
GE22	Goal 2/Outcome 2	Oral Communication
GE3H	Goal 3/Outcome 1	Arts & Humanities
GE3N	Goal 3/Outcome 2	Natural Sciences
GE3S	Goal 3/Outcome 3	Social Sciences
AE41	Goal 4/Outcome 1	Human Diversity
AE42	Goal 4/Outcome 2	Global Culture/Awareness
AE51 or AE52	Goal 5/Outcome 1	Social Responsibility & Ethics (course or practice)
AE61	Goal 6/Outcome 1/2	Integration & Creativity

Natural Science Electives

Courses designated GE3N except Basic Science requirements and any Physics course 210 and below can satisfy the natural science elective for CS students. IC Journalism students can also take PHSX 210 AND 216 for a natural science elective.

Professional Electives

The intent of the Professional Electives is to allow students to prepare for a variety of professional careers (management, medical school, interdisciplinary, etc.). Courses are chosen from the following list (other courses may be petitioned):

- EECS: Any EECS course except EECS 137, EECS 138, EECS 315, EECS 316, EECS 317, EECS 318, EECS 498 and 692. Also, EECS 645 may not be used by CoE majors, neither Math 526 nor EECS 643 may be used by CS majors, and only EECS 645 may be used to satisfy EE degree requirements.
- IT: IT 320, IT 330, IT 416, IT 430, and IT 450 may be used.
- Engineering: Any course from any Engineering Department numbered 200 or above, except for AE 211, ENGR 300, ENGR 490, ME 208, ME 228 and any computing courses.
- Natural Science: Any course designed GE3N except Basic Science requirements and any Physics course 236 and below. Also, you cannot use CHEM 110 if you have already taken (or will take) CHEM 130 or CHEM 150. If a course used for the natural science elective exceeds the required natural science elective hours, then excess hours will be considered Professional Elective hours.
- Math: Any MATH course numbered 500 or above, except MATH 526 and 701.
- Business: Any course 200 and above from the School of Business that applies towards a Business major, minor, or certificate, except for Statistics and Computing courses.
- Technical Writing: ENGR 504 or ENGL 362. Electrical Engineering students cannot take two technical writing courses.
- Foreign Language: Any foreign language course may be petitioned to count as a professional elective or additional humanities or social science elective.

Senior Electives

EE and CoE majors may choose any EECS course 400 or above, excluding EECS 498 and EECS 692.

For CS majors, CS electives must be chosen from the following courses. Under unusual circumstances, other courses can be considered but only with an accompany petition. Additionally, any EECS course 700 or above may be taken as a CS elective (see page 38 for graduate course requirements).

- 2 or more CS electives must from the list: EECS 455, 465, 630, 658, 665.
- 2 or more CS electives must be from the list: EECS 443, 447, 569, 649, 662.
- Additional CS elective options: EECS 638, 639, 672, 675, 690.

For IC majors, EECS electives must be chosen from EECS 447, 465, 510, 563, 569, 639, 645, 649, 658, 660, 662, 665 672, 675, 690 and any EECS course 700 or above.

Under unusual circumstances other courses can be petitioned as Senior Electives, subject to approval.

Electrical Engineering

Electrical engineers work with a broad range of electrical and electronic devices and systems. Electrical engineers may work in the areas of circuit design, electronic devices, electrical and optical communications, control and automation, electromagnetics/antennas/radar, instrumentation, energy and power, or signal processing. While computers are involved in many of these areas, either as components or as design/analysis tools, an electrical engineer's work often extends beyond the computing aspects of a problem or system.

Program Educational Objectives for Electrical Engineering

Graduates who have earned a Bachelor's Degree in Electrical Engineering, within a few years following graduation, will have demonstrated technical proficiency, collaborative activities, and professional development.

Technical Proficiency - Graduates will have achieved success and visibility in their chosen careers as shown by technical accomplishments in industry, government, entrepreneurial activities, or academia.
Collaborative Activities - Graduates will have exercised shared responsibilities through activities such as contributions to multi-person or multi-disciplinary technical projects, participation in professional society/organization functions, or performing collaborative research. In all such cases, graduates will have contributed to documentation of the collaborative activities.
Professional Development - Graduates will have demonstrated continual updating to extend their expertise and adapt to a changing environment through graduate studies; short courses, conferences, and seminars; or professional self-study. In addition, graduates will have demonstrated evidence of increasing technical and/or managerial impact.

Requirements for the degree of Bachelor of Science in Electrical Engineering
A total of 128 credit hours is required for the BSEE degree, as follows:

Electrical Engineering (64 credit hours)

		HRS	SEM	GRD
EECS 101	New Student Seminar (part of AE51)	1		
EECS 140	Intro to Digital Logic Design ♦	4		
EECS 168	Programming I ♦	4		
EECS 202	Circuits I	4		
EECS 212	Circuits II	4		
EECS 312	Electronic Circuits I	3		
EECS 361	Signal & System Analysis	3		
EECS 388	Embedded Systems	4		
EECS 412	Electronic Circuits II	4		
EECS 420	Electromagnetics II	4		
EECS 443	Digital Systems Design	4		
EECS 444	Control Systems	3		
EECS 470	Electrical Devices & Properties of Materials	3		
EECS 501	Senior Design Lab I (part of AE51)	3		
EECS 502	Senior Design Laboratory II (AE61)	3		
EECS 562	Intro to Communication Systems	4		
Senior electives ‡		3		
		3		
		3		

Mathematics (20 credit hours)

MATH 125	Calculus I (GE12)	4		
MATH 126	Calculus II	4		
MATH 127	Calculus III	4		
MATH 220	Applied Differential Equations	3		
MATH 290	Elementary Linear Algebra	2		
EECS 461	Probability & Statistics	3		

Basic Science (17 credit hours)

		HRS	SEM	GRD
CHEM 130/	General Chemistry I or	5		
CHEM 150	Chemistry for Engineers			
PHSX 210	General Physics I for Engrs (GE11)	3		
PHSX 216	General Physics I Lab (part of AE51)	1		
EECS 220	Electromagnetics I	4		
PHSX 313	General Physics III (GE3N)	3		
PHSX 316	Intermediate Physics lab 1	1		

Professional Electives (6 credit hours) ○⌘

	HRS	SEM	GRD
Professional Elective 2	3		
Professional Elective 2	3		

Satisfy GE21: Written Communication (6 hours) ❖
(Typically satisfied by ENGL 101 & 102)

	3		
	3		

Satisfy GE22: Oral Communication (3 hours) ❖
(Typically satisfied by COMS 130)

	3		

Arts/Humanities/Social Science (6 hours) ❖

ECON 142 Principles of Microeconomics (preferred) or
ECON 144 Principles of Macroeconomics (GE3S)   3 _____ _____
Satisfy GE3H: Arts/Humanities ❖   3 _____ _____

Satisfy AE41 and AE42: Diversity, Global Awareness (6 hours) ❖

3		
3		

♦ Electrical Engineering & Computer Engineering students take EECS 140 in fall and EECS 168 in spring. Computer Science & Interdisciplinary Computing students take EECS 168 in fall and EECS 140 in spring.
❖ Means of satisfying KU Core Goals are chosen from a variety of options (see http://kucore.ku.edu). Hours listed are assuming the goals are satisfied with course work.
⌘ Foreign Language: Any foreign language course may be petitioned to count as a professional elective.
○ Six hours of Professional Electives are chosen from a list of engineering, math, natural science or business, technical writing, and foreign language courses (see page 8).
‡ Nine hours of Senior Electives are chosen from EECS courses at 400 level or above (see page 9).

For students admitted in fall 2022

Electrical Engineering Suggested Course Sequence

(Symbol key on previous page)

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101 (part of AE51) ❖	1	GE21 (second) ❖	3	EECS 202	4	EECS 212	4
GE21 (first) ❖	3	MATH 126	4	MATH 127	4	EECS 220	4
MATH 125 (GE12) ❖	4	PHSX 210 (GE11) ❖	3	MATH 220	3	CHEM 130 or 150	5
EECS 140 ♦	4	PHSX 216 (part of AE51) ❖	1	MATH 290	2	GE3H ❖	3
ECON 142/144 (GE3S) ❖	3	EECS 168 ♦	4	GE22 ❖	3		
Total hours	**15**	**Total hours**	**15**	**Total Hours**	**16**	**Total Hours**	**16**
Fall 5th Semester		Spring 6th Semester		Fall 7th Semester		Spring 8th Semester	
EECS 312	3	EECS 412	4	EECS 420	4	EECS 443	4
EECS 361	3	EECS 444	3	EECS 470	3	EECS 502 (AE61) ❖	3
PHSX 313 + 316 (GE3N) ❖	4	EECS 461	3	EECS 501 (part of AE51) ❖	3	Sr. Elective 2⚕	3
AE41 ❖	3	EECS 562	4	Sr. Elective 1⚕	3	Sr. Elective 3⚕	3
EECS 388	4	Professional Elective 1○⌘	3	Professional Elective 2○⌘	3	AE42 ❖	3
Total hours	**17**	**Total hours**	**17**	**Total Hours**	**16**	**Total Hours**	**16**

Electrical Engineering Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BSEE program. This chart, the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established ▬▬▬▬▬   Prerequisite ➤   Corequisite ┅┅┅➤

For students admitted in fall 2022

Computer Engineering

Computer engineers focus on all aspects of computational devices and systems, including both hardware and software. Wherever computers can be found, computer engineers are needed. In addition to the computer system aspects of the electrical engineering and computer science, computer engineers may work in the areas of computer elements and architectures, very large scale integrated (VLSI) circuits for data processing and storage, embedded and real-time computer systems, or computer networking.

Program Educational Objectives for Computer Engineering

Graduates who have earned a Bachelor's Degree in Computer Engineering, within a few years following graduation, will have demonstrated technical proficiency, collaborative activities, and professional development.

Technical Proficiency - Graduates will have achieved success and visibility in their chosen careers as shown by technical accomplishments in industry, government, entrepreneurial activities, or academia.

Collaborative Activities - Graduates will have exercised shared responsibilities through activities such as contributions to multi-person or multi-disciplinary technical projects, participation in professional society/organization functions, or performing collaborative research. In all such cases, graduates will have contributed to documentation of the collaborative activities.

Professional Development - Graduates will have demonstrated continual updating to extend their expertise and adapt to a changing environment through graduate studies; short courses, conferences, and seminars; or professional self-study. In addition, graduates will have demonstrated evidence of increasing technical and/or managerial impact.
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Requirements for the degree of Bachelor of Science in Computer Engineering

A total of 127 credit hours is required for the BSCoE degree, as follows:

Computer Engineering (67 credit hours)

		HRS	SEM	GRD
EECS 101	New Student Seminar (part of AE51)	1		
EECS 140	Intro to Digital Logic Design ♦	4		
EECS 168	Programming I ♦	4		
EECS 202	Circuits I	4		
EECS 212	Circuits II	4		
EECS 268	Programming II	4		
EECS 312	Electronic Circuits I	3		
EECS 348	Software Engineering I	4		
EECS 361	Signal and System Analysis	3		
EECS 388	Embedded Systems	4		
EECS 443	Digital Systems Design	4		
EECS 468	Programming Paradigms	3		
EECS 541	Comp Sys Design Lab I (part of AE51)	3		
EECS 542	Comp Sys Design Lab II (AE61)	3		
EECS 563	Intro to Communication Networks	3		
EECS 643	Computer Architecture	3		
EECS 678	Introduction to Operating Systems	4		
Senior electives ‡		3		
		3		
		3		

Mathematics (24 credit hours)

		HRS	SEM	GRD
MATH 125	Calculus I (GE12)	4		
MATH 126	Calculus II	4		
MATH 127	Calculus III	4		
MATH 220	Applied Differential Equations	3		
MATH 290	Elementary Linear Algebra	2		
EECS 210	Discrete Structures	4		

	HRS	SEM	GRD
EECS 461 Probability & Statistics	3		

Basic Science (12 credit hours)

		HRS	SEM	GRD
PHSX 210	General Physics I for Engrs (GE11)	3		
PHSX 216	General Physics I Lab (part of AE51)	1		
EECS 220	Electromagnetics I	4		
PHSX 313	General Physics III (GE3N)	3		
PHSX 316	Intermediate Physics lab 1	1		

Professional Electives (3 credit hours) ○⌘

	HRS	SEM	GRD
Professional Elective 1	3		

Satisfy GE21: Written Communication (6 hours) ❖

	HRS	SEM	GRD
(Typically satisfied by ENGL 101 & 102)	3		
	3		

Satisfy GE22: Oral Communication (3 hours) ❖

	HRS	SEM	GRD
(Typically satisfied by COMS 130)	3		

Arts/Humanities/Social Science (6 hours) ❖

	HRS	SEM	GRD
ECON 142 Principles of Microeconomics (preferred) or ECON 144 Principles of Macroeconomics (GE3S)	3		
Satisfy GE3H: Arts/Humanities ❖	3		

Satisfy AE41 and AE42: Diversity, Global Awareness (6 hours)❖

	HRS	SEM	GRD
	3		
	3		

♦ Electrical Engineering & Computer Engineering students take EECS 140 in fall and EECS 168 in spring. Computer Science & Interdisciplinary Computing students take EECS 168 in fall and EECS 140 in spring.

❖ Means of satisfying KU Core Goals are chosen from a variety of options (see http://kucore.ku.edu). Hours listed are assuming the goals are satisfied with course work.

⌘ Foreign Language: Any foreign language course may be petitioned to count as a professional elective.

○ Six hours of Professional Electives are chosen from a list of engineering, math, natural science or business, technical writing, and foreign language courses (see page 8).

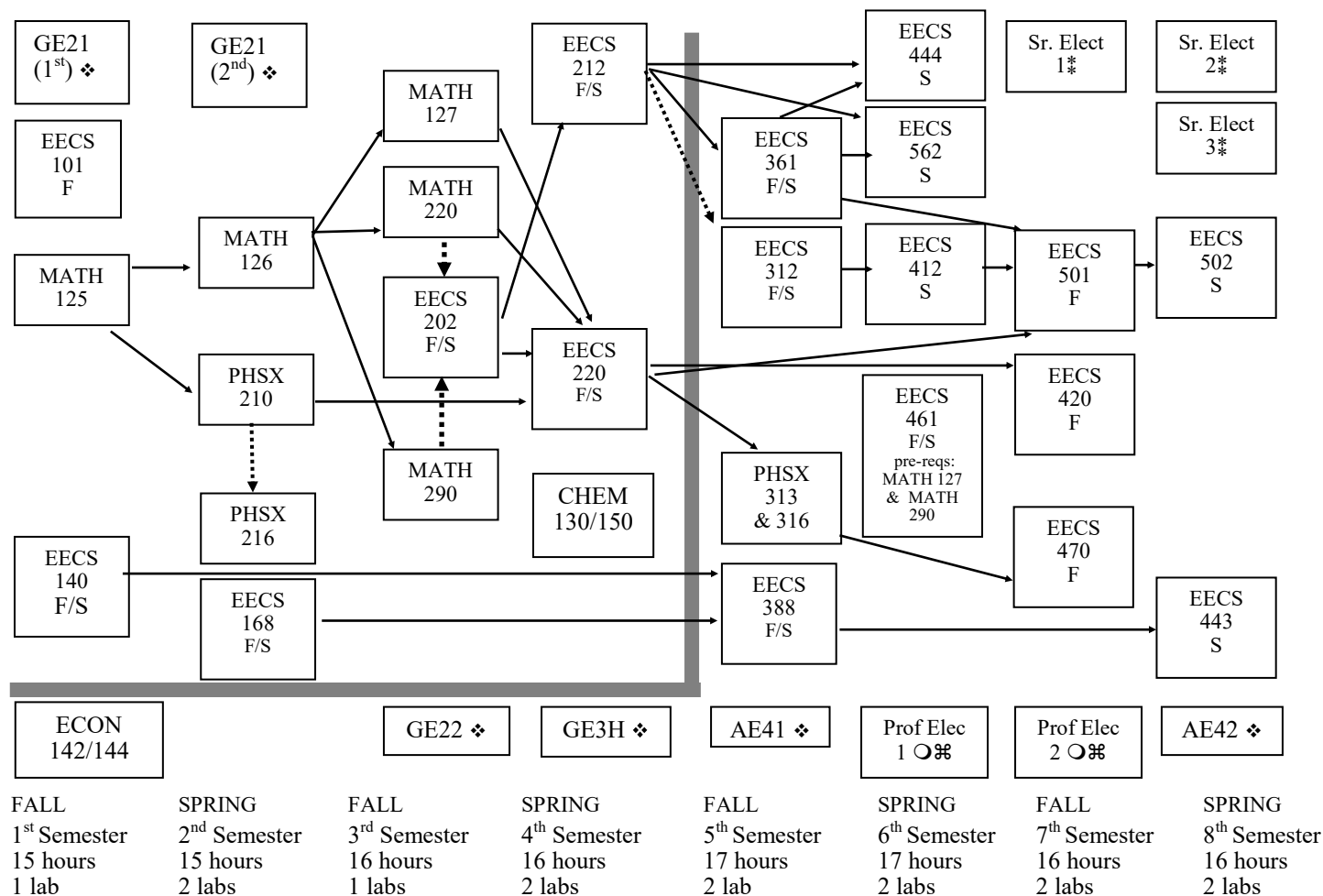‡ Nine hours of Senior Electives are chosen from EECS courses at 400 level or above (see page 9).

For students admitted in fall 2022

Computer Engineering Suggested Course Sequence

(Symbol key on previous page)

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101 (part of AE51) ❖	1	GE21 (second) ❖	3	EECS 202	4	EECS 210	4
GE21 (second) ❖	3	MATH 126	4	EECS 268	4	EECS 212	4
MATH 125 (GE12) ❖	4	PHSX 210 (GE11) ❖	3	MATH 127	4	EECS 220	4
EECS 140 ♦	4	PHSX 216 (part of AE51) ❖	1	MATH 220	3	GE3H ❖	3
ECON 142/144 (GE3S) ❖	3	EECS 168 ♦	4	MATH 290	2	GE22 ❖	3
Total hours	**15**	Total hours	**15**	Total Hours	**17**	Total Hours	**18**
Fall 5th Semester		**Spring 6th Semester**		**Fall 7th Semester**		**Spring 8th Semester**	
EECS 312	3	EECS 361	3	EECS 541 (part of AE51) ❖	3	EECS 542 (AE61) ❖	3
EECS 348	4	EECS 443	4	EECS 563	3	PHSX 313 + 316 (GE3N) ❖	4
EECS 388	4	EECS 461	3	EECS 643	3	Sr. Elective ‡	3
EECS 468	3	AE41 ❖	3	EECS 678	4	Sr. Elective ‡	3
		Professional Elective 1 ○ ⌘	3	Sr. Elective 1 ‡	3	AE42 ❖	3
Total hours	**14**	Total hours	**16**	Total Hours	**16**	Total Hours	**16**

Computer Engineering Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BSCoE program. This chart, the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

FALL	SPRING	FALL	SPRING	FALL	SPRING	FALL	SPRING
1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester
15 hours	15 hours	17 hours	18 hours	14 hours	16 hours	16 hours	16 hours
1 lab	2 labs	2 labs	2 labs	2 labs	1 lab	2 labs	2 labs

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established ▬▬▬▬   Prerequisite ➤   Corequisite ▪▪▪▪▪▶

For students admitted in fall 2022

Computer Science

Computer scientists focus on the theory and practice of computing. They may pursue the design, analysis, and implementation of computer algorithms, study the theory of programming methods and languages, or design and develop software systems. Computer scientists may also work in the areas of artificial intelligence, database systems, parallel and distributed computation, human-computer interaction, computer graphics, operating systems, or computer systems analysis and administration.

Program Educational Objectives for Computer Science

Graduates who have earned a Bachelor's Degree in Computer Science, within a few years following graduation, will have demonstrated technical proficiency, collaborative activities, and professional development.

<u>Technical Proficiency</u> - Graduates will have achieved success and visibility in their chosen careers as shown by technical accomplishments in industry, government, entrepreneurial activities, or academia.

<u>Collaborative Activities</u> - Graduates will have exercised shared responsibilities through activities such as contributions to multi-person or multi-disciplinary technical projects, participation in professional society/organization functions, or performing collaborative research. In all such cases, graduates will have contributed to documentation of the collaborative activities.

<u>Professional Development</u> - Graduates will have demonstrated continual updating to extend their expertise and adapt to a changing environment through graduate studies; short courses, conferences, and seminars; or professional self-study. In addition, graduates will have demonstrated evidence of increasing technical and/or managerial impact.

Requirements for the degree of Bachelor of Science in Computer Science

A total of 126 credit hours is required for the BSCS degree, as follows:

Computer Science (71 credit hours)

Course		HRS	SEM	GRD
EECS 101	New Student Seminar (part of AE51)	1		
EECS 140	Intro to Digital Logic Design ♦	4		
EECS 168	Programming I ♦	4		
EECS 268	Programming II	4		
EECS 330	Data Structures & Algorithms	4		
EECS 348	Software Engineering I	4		
EECS 388	Embedded Systems	4		
EECS 468	Programming Paradigms	3		
EECS 510	Intro to Theory of Computing	3		
EECS 563	Intro to Communication Networks	3		
EECS 565	Intro to Info & Computer Security	3		
EECS 581	Software Engineering II	3		
(part of AE51)				
EECS 582	CS /IC Design II (AE61)	3		
EECS 645	Computer Systems Architecture	3		
EECS 678	Introduction to Operating Systems	4		
CS electives ‡		3		
		3		
		3		
		3		
		3		
		3		
		3		
		3		

Mathematics (21 credit hours)

Course		HRS	SEM	GRD
MATH 125	Calculus I (GE12)	4		
MATH 126	Calculus II	4		
MATH 127	Calculus III	4		
MATH 290	Elementary Linear Algebra	2		
EECS 210	Discrete Structures	4		
EECS 461	Probability & Statistics	3		

Basic Science (7 credit hours)

Course		HRS	SEM	GRD
PHSX 210	General Physics I for Engrs (GE11)	3		
PHSX 216	General Physics I, Lab (part of AE51)	1		

Natural Science Elective (one course) ⚖   3 _____ _____

Professional Electives (6 credit hours) ◯⌘

	HRS	SEM	GRD
Professional Elective 1	3		
Professional Elective 1	3		

Satisfy GE21: Written Communication (6 hours) ❖

	HRS	SEM	GRD
(Typically satisfied by ENGL 101 & 102)	3		
	3		

Satisfy GE22: Oral Communication (3 hours) ❖

	HRS	SEM	GRD
(Typically satisfied by COMS 130)	3		

Arts/Humanities/Social Science (6 hours)

	HRS	SEM	GRD
Satisfy GE3H: Arts/Humanities ❖	3		
Satisfy GE3S: Social Science ❖	3		

Satisfy AE41 and AE42: Diversity, Global Awareness (6 hours) ❖

	HRS	SEM	GRD
	3		
	3		

♦ Electrical Engineering & Computer Engineering students take EECS 140 in fall and EECS 168 in spring. Computer Science & Interdisciplinary Computing students take EECS 168 in fall and EECS 140 in spring.

❖ Means of satisfying KU Core Goals are chosen from a variety of options (see http://kucore.ku.edu). Hours listed are assuming the goals are satisfied with course work.

⌘ Foreign Language: Any foreign language course may be petitioned to count as an additional Humanities/Social Science or professional elective.

◯ Six hours of Professional Electives are chosen from a list of engineering, math, natural science or business, technical writing, and foreign language courses (see page 8).

‡ Twenty one hours of CS Electives are chosen from EECS courses (see page 9).

⚖ Natural Science Electives (1 course, 3 hours) are chosen from a list of courses (see page 8). Excess natural science hours can as Professional Elective hours.
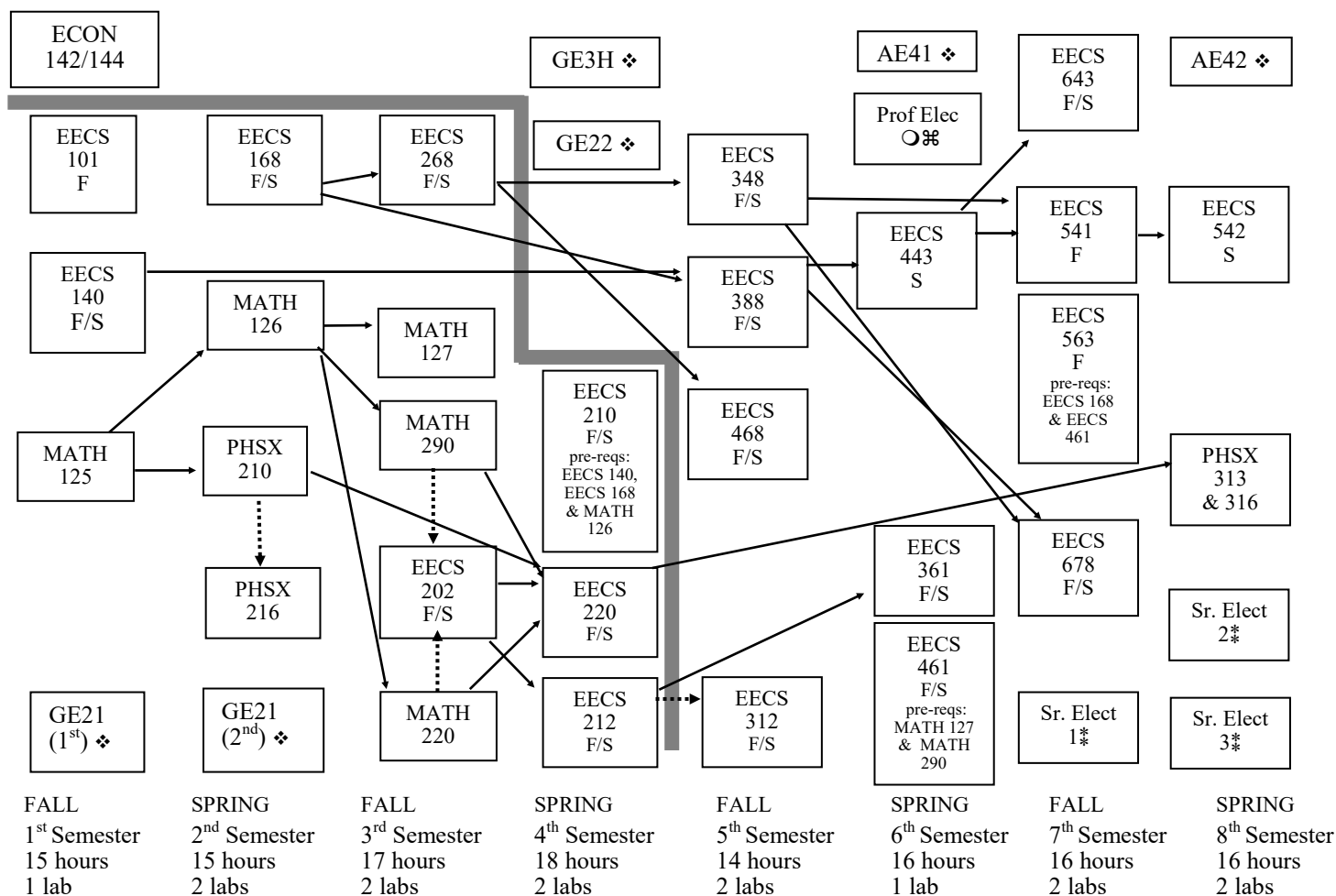
Computer Science Suggested Course Sequence

(Symbol key on previous page)

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101 (part of AE51) ❖	1	GE21 (second) ❖	3	MATH 127	4	EECS 388	4
GE21 (first) ❖	3	MATH 126	4	EECS 210	4	EECS 330	4
MATH 125 (part of AE51) ❖	4	EECS 268	4	PHSX 210 (GE11) ❖	3	MATH 290	2
EECS 168 ♦	4	EECS 140 ♦	4	PHSX 216 (part of AE51) ❖	1	Natural Science ♎	3
GE22 ❖	3			EECS 348	4	AE41 ❖	3
Total hours	15	Total hours	15	Total Hours	16	Total Hours	16
Fall 5th Semester		**Spring 6th Semester**		**Fall 7th Semester**		**Spring 8th Semester**	
EECS 461	3	EECS 563	3	EECS 581 (part of AE51) ❖	3	EECS 582 (AE61) ❖	3
EECS 510	3	EECS 565	3	CS Elective 4 ⚕	3	CS Elective 6 ⚕	3
EECS 468	3	EECS 645	3	CS Elective 5 ⚕	3	CS Elective 7 ⚕	3
EECS 678	4	GE3H ❖	3	Professional Elective 1 ◯ ⌘	3	Professional Elective 2 ◯ ⌘	3
CS Elective 1 ⚕	3	CS Elective 2 ⚕	3	GE3S ❖	3	AE42 ❖	3
		CS Elective 3 ⚕	3				
Total hours	16	Total hours	18	Total Hours	15	Total Hours	15

Computer Science Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BSCS program. This chart,
the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

FALL	SPRING	FALL	SPRING	FALL	SPRING	FALL	SPRING
1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester
15 hours	15 hours	16 hours	16 hours	16 hours	18 hours	15 hours	15 hours
1 lab	2 labs	2 labs	2 labs	1 lab	0 labs	1 labs	1 lab

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established ▬▬▬▬ Prerequisite ➝ Corequisite ▪▪▪▪▶

For students admitted in fall 2022
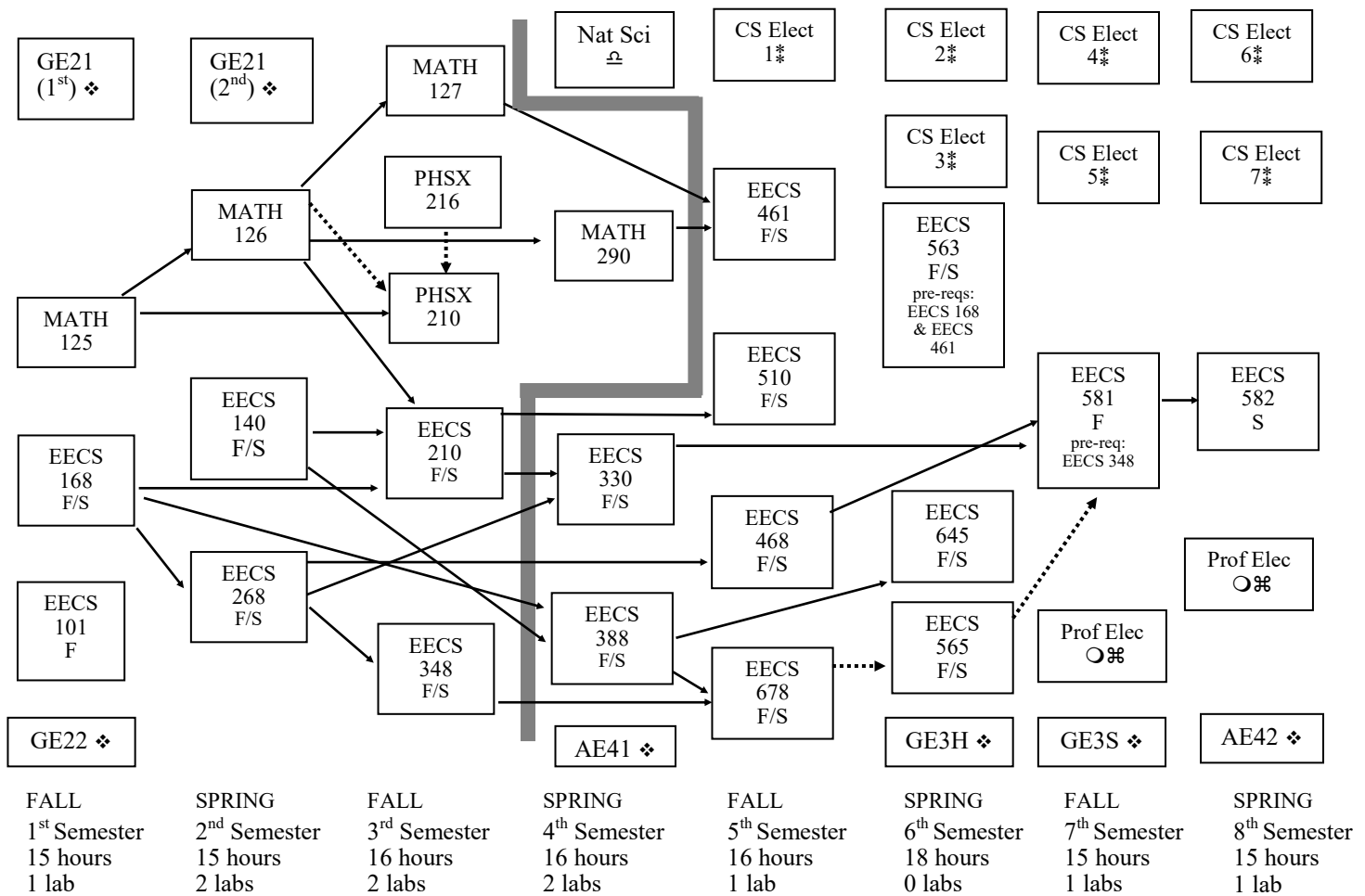
Interdisciplinary Computing-Astronomy

Interdisciplinary Computing graduates with a concentration in Astronomy are likely to collaborate with Astronomers, applying their computing expertise to large-scale Astronomy problems. However, the Interdisciplinary Computing degree also provides a very solid and broad foundation in computer science, preparing graduates for a wide variety of computing careers (see Computer Science).

Program Educational Objectives for Interdisciplinary Computing-Astronomy

Graduates who have earned a Bachelor's Degree in Interdisciplinary Computing, within a few years following graduation, will have demonstrated technical proficiency, collaborative activities, and professional development.

<u>Technical Proficiency</u> - Graduates will have achieved success and visibility in their chosen careers as shown by technical accomplishments in industry, government, entrepreneurial activities, or academia.

<u>Collaborative Activities</u> - Graduates will have exercised shared responsibilities through activities such as contributions to multi-person or multi-disciplinary technical projects, participation in professional society/organization functions, or performing collaborative research. In all such cases, graduates will have contributed to documentation of the collaborative activities.

<u>Professional Development</u> - Graduates will have demonstrated continual updating to extend their expertise and adapt to a changing environment through graduate studies; short courses, conferences, and seminars; or professional self-study. In addition, graduates will have demonstrated evidence of increasing technical and/or managerial impact.

Requirements for the degree of Bachelor of Science in Interdisciplinary Computing (Astronomy) Degree

A total of 127 credit hours is required for the BSIC (Astronomy) degree, as follows:

Computer Science (50 credit hours)

		HRS	SEM	GRD
EECS 101	New Student Seminar (part of AE51)	1		
EECS 140	Intro to Digital Logic Design ♦	4		
EECS 168	Programming I ♦	4		
EECS 268	Programming II	4		
EECS 330	Data Structures & Algorithms	4		
EECS 348	Software Engineering I	4		
EECS 388	Embedded Systems	4		
EECS 468	Program. Language Paradigms	3		
EECS 565	Intro to Info & Cmptr Security	3		
EECS 581	Software Engineering II	3		
	(part of AE51)			
EECS 582	CS / IC Capstone (AE61)	3		
EECS 678	Introduction to Operating Systems	4		
CS electives ‡		3		
		3		
		3		

Mathematics (24 credit hours)

		HRS	SEM	GRD
MATH 125	Calculus I (GE12)	4		
MATH 126	Calculus II	4		
MATH 127	Calculus III	4		
MATH 220	Applied Differential Equations	3		
MATH 290	Elementary Linear Algebra	2		
EECS 210	Discrete Structures	4		
EECS 461	Probability & Statistics	3		

Satisfy GE21: Written Communication (6 hours) ❖

	HRS	SEM	GRD
(Typically satisfied by ENGL 101 & 102)	3		
	3		

Satisfy GE22: Oral Communication (3 hours) ❖

	HRS	SEM	GRD
(Typically satisfied by COMS 130)	3		

Arts/Humanities/Social Science (6 hours) ❖

	HRS	SEM	GRD
Satisfy GE3H: Arts/Humanities	3		
Satisfy GE3S: Social Science	3		

Satisfy AE41 and AE42: Diversity, Global Awareness (6 hours) ❖

	HRS	SEM	GRD
	3		
	3		

Astronomy and Physics (32 credit hours)

		HRS	SEM	GRD
ASTR 391	Physical Astronomy, Honors	3		
ASTR 503	Undergraduate Research	2		
ASTR 591	Stellar Astronomy	3		
ASTR 592	Galactic & Extragalactic Astro	3		
ASTR 596	Observational Astrophysics	3		
ASTR Electives Δ		3		
		3		
PHSX 210	General Physics I for Engrs (GE11)	3		
PHSX 216	General Physics I Lab (part of AE51)	1		
PHSX 212	General Physics II (GE3N)	3		
PHSX 236	General Physics II Lab	1		
PHSX 313	General Physics III	3		
PHSX 316	Intermediate Physics Lab I	1		

♦ Electrical Engineering & Computer Engineering students take EECS 140 in fall and EECS 168 in spring. Computer Science & Interdisciplinary Computing students take EECS 168 in fall and EECS 140 in spring.

❖ Means of satisfying KU Core Goals are chosen from a variety of options (see http://kucore.ku.edu). Hours listed are assuming the goals are satisfied with course work.

‡ Nine hours of Computer Science Electives are chosen from a list of EECS courses (see page 9).

Δ Six hours of Astronomy electives are chosen from any Astronomy course numbered 500 or above.

Interdisciplinary Computing (Astronomy) Suggested Course Sequence

FOR STUDENTS ENTERING IN FALL OF <u>ODD</u> YEARS *(Symbol key on previous page)*

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101 (part of AE51) ❖	1	GE21 (second) ❖	1	EECS 268	4	EECS 210	4
GE21 (first) ❖	3	MATH 126	4	MATH 127	4	EECS 468	3
MATH 125 (GE12) ❖	4	PHSX 210 (GE11) ❖	3	MATH 220	3	EECS 348	4
EECS 168 ♦	4	PHSX 216 (part of AE51) ❖	1	MATH 290	2	GE3S ❖	3
GE3H ❖	3	EECS 140 ♦	4	PHSX 212 (GE3N) ❖	3	ASTR 391	3
				PHSX 236	1		
Total hours	15	Total hours	15	Total Hours	17	Total Hours	17
Fall 5th Semester		**Spring 6th Semester**		**Fall 7th Semester**		**Spring 8th Semester**	
EECS 388	4	EECS 330	4	EECS 581 (part of AE51) ❖	3	EECS 582 (AE61) ❖	3
EECS 461	3	EECS 678	4	EECS 565	3	CS Elective 1 ⚗	3
ASTR 591	3	PHSX 313	3	CS Elective 1 ⚗	3	CS Elective 3 ⚗	3
ASTR 596	3	PHSX 316	1	ASTR Elective 1Δ	3	ASTR Elective 2Δ	3
GE22 ❖	3	ASTR 592	3	ASTR 503	3	AE42 ❖	3
				AE41 ❖	3		
Total hours	16	Total hours	15	Total Hours	17	Total Hours	15

Interdisciplinary Computing (Astronomy) Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BS-IC program. This chart, the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

FALL	SPRING	FALL	SPRING	FALL	SPRING	FALL	SPRING
1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester
15 hours	15 hours	17 hours	17 hours	16 hours	15 hours	17 hours	15 hours
1 lab	2 labs	2 labs	1 labs	1 lab	2 labs	1 labs	1 lab

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established ▬▬▬ Prerequisite ➝ Corequisite ▪▪▪▪▶

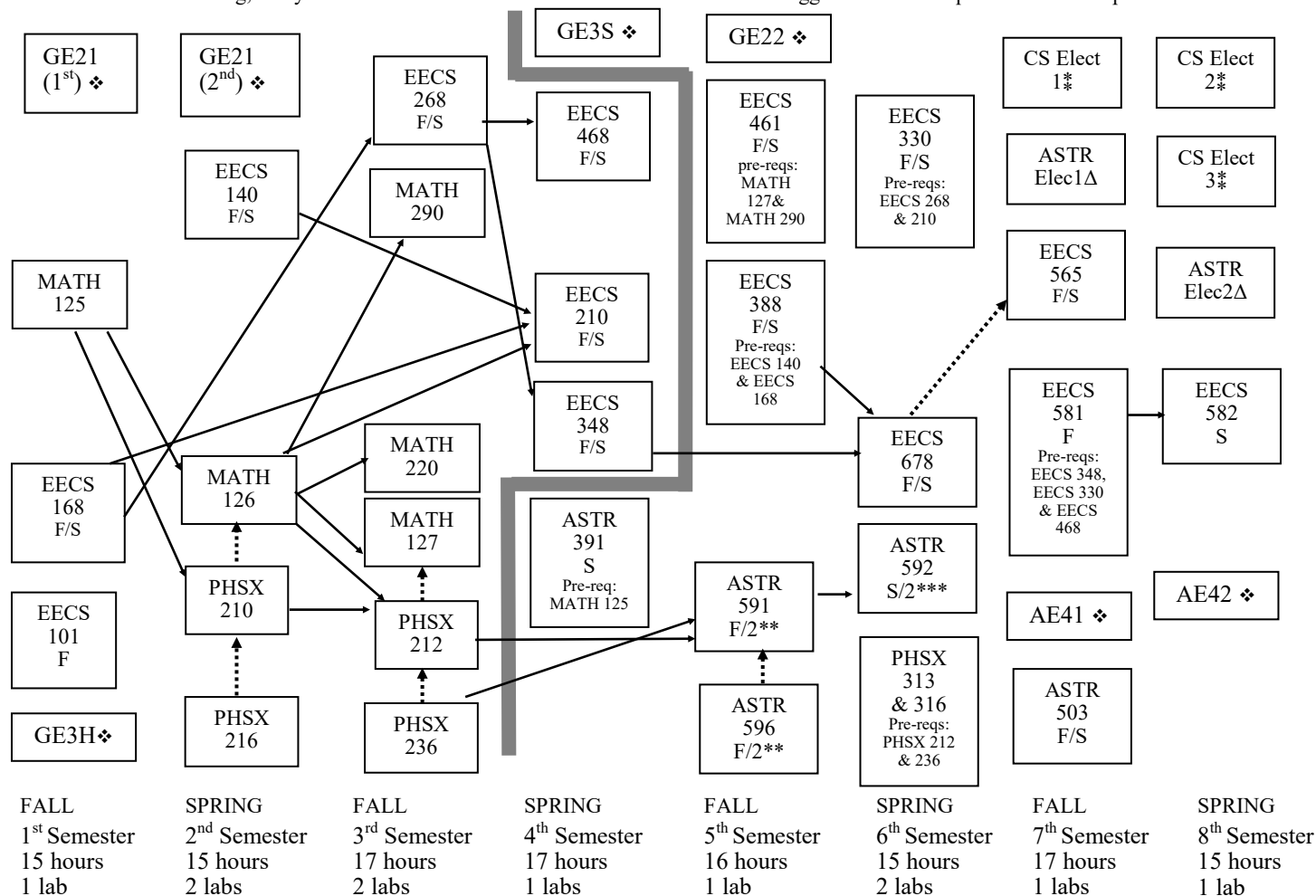# Interdisciplinary Computing (Astronomy) Suggested Course Sequence

FOR STUDENTS ENTERING IN FALL OF **EVEN** YEARS   *(Symbol key on previous page)*

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101 (part of AE51) ❖	1	GE21 (second) ❖	1	EECS 268	4	EECS 210	4
GE21 (first) ❖	3	MATH 126	4	MATH 127	4	EECS 468	3
MATH 125 (GE12) ❖	4	PHSX 210 (GE11) ❖	3	MATH 220	3	EECS 348	4
EECS 168 ♦	4	PHSX 216 (part of AE51) ❖	1	MATH 290	2	GE3S ❖	3
GE3H ❖	3	EECS 140 ♦	4	PHSX 212 (GE3N) ❖	3	ASTR 391	3
				PHSX 236	1		
Total hours	15	Total hours	15	Total Hours	17	Total Hours	17
Fall 5th Semester		**Spring 6th Semester**		**Fall 7th Semester**		**Spring 8th Semester**	
EECS 388	4	EECS 330	4	EECS 581 (part of AE51) ❖	3	EECS 582 (AE61) ❖	3
EECS 461	3	EECS 678	4	CS Elective 1 ❁	3	CS Elective 2❁	3
PHSX 313	3	EECS 565	3	ASTR Elective 1Δ	3	CS Elective 3 ❁	3
PHSX 316	1	AE42 ❖	3	ASTR 503	2	ASTR Elective 2Δ	3
GE22 ❖	3			ASTR 591	3	ASTR 592	3
AE41 ❖	3			ASTR 596	3		
Total hours	17	Total hours	14	Total Hours	17	Total Hours	15

Interdisciplinary Computing (Astronomy) Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BS-IC program. This chart, the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

FALL	SPRING	FALL	SPRING	FALL	SPRING	FALL	SPRING
1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester
15 hours	15 hours	17 hours	17 hours	17 hours	14 hours	17 hours	15 hours
1 lab	2 labs	2 labs	1 labs	2 lab	2 labs	1 labs	1 lab

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established ▬▬▬   Prerequisite ⟶   Corequisite ┈┈┈▶
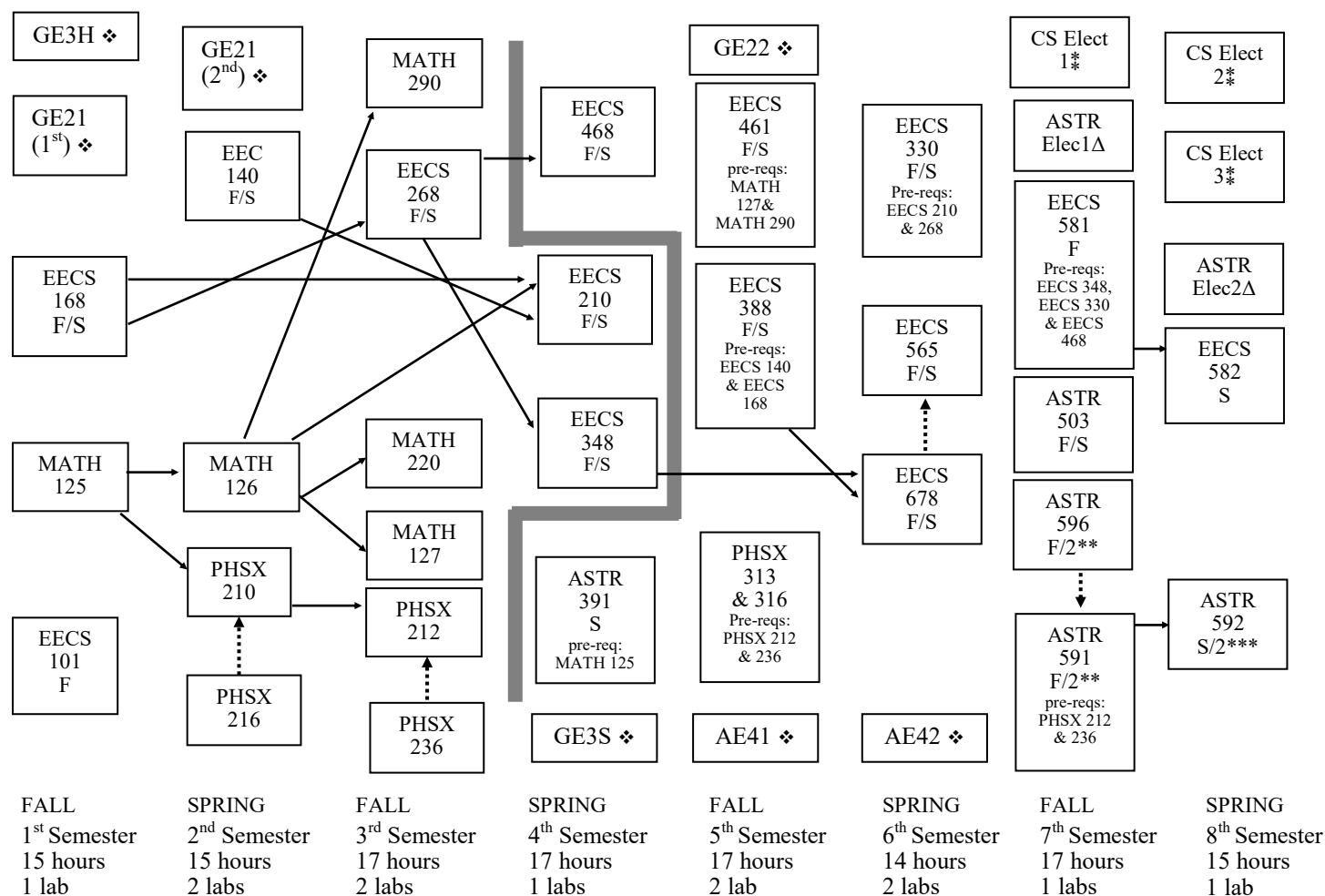
Interdisciplinary Computing-Biology

Interdisciplinary Computing graduates with a concentration in Biology are likely to collaborate with Biologists, applying their computing expertise to large-scale Biology problems. However, the Interdisciplinary Computing degree also provides a very solid and broad foundation in computer science, preparing graduates for a wide variety of computing careers (see Computer Science).

Program Educational Objectives for Interdisciplinary Computing-Biology

Graduates who have earned a Bachelor's Degree in Interdisciplinary Computing, within a few years following graduation, will have demonstrated technical proficiency, collaborative activities, and professional development.

Technical Proficiency - Graduates will have achieved success and visibility in their chosen careers as shown by technical accomplishments in industry, government, entrepreneurial activities, or academia.

Collaborative Activities - Graduates will have exercised shared responsibilities through activities such as contributions to multi-person or multi-disciplinary technical projects, participation in professional society/organization functions, or performing collaborative research. In all such cases, graduates will have contributed to documentation of the collaborative activities.

Professional Development - Graduates will have demonstrated continual updating to extend their expertise and adapt to a changing environment through graduate studies; short courses, conferences, and seminars; or professional self-study. In addition, graduates will have demonstrated evidence of increasing technical and/or managerial impact.

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Requirements for the degree of Bachelor of Science in Interdisciplinary Computing (Biology) Degree

A total of 130 credit hours is required for the BSIC (Biology) degree, as follows:

Computer Science (50 credit hours) — HRS SEM GRD

Course		HRS	SEM	GRD
EECS 101	New Student Seminar (part of AE51)	1	_____	_____
EECS 140	Intro to Digital Logic Design ♦	4	_____	_____
EECS 168	Programming I ♦	4	_____	_____
EECS 268	Programming II	4	_____	_____
EECS 330	Data Structures & Algorithms	4	_____	_____
EECS 348	Software Engineering I	4	_____	_____
EECS 388	Embedded Systems	4	_____	_____
EECS 468	Program. Language Paradigms	3	_____	_____
EECS 565	Intro to Info & Cmptr Security	3	_____	_____
EECS 581	Software Engineering II (part of AE51)	3	_____	_____
EECS 582	CS / IC Capstone (AE61)	3	_____	_____
EECS 678	Introduction to Operating Systems	4	_____	_____
CS electives ‡		3	_____	_____
		3	_____	_____
		3	_____	_____

Mathematics (21 credit hours)

Course		HRS	SEM	GRD
MATH 125	Calculus I (GE12)	4	_____	_____
MATH 126	Calculus II	4	_____	_____
MATH 127	Calculus III	4	_____	_____
MATH 290	Elementary Linear Algebra	2	_____	_____
EECS 210	Discrete Structures	4	_____	_____
EECS 461	Probability & Statistics	3	_____	_____

Satisfy GE11: Critical Thinking (3 hours) ❖ 3 _____ _____

Satisfy GE21: Written Communication (6 hours) ❖
(Typically satisfied by ENGL 101 and 102) 3 _____ _____
3 _____ _____

Satisfy GE22: Oral Communication (3 hours) ❖
(Typically satisfied by COMS 130) 3 _____ _____

Arts/Humanities/Social Science (6 hours) ❖
Satisfy GE3H: Arts/Humanities 3 _____ _____

Satisfy GE3S: Social Science 3 _____ _____

Satisfy AE41 and AE42: Diversity, Global Awareness (6 hours)❖
3 _____ _____
3 _____ _____

Social Responsibility and Ethics (3 hours)
PHIL 160/320/375 (AE51) 3 _____ _____

Biology and Chemistry (32 credit hours)
BIOL 150 Principles of Molecular
    Cellular Biology (GE3N) 3 _____ _____
BIOL 152 Principles of Organismal Biology 3 _____ _____
BIOL 154 Introductory Biology Lab for STEM 2 _____ _____
BIOL 350 Principles of Genetics 4 _____ _____
BIOL 412 Evolutionary Biology 4 _____ _____
Biology Choice 1: Choose one of the following 3 _____ _____
  BIOL 400 Fundamentals of Microbiology
  BIOL 416 Cell Structure and Function
Biology Choice 2: Choose one of the following 3 _____ _____
  BIOL 413 History & Diversity of Organisms
  BIOL 414 Principles of Ecology
  BIOL 428 Introduction to Systematics
  *BIOL 544 Comparative Animal Physiology
CHEM 130 General Chemistry I 5 _____ _____
CHEM 135 General Chemistry II 5 _____ _____

♦ ♦ Electrical Engineering & Computer Engineering students take EECS 140 in fall and EECS 168 in spring. Computer Science & Interdisciplinary Computing students take EECS 168 in fall and EECS 140 in spring.

❖ Means of satisfying KU Core Goals are chosen from a variety of options (see http://kucore.ku.edu). Hours listed are assuming the goals are satisfied with course work.

*Chemistry 330 is a pre-requisite

‡ Nine hours of Computer Science Electives are chosen from a list of EECS courses (see page 9).

For students admitted in fall 2022

Interdisciplinary Computing (Biology) Suggested Course Sequence

(Symbol key on previous page)

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101 (part of AE51) ❖	1	GE21 (second) ❖	3	EECS 268	4	EECS 210	4
GE21 (first) ❖	3	MATH 126	4	MATH 127	4	EECS 461	3
MATH 125 (GE12) ❖	4	EECS 140 ♦	4	MATH 290	2	EECS 348	4
EECS 168 ♦	4	CHEM 135	5	BIOL 150 (GE3N) ❖	3	BIOL 152	3
CHEM 130	5			GE11 ❖	3	BIOL 154	2
Total hours	17	Total hours	16	Total Hours	16	Total Hours	16
Fall 5th Semester		**Spring 6th Semester**		**Fall 7th Semester**		**Spring 8th Semester**	
EECS 388	4	EECS 330	4	EECS 565	3	EECS 582 (AE61) ❖	3
EECS 468	3	AE41 ❖	3	EECS 581 (part of AE51) ❖	3	CS Elective 2 ⚜	3
GE3H ❖	3	BIOL 412	4	EECS 678	4	CS Elective 3 ⚜	3
GE3S ❖	3	BIOL Choice 1 or 2	3	CS Elective 1 ⚜	3	PHIL 160/320/375	3
BIOL 350	4	BIOL Choice 1 or 2	3	GE22 ❖	3	AE42 ❖	3
Total hours	17	Total hours	17	Total Hours	16	Total Hours	15

Interdisciplinary Computing (Biology) Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BS-IC program. This chart, the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

FALL
1st Semester
17 hours
2 lab

SPRING
2nd Semester
16 hours
2 labs

FALL
3rd Semester
16 hours
1 labs

SPRING
4th Semester
16 hours
2 labs

FALL
5th Semester
17 hours
2 lab

SPRING
6th Semester
17 hours
1 labs

FALL
7th Semester
16 hours
2 lab

SPRING
8th Semester
15 hours
1 lab

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established   Prerequisite   Corequisite ▪▪▪▪▪▪▪►

For students admitted in fall 2022

Interdisciplinary Computing-Chemistry

Interdisciplinary Computing graduates with a concentration in Chemistry are likely to collaborate with Chemists, applying their computing expertise to large-scale Chemistry problems. However, the Interdisciplinary Computing degree also provides a very solid and broad foundation in computer science, preparing graduates for a wide variety of computing careers (see Computer Science).

Program Educational Objectives for Interdisciplinary Computing-Chemistry

Graduates who have earned a Bachelor's Degree in Interdisciplinary Computing, within a few years following graduation, will have demonstrated technical proficiency, collaborative activities, and professional development.

Technical Proficiency - Graduates will have achieved success and visibility in their chosen careers as shown by technical accomplishments in industry, government, entrepreneurial activities, or academia.

Collaborative Activities - Graduates will have exercised shared responsibilities through activities such as contributions to multi-person or multi-disciplinary technical projects, participation in professional society/organization functions, or performing collaborative research. In all such cases, graduates will have contributed to documentation of the collaborative activities.

Professional Development - Graduates will have demonstrated continual updating to extend their expertise and adapt to a changing environment through graduate studies; short courses, conferences, and seminars; or professional self-study. In addition, graduates will have demonstrated evidence of increasing technical and/or managerial impact.

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Requirements for the degree of Bachelor of Science in Interdisciplinary Computing (Chemistry) Degree

A total of 129 credit hours is required for the BSIC (Chemistry) degree, as follows:

Computer Science (50 credit hours)

		HRS	SEM	GRD
EECS 101	New Student Seminar (part of AE51)	1		
EECS 140	Intro to Digital Logic Design ♦	4		
EECS 168	Programming I ♦	4		
EECS 268	Programming II	4		
EECS 330	Data Structures & Algorithms	4		
EECS 348	Software Engineering I	4		
EECS 388	Embedded Systems	4		
EECS 468	Program. Language Paradigms	3		
EECS 565	Intro to Info & Cmptr Security	3		
EECS 581	Software Engineering II	3		
	(part of AE51)			
EECS 582	CS / IC Capstone (AE61)	3		
EECS 678	Introduction to Operating Systems	4		
CS electives ‡		3		
		3		
		3		

Mathematics (24 credit hours)

MATH 125	Calculus I (GE12)	4		
MATH 126	Calculus II	4		
MATH 127	Calculus III	4		
MATH 220	Applied Differential Equations	3		
MATH 290	Elementary Linear Algebra	2		
EECS 210	Discrete Structures	4		
EECS 461	Probability & Statistics	3		

Satisfy GE21: Written Communication (6 hours) ❖

(Typically satisfied by ENGL 101 & 102)	3		
	3		

Satisfy GE22: Oral Communication (3 hours) ❖

(Typically satisfied by COMS 130)	3		

Arts/Humanities/Social Science (6 hours) ❖

Satisfy GE3H: Arts/Humanities	3		
Satisfy GE3S: Social Science	3		

Satisfy AE41 and AE42: Diversity, Global Awareness (6 hours)❖

	3		
	3		

Chemistry and Physics (34 hours)

CHEM 201 Lab Safety in Chemical Science	1		
CHEM 130 General Chemistry 1	5		
CHEM 135 General Chemistry 2	5		
CHEM 330 Organic Chemistry I	3		
CHEM 530 Physical Chemistry 1	4		
CHEM 535 Physical Chemistry 2	3		
*CHEM 537 Physics Chemistry 1 Laboratory	3		
CHEM 498 Undergraduate Research Problems	2		
PHSX 210 General Physics I for Engrs (GE11)	3		
PHSX 216 General Physics I Lab (part of AE51)	1		
PHSX 212 General Physics II	3		
PHSX 236 General Physics II Lab	1		

♦ Electrical Engineering & Computer Engineering students take EECS 140 in fall and EECS 168 in spring. Computer Science & Interdisciplinary Computing students take EECS 168 in fall and EECS 140 in spring.

❖ Means of satisfying KU Core Goals are chosen from a variety of options (see http://kucore.ku.edu). Hours listed are assuming the goals are satisfied with course work.

*For IC-Chemistry students, Math 526 replaces CHEM 401 in the pre-requisite list. Chemistry permission required.

‡Nine hours of Computer Science Electives are chosen from a list of EECS courses (see page 9).
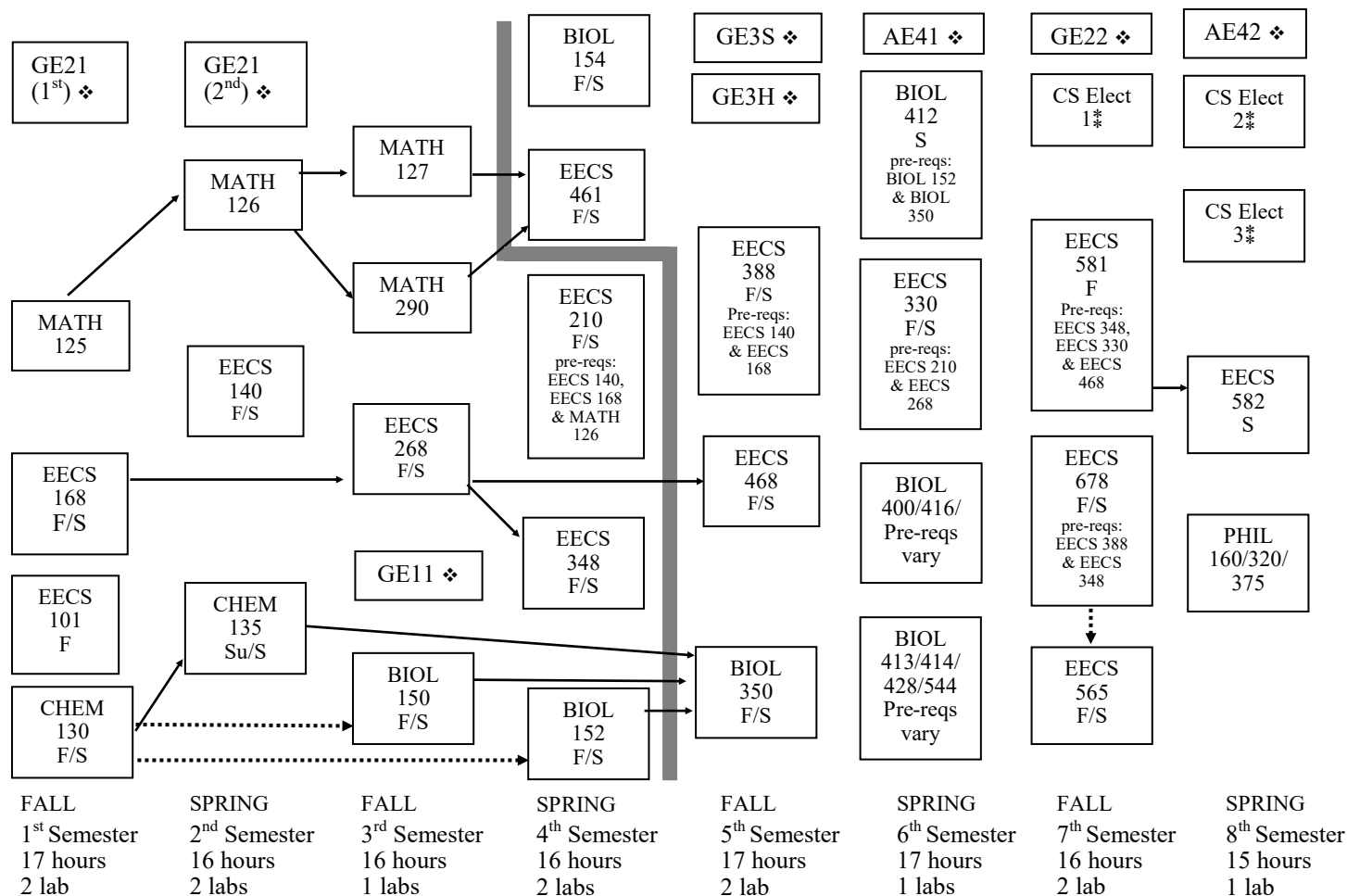
For students admitted in fall 2022

Interdisciplinary Computing (Chemistry) Suggested Course Sequence

(Symbol key on previous page)

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101 (part of AE51) ❖	1	GE21 (second) ❖	3	EECS 268	4	EECS 210	4
GE21 (first) ❖	3	MATH 126	4	MATH 127	4	EECS 348	4
MATH 125 (GE12) ❖	4	EECS 140 ♦	4	MATH 290	2	MATH 220	3
EECS 168 ♦	4	CHEM 135	5	PHSX 210 (GE11) ❖	3	PHSX 212	3
CHEM 130	5			PHSX 216 (part of AE51) ❖	1	PHSX 236	1
				CHEM 330	3		
Total hours	17	Total hours	16	Total Hours	17	Total Hours	15
Fall 5th Semester		**Spring 6th Semester**		**Fall 7th Semester**		**Spring 8th Semester**	
EECS 468	3	EECS 388	4	EECS 565	3	EECS 582 (AE61) ❖	3
EECS 330	4	EECS 461	3	EECS 678	4	CS Elective 2 ⚗	3
GE22 ❖	3	CHEM 537	3	EECS 581 (part of AE51) ❖	3	CS Elective 3 ⚗	3
GE3H ❖	3	CHEM 535	3	CS Elective 1 ⚗	3	AE41 ❖	3
CHEM 201	1	GE3S ❖	3	CHEM 498	2	AE42 ❖	3
CHEM 530	4						
Total hours	18	Total hours	16	Total Hours	15	Total Hours	15

Interdisciplinary Computing (Chemistry) Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BS-IC program. This chart, the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established ▬▬▬▬ Prerequisite ▬▬▬► Corequisite ••••••►

For students admitted in fall 2022

Interdisciplinary Computing-Economics

Interdisciplinary Computing graduates with a concentration in Economics are likely to collaborate with Economist, applying their computing expertise to large-scale Economic problems. However, the Interdisciplinary Computing degree also provides a very solid and broad foundation in computer science, preparing graduates for a wide variety of computing careers (see Computer Science).

Program Educational Objectives for Interdisciplinary Computing-Economics

Graduates who have earned a Bachelor's Degree in Interdisciplinary Computing, within a few years following graduation, will have demonstrated technical proficiency, collaborative activities, and professional development.

<u>Technical Proficiency</u> - Graduates will have achieved success and visibility in their chosen careers as shown by technical accomplishments in industry, government, entrepreneurial activities, or academia.

<u>Collaborative Activities</u> - Graduates will have exercised shared responsibilities through activities such as contributions to multi-person or multi-disciplinary technical projects, participation in professional society/organization functions, or performing collaborative research. In all such cases, graduates will have contributed to documentation of the collaborative activities.

<u>Professional Development</u> - Graduates will have demonstrated continual updating to extend their expertise and adapt to a changing environment through graduate studies; short courses, conferences, and seminars; or professional self-study. In addition, graduates will have demonstrated evidence of increasing technical and/or managerial impact.

Requirements for the degree of Bachelor of Science in Interdisciplinary Computing (Economics) Degree

A total of 128 credit hours is required for the BSIC (Economics) degree, as follows:

Computer Science (50 credit hours)

		HRS	SEM	GRD
EECS 101	New Student Seminar	1		
EECS 140	Intro to Digital Logic Design ♦	4		
EECS 168	Programming I ♦	4		
EECS 268	Programming II	4		
EECS 330	Data Structures & Algorithms	4		
EECS 348	Software Engineering I	4		
EECS 388	Embedded Systems	4		
EECS 468	Program. Language Paradigms	3		
EECS 565	Intro to Info & Cmptr Security	3		
EECS 581	Software Engineering II	3		
EECS 582	CS / IC Capstone (AE61)	3		
EECS 678	Introduction to Operating Systems	4		
CS electives ‡		3		
		3		
		3		

Mathematics (21 credit hours)

		HRS	SEM	GRD
MATH 125	Calculus I (GE12)	4		
MATH 126	Calculus II	4		
MATH 127	Calculus III	4		
MATH 290	Elementary Linear Algebra	2		
EECS 210	Discrete Structures	4		
EECS 461	Probability & Statistics	3		

Satisfy GE11: Critical Thinking (3 hours) ❖

	3		

Satisfy GE21: Written Communication (6 hours) ❖

ENGL 101	3		
GE21-2 (Typically ENGL 102)	3		

Satisfy GE22: Oral Communication (3 hours) ❖

(Typically satisfied by COMS 130) 3 _____ _____

Basic Science (3 credit hours)
Natural Science Elective (one course) (GE3N) ♋❖ 3 _____ _____

Arts/Humanities/Social Science (3 hours) ❖
Satisfy GE3H: Arts/Humanities 3 _____ _____

Satisfy AE41 and AE42: Diversity, Global Awareness (6 hours)❖

	3		
	3		

Satisfy GE51: Social Responsibility & Ethics (3 hours)❖

	3		

Economics (30 hours)

	HRS	SEM	GRD
ECON 142, Principles of Microeconomics (GE3S)	3		
ECON 144, Principles of Macroeconomics	3		
ECON 520, Microeconomics	3		
ECON 522, Macroeconomics	3		
ECON 526, Introduction to Econometrics	3		
ECON 500+ Elective A Δ (6 hours)	3		
	3		
ECON 600+ Elective B ΔΔ (9 hours)	3		
	3		
	3		

♦ Electrical Engineering & Computer Engineering students take EECS 140 in fall and EECS 168 in spring. Computer Science & Interdisciplinary Computing students take EECS 168 in fall and EECS 140 in spring.

❖ Means of satisfying KU Core Goals are chosen from a variety of options (see http://kucore.ku.edu). Hours listed are assuming the goals are satisfied with course work.

‡ Nine hours of Computer Science Electives are chosen from a list of EECS courses (see page 9).

♋ Natural Science Electives (1 course, 3 hours) are chosen from a list of courses (see page 8).

Δ Six hours of Economics are chosen from 500 level and above courses.

ΔΔ Nine hours of Economic electives are chosen from 600 level and above courses.
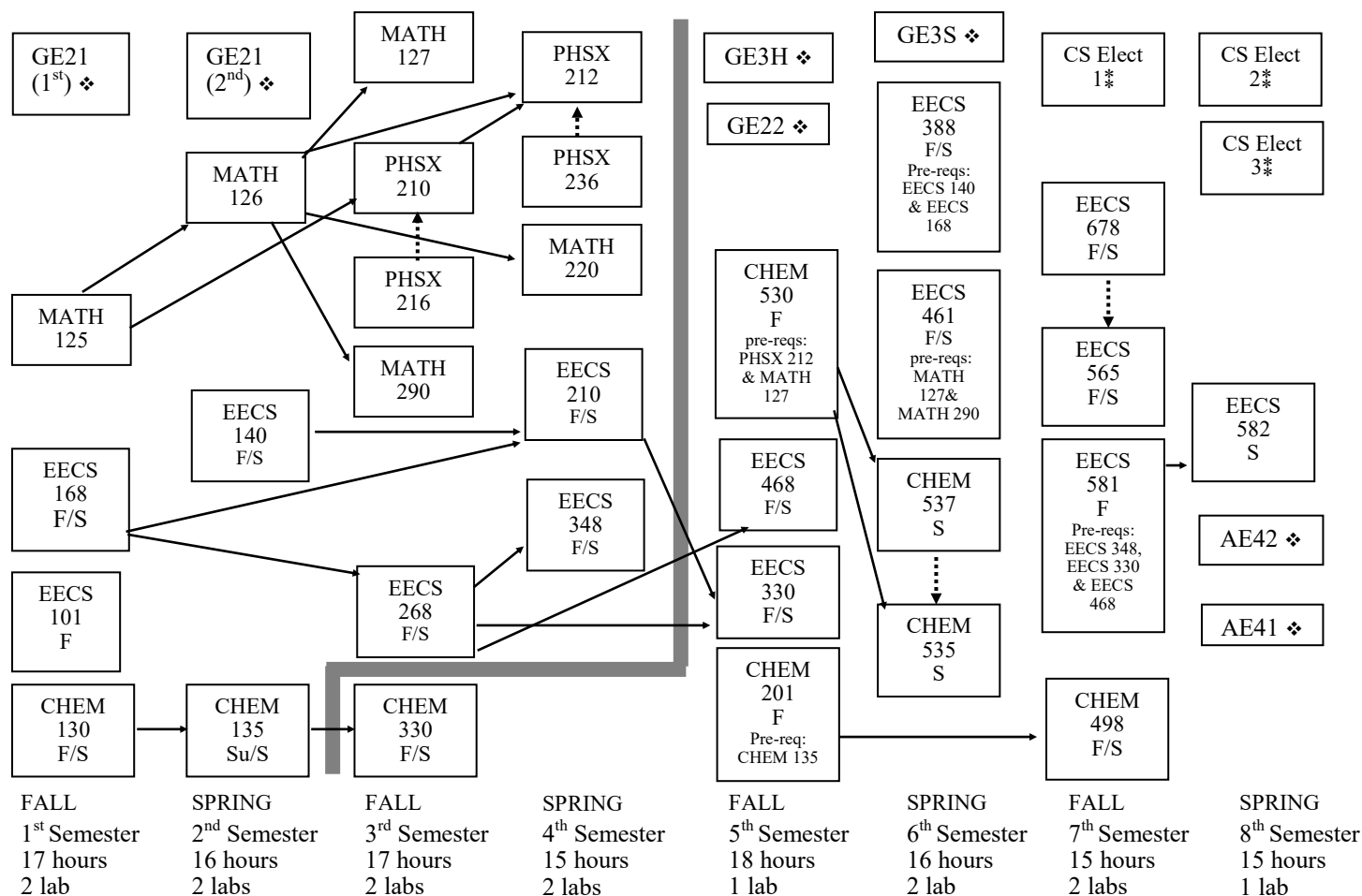
For students admitted in fall 2022

Interdisciplinary Computing (Economics) Suggested Course Sequence

(Symbol key on previous page)

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101 ❖	1	GE21 (second) ❖	3	EECS 268	4	EECS 210	4
ENGL 101 (GE21-1) ❖	3	MATH 126	4	MATH 127	4	EECS 468	3
MATH 125 (GE12) ❖	4	EECS 140 ♦	4	ECON 520	3	EECS 348	4
EECS 168 ♦	4	ECON 144	3	GE11 ❖	3	ECON 522	3
ECON 142 (GE3S) ❖	3	GE3N ⚎❖	3	GE22 ❖	3	Math 290	2
Total hours	15	Total hours	17	Total Hours	17	Total Hours	16
Fall 5th Semester		**Spring 6th Semester**		**Fall 7th Semester**		**Spring 8th Semester**	
EECS 388	4	EECS 330	4	EECS 565	3	EECS 582 (AE61) ❖	3
EECS 461	3	EECS 678	4	EECS 581❖	3	CS Elective 2 ✳	3
ECON Elective A Δ	3	ECON 526	3	CS Elective 1 ✳	3	CS Elective 3 ✳	3
AE41 ❖	3	ECON Elective A Δ	3	ECON Elective B Δ Δ	3	ECON Elective BΔΔ	3
AE51 ❖	3	AE42 ❖	3	ECON Elective B Δ Δ	3	GE3H ❖	3
Total hours	16	Total hours	17	Total Hours	15	Total Hours	15

Interdisciplinary Computing (Economics) Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BS-IC program. This chart, the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

FALL	SPRING	FALL	SPRING	FALL	SPRING	FALL	SPRING
1ˢᵗ Semester	2ⁿᵈ Semester	3ʳᵈ Semester	4ᵗʰ Semester	5ᵗʰ Semester	6ᵗʰ Semester	7ᵗʰ Semester	8ᵗʰ Semester
15 hours	17 hours	17 hours	16 hours	16 hours	17 hours	15 hours	15 hours
1 lab	1 labs	1 lab	1 lab	1 lab	2 lab	1 labs	1 lab

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established   Prerequisite   Corequisite ▪▪▪▪▪▶

Interdisciplinary Computing-Geography

Interdisciplinary Computing graduates with a concentration in Geography are likely to collaborate with Geographers, applying their computing expertise to large-scale Geography problems. However, the Interdisciplinary Computing degree also provides a very solid and broad foundation in computer science, preparing graduates for a wide variety of computing careers (see Computer Science).

Program Educational Objectives for Interdisciplinary Computing-Geography

Graduates who have earned a Bachelor's Degree in Interdisciplinary Computing, within a few years following graduation, will have demonstrated technical proficiency, collaborative activities, and professional development.

<u>Technical Proficiency</u> - Graduates will have achieved success and visibility in their chosen careers as shown by technical accomplishments in industry, government, entrepreneurial activities, or academia.

<u>Collaborative Activities</u> - Graduates will have exercised shared responsibilities through activities such as contributions to multi-person or multi-disciplinary technical projects, participation in professional society/organization functions, or performing collaborative research. In all such cases, graduates will have contributed to documentation of the collaborative activities.

<u>Professional Development</u> - Graduates will have demonstrated continual updating to extend their expertise and adapt to a changing environment through graduate studies; short courses, conferences, and seminars; or professional self-study. In addition, graduates will have demonstrated evidence of increasing technical and/or managerial impact.

Requirements for the degree of Bachelor of Science in Interdisciplinary Computing (Geography) Degree

A total of 124 credit hours is required for the BSIC (Geography) degree, as follows:

Computer Science (50 credit hours)	HRS	SEM	GRD
EECS 101 New Student Seminar (part of AE51)	1		
EECS 140 Intro to Digital Logic Design ♦	4		
EECS 168 Programming I ♦	4		
EECS 268 Programming II	4		
EECS 330 Data Structures & Algorithms	4		
EECS 348 Software Engineering I	4		
EECS 388 Embedded Systems	4		
EECS 468 Program. Language Paradigms	3		
EECS 565 Intro to Info & Cmptr Security	3		
EECS 581 Software Engineering II	3		
(part of AE51)			
EECS 582 CS / IC Capstone (AE61)	3		
EECS 678 Introduction to Operating Systems	4		
CS electives ‡	3		
	3		
	3		

Mathematics (21 credit hours)			
MATH 125 Calculus I (GE12)	4		
MATH 126 Calculus II	4		
MATH 127 Calculus III	4		
MATH 290 Elementary Linear Algebra	2		
EECS 210 Discrete Structures	4		
EECS 461 Probability & Statistics	3		

Satisfy GE21: Written Communication (6 hours) ❖

(Typically satisfied by ENGL 101 & 102)	3		
	3		

Satisfy GE22: Oral Communication (3 hours) ❖

(Typically satisfied by COMS 130)	3		

Arts/Humanities/Social Science (6 hours) ❖			
Satisfy GE3H: Arts/Humanities ❖	3		
Satisfy GE3S: Social Science ❖	3		

Satisfy AE41 and AE42: Diversity, Global Awareness (6 hours) ❖			
	3		
	3		

Geography and Physics (32 hours)			
GEOG Basics 1 Δ	3		
GEOG Basics 2 Δ	3		
GEOG 311 Introd Cart & Geovisualization	4		
GEOG 358 Intro to Geog Informtn Systems	4		
GEOG 526 Remote Sensing of Environment I	4		
GEOG 558 Spatial Data Analysis	4		
GEOG Elective 1 ΔΔ	3		
GEOG Elective 2 ΔΔ	3		
PHSX 210 General Physics I for Engrs (GE11)	3		
PHSX 216 General Physics II Lab (part of AE51)	1		

♦ Electrical Engineering & Computer Engineering students take EECS 140 in fall and EECS 168 in spring. Computer Science & Interdisciplinary Computing students take EECS 168 in fall and EECS 140 in spring.

❖ Means of satisfying KU Core Goals are chosen from a variety of options (see http://kucore.ku.edu). Hours listed are assuming the goals are satisfied with course work.

‡ Nine hours of Computer Science Electives are chosen from a list of EECS courses (see page 9).

Δ Six hours of Geography are chosen from 300 level and above courses in categories defined in the Undergraduate Study in Geography and Atmospheric Science Handbook as: Physical Studies, Geographic Information Science, Human Studies, Regional Studies, and Atmospheric Science.

ΔΔ Six hours of Geography electives are chosen from GEOG 512, GEOG 528, GEOG 560, GEOG 648, GEOG 658, GEOG 712, GEOG 726, GEOG 758.
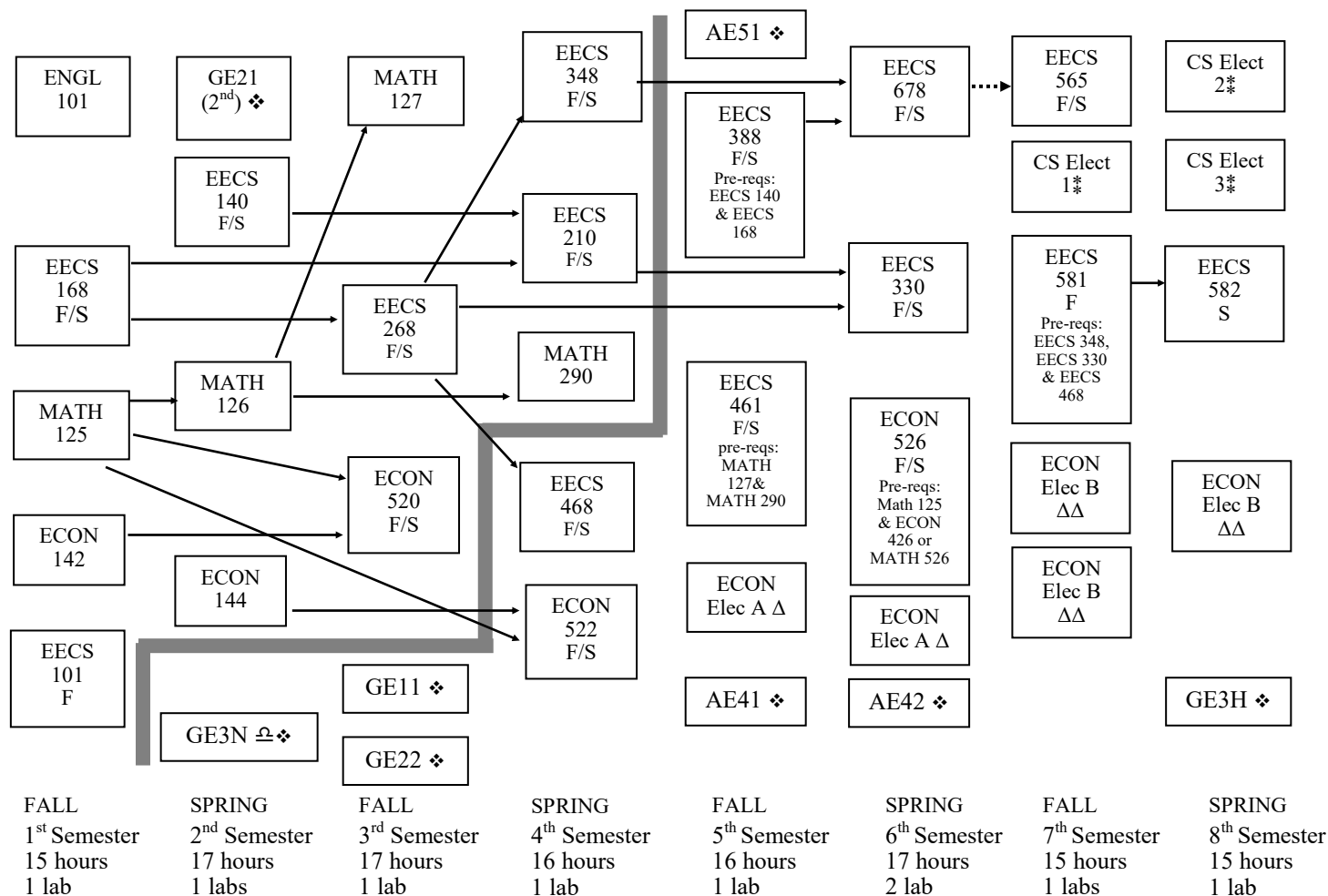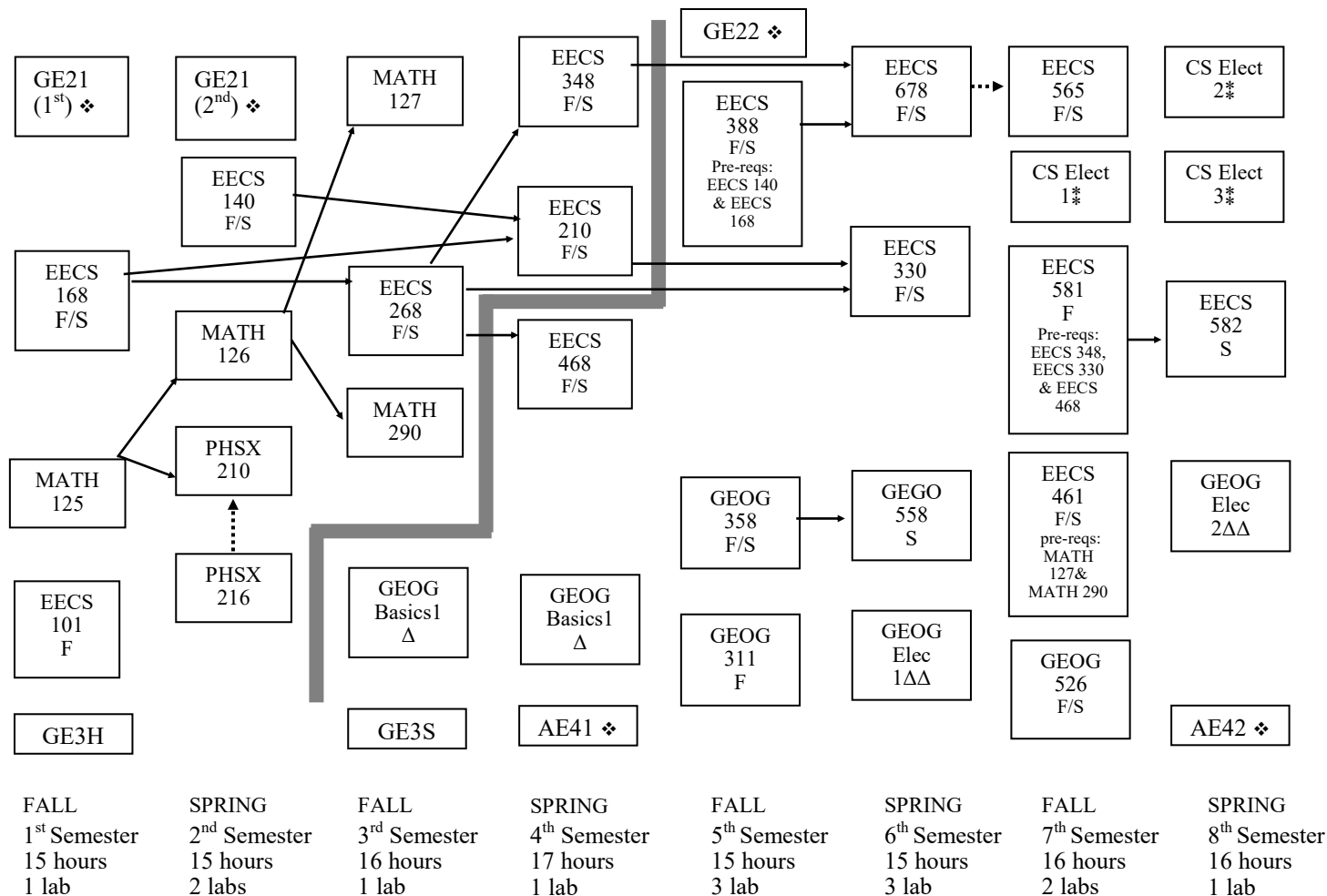
For students admitted in fall 2022

Interdisciplinary Computing (Geography) Suggested Course Sequence

(Symbol key on previous page)

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101 (part of AE51) ❖	1	GE21 (second) ❖	3	EECS 268	4	EECS 210	4
GE21 (first) ❖	3	MATH 126	3	MATH 127	4	EECS 468	3
MATH 125 (GE12) ❖	4	EECS 140 ♦	4	MATH 290	2	EECS 348	4
EECS 168 ♦	4	PHSX 210 (GE11) ❖	3	GE3S ❖	3	AE41 ❖	3
GE3H ❖	3	PHSX 216 (part of AE51) ❖	1	GEOG Basics1 Δ	3	GEOG Basics1 Δ	3
Total hours	**15**	**Total hours**	**15**	**Total Hours**	**16**	**Total Hours**	**17**
Fall 5th Semester		Spring 6th Semester		Fall 7th Semester		Spring 8th Semester	
EECS 388	4	EECS 330	4	EECS 565	3	EECS 582 (AE61) ❖	3
GEOG 311	4	EECS 678	4	EECS 581 (part of AE51) ❖	3	CS Elective 2 ⚹	3
GEOG 358	4	GEOG Elective 1 ΔΔ	3	CS Elective 1 ⚹	3	CS Elective 3 ⚹	3
GE22 ❖	3	GEOG 558	4	EECS 461	3	GEOG Elective 2 ΔΔ	3
				GEOG 526	4	AE42 ❖	3
Total hours	**15**	**Total hours**	**15**	**Total Hours**	**16**	**Total Hours**	**15**

Interdisciplinary Computing (Geography) Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BS-IC program. This chart, the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

FALL	SPRING	FALL	SPRING	FALL	SPRING	FALL	SPRING
1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester
15 hours	15 hours	16 hours	17 hours	15 hours	15 hours	16 hours	16 hours
1 lab	2 labs	1 lab	1 lab	3 lab	3 lab	2 labs	1 lab

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established ▨▨▨   Prerequisite ──────▶   Corequisite ┄┄┄┄▶

For students admitted in fall 2022

Interdisciplinary Computing-Journalism

Interdisciplinary Computing graduates with a concentration in Journalism are likely to collaborate with Journalists, applying their computing expertise to Journalism problems. However, the Interdisciplinary Computing degree also provides a very solid and broad foundation in computer science, preparing graduates for a wide variety of computing careers (see Computer Science).

Program Educational Objectives for Interdisciplinary Computing-Journalism

Graduates who have earned a Bachelor's Degree in Interdisciplinary Computing, within a few years following graduation, will have demonstrated technical proficiency, collaborative activities, and professional development.

Technical Proficiency - Graduates will have achieved success and visibility in their chosen careers as shown by technical accomplishments in industry, government, entrepreneurial activities, or academia.

Collaborative Activities - Graduates will have exercised shared responsibilities through activities such as contributions to multi-person or multi-disciplinary technical projects, participation in professional society/organization functions, or performing collaborative research. In all such cases, graduates will have contributed to documentation of the collaborative activities.

Professional Development - Graduates will have demonstrated continual updating to extend their expertise and adapt to a changing environment through graduate studies; short courses, conferences, and seminars; or professional self-study. In addition, graduates will have demonstrated evidence of increasing technical and/or managerial impact.

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Requirements for the degree of Bachelor of Science in Interdisciplinary Computing (Journalism) Degree

A total of 122 credit hours is required for the BSIC (Journalism) degree, as follows:

Computer Science (50 credit hours) — HRS SEM GRD

Course		HRS	SEM	GRD
EECS 101	New Student Seminar	1		
EECS 140	Intro to Digital Logic Design ♦	4		
EECS 168	Programming I ♦	4		
EECS 268	Programming II	4		
EECS 330	Data Structures & Algorithms	4		
EECS 348	Software Engineering I	4		
EECS 388	Embedded Systems	4		
EECS 468	Program. Language Paradigms	3		
EECS 565	Intro to Info & Cmptr Security	3		
EECS 581	Software Engineering II	3		
EECS 582	CS / IC Capstone (AE61)	3		
EECS 678	Introduction to Operating Systems	4		
CS electives ‡		3		
		3		
		3		

Mathematics (21 credit hours)

Course		HRS	SEM	GRD
MATH 125	Calculus I (GE12)	4		
MATH 126	Calculus II	4		
MATH 127	Calculus III	4		
MATH 290	Elementary Linear Algebra	2		
EECS 210	Discrete Structures	4		
EECS 461	Probability & Statistics	3		

Satisfy GE22: Oral Communication (3 hours)❖

	HRS	SEM	GRD
	3		

Basic Science (3 credit hours)
Natural Science Elective (one course) (GE3N) ⚛ — 3

Arts/Humanities/Social Science (6 hours)
Satisfy GE3H: Arts/Humanities❖ — 3
Additional Arts/Humanities/Social Science •⌘ — 3

Satisfy AE41 and AE42: Diversity, Global Awareness (6 hours)❖

	HRS	SEM	GRD
	3		
	3		

Journalism Basics (21 hours)

Course	HRS	SEM	GRD
JMC 101 Media and Society (GE3S)	3		
JMC 104 Words at Work: Writing Essentials (GE21-1)	3		
JMC 300 Visual Storytelling	2		
JMC 211-215 (Choose 1. Commonly taken with JMC 300)	1		
JMC 302 Information Exploration (GE11)	3		
JMC 304 Media Writing (GE21-2)	3		
JMC 309 Data Storytelling	3		
JMC 408 Media Law and Ethics (AE51)	3		

Journalism Emphasis 1: Multimedia Journalism (12 hours)

Course	HRS	SEM	GRD
JMC 415 Multimedia Reporting	3		
JMC 419 Multimedia Editing	3		
Choose two of the following:	6		
JMC 410 Media Photography			
JMC 503 History of Journalism & Mass Communication			
JMC 540 Sports, Media and Society			
JMC 551 Advanced Multimedia Reporting			
JMC 552 Broadcast Reporting			
JMC 553 Data Advanced Editing & Production			
JMC 621 Data Reporting & Visualization – Adv Media			

Journalism Emphasis 2: Strategic Communication (12 hours)

Course	HRS	SEM	GRD
JMC 320 Intro Strategic Communication I	3		
Choose three of the following:			
JMC 420 Strategic Communication II	9		
JMC 460 Research Methods—Stratcom			
JMC 611 Sales Strategies			
JMC 613 International Strategic Communication			
JMC 616 Financial Basics Communicators			

♦ Electrical Engineering & Computer Engineering students take EECS 140 in fall and EECS 168 in spring. Computer Science & Interdisciplinary Computing students take EECS 168 in fall and EECS 140 in spring.
❖ Means of satisfying KU Core Goals are chosen from a variety of options (see http://kucore.ku.edu). Hours listed are assuming the goals are satisfied with course work.
● Non-KU Core courses may be petitioned to satisfy additional Arts/Humanities/Social Science hours.
‡ Nine hours of Computer Science Electives are chosen from a list of EECS courses (see page 9).
⚛ Natural Science Electives (1 course, 3 hours) are chosen from a list of courses (see page 8).
⌘ Foreign Language: Any foreign language course may be petitioned to count as an additional Humanities/Social Science elective.

For students admitted in fall 2022

Interdisciplinary Computing (Journalism—Emphasis 1: Multimedia Journalism)
Suggested Course Sequence
(Symbol key on previous page)

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101	1	Natural Science (GE3N) ❖	3	EECS 268	4	EECS 210	4
JMC 104 (GE21-1) ❖	3	MATH 126	4	MATH 127	4	EECS 468	3
MATH 125 (GE12) ❖	4	EECS 140 ♦	4	MATH 290	2	EECS 348	4
EECS 168 ♦	4	JMC 101 (GE3S)	3	JMC 300	3	JMC 304 (GE21-2) ❖	3
GE3H ❖	3	GE22 ❖	3	JMC 302 (GE11)	3	JMC 211-215	1
Total hours	15	Total hours	17	Total Hours	15	Total Hours	15
Fall 5th Semester		**Spring 6th Semester**		**Fall 7th Semester**		**Spring 8th Semester**	
EECS 388	4	EECS 330	4	EECS 581	3	EECS 582 (AE61) ❖	3
EECS 461	3	EECS 678	4	CS Elective 1 ◗	3	CS Elective 2 ◗	3
AE41 ❖	3	JMC 415	3	JMC Elective 1	3	CS Elective 3 ◗	3
JMC 309	3	JMC 419	3	JMC Elective 2	3	AE42 ❖	3
JMC 408 (AE51)	3			EECS 565	3	Additional A/H/S	3
Total hours	16	Total hours	14	Total Hours	15	Total Hours	15

Interdisciplinary Computing (Journalism—Emphasis 1) Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BS-IC program. This chart, the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

FALL	SPRING	FALL	SPRING	FALL	SPRING	FALL	SPRING
1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester
15 hours	17 hours	15 hours	15 hours	16 hours	14 hours	15 hours	15 hours
1 lab	1 labs	1 lab	1 lab	1 lab	2 labs	1 lab	1 lab

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established ▬▬▬▬ Prerequisite ➝ Corequisite ┄┄➤

For students admitted in fall 2022

Interdisciplinary Computing (Journalism—Emphasis 2: Strategic Communication)
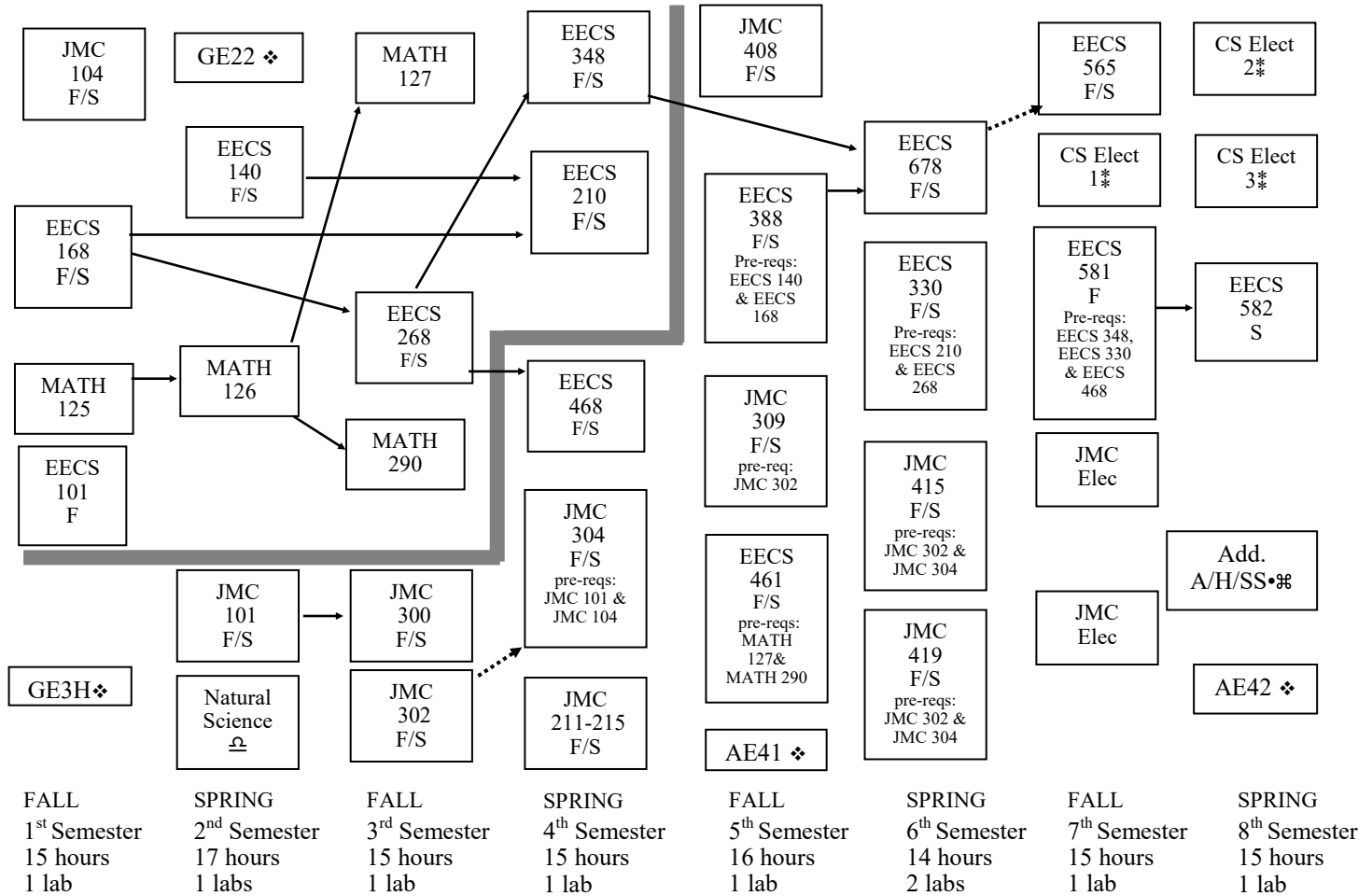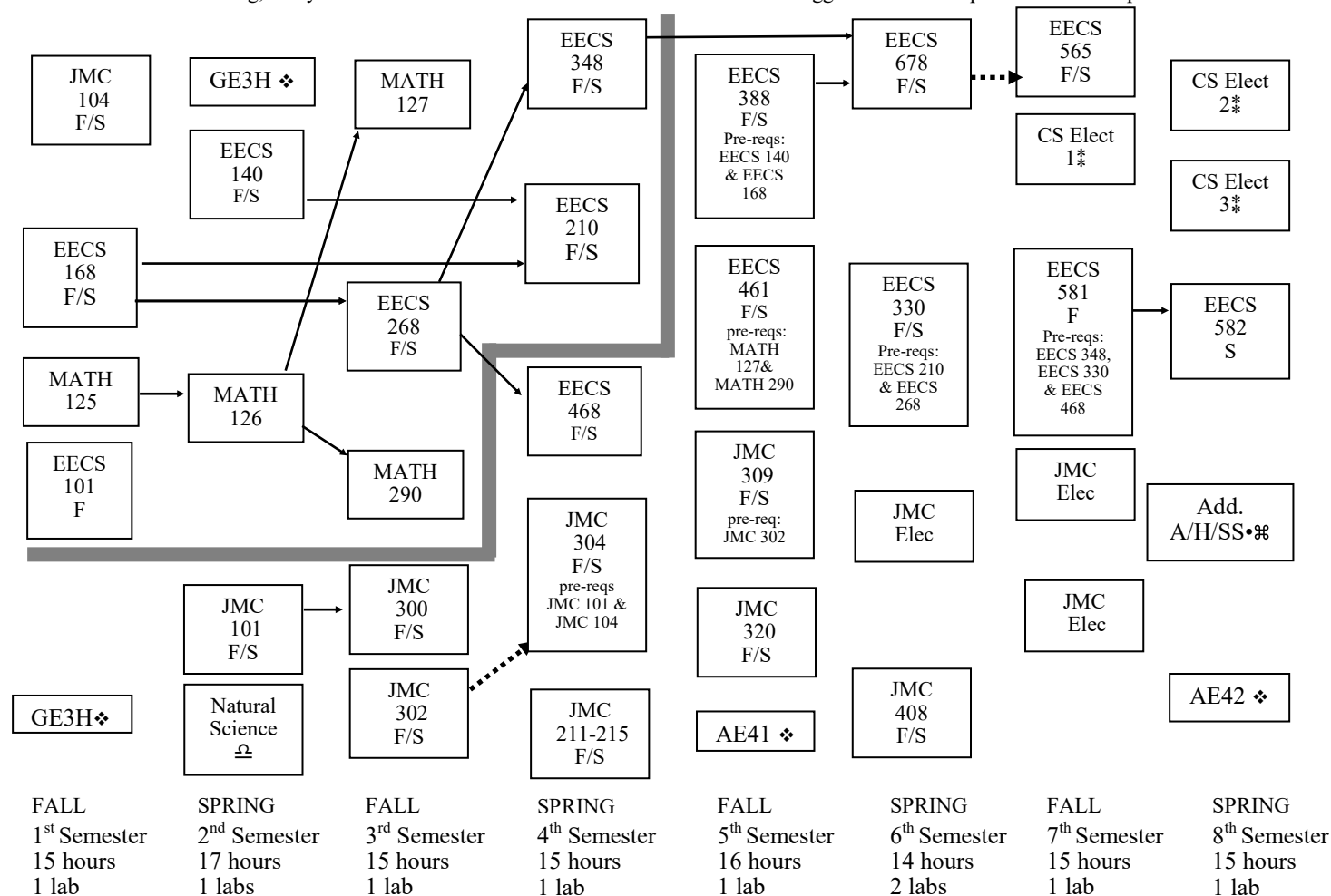## Suggested Course Sequence
(Symbol key on previous page)

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101 (part of AE51) ❖	1	Natural Science (GE3N)	3	EECS 268	4	EECS 210	4
JMC 104 (GE21-1) ❖	3	MATH 126	4	MATH 127	4	EECS 468	3
MATH 125 (GE12) ❖	4	EECS 140 ♦	4	MATH 290	2	EECS 348	4
EECS 168 ♦	4	JMC 101 (GE3S) ❖	3	JMC 300	3	JMC 304 (GE21-2) ❖	3
GE3H ❖	3	GE22 ❖	3	JMC 302 (GE11) ❖	3	JMC 211-215	1
Total hours	15	Total hours	17	Total Hours	15	Total Hours	15
Fall 5th Semester		**Spring 6th Semester**		**Fall 7th Semester**		**Spring 8th Semester**	
EECS 388	4	EECS 330	4	EECS 565	3	EECS 582 (AE61) ❖	3
EECS 461	3	EECS 678	4	EECS 581 (part of AE51) ❖	3	CS Elective 2 ⌗	3
AE41 ❖	3	JMC Elective 1	3	CS Elective 1 ⌗	3	CS Elective 3 ⌗	3
JMC 320	3	JMC 408 (AE51) ❖	3	JMC Elective 2	3	AE42 ❖	3
JMC 309	3			JMC Elective 3	3	Additional A/H/S	3
Total hours	16	Total hours	14	Total Hours	15	Total Hours	15

Interdisciplinary Computing (Journalism—Emphasis 2) Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BS-IC program. This chart, the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

FALL	SPRING	FALL	SPRING	FALL	SPRING	FALL	SPRING
1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester
15 hours	17 hours	15 hours	15 hours	16 hours	14 hours	15 hours	15 hours
1 lab	1 labs	1 lab	1 lab	1 lab	2 labs	1 lab	1 lab

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established ▬▬▬ Prerequisite ➝ Corequisite ·······➤

For students admitted in fall 2022

Interdisciplinary Computing-Physics

Interdisciplinary Computing graduates with a concentration in Physics are likely to collaborate with Physicists, applying their computing expertise to large-scale Physics problems. However, the Interdisciplinary Computing degree also provides a very solid and broad foundation in computer science, preparing graduates for a wide variety of computing careers (see Computer Science).

Program Educational Objectives for Interdisciplinary Computing-Physics

Graduates who have earned a Bachelor's Degree in Interdisciplinary Computing, within a few years following graduation, will have demonstrated technical proficiency, collaborative activities, and professional development.

<u>Technical Proficiency</u> - Graduates will have achieved success and visibility in their chosen careers as shown by technical accomplishments in industry, government, entrepreneurial activities, or academia.

<u>Collaborative Activities</u> - Graduates will have exercised shared responsibilities through activities such as contributions to multi-person or multi-disciplinary technical projects, participation in professional society/organization functions, or performing collaborative research. In all such cases, graduates will have contributed to documentation of the collaborative activities.

<u>Professional Development</u> - Graduates will have demonstrated continual updating to extend their expertise and adapt to a changing environment through graduate studies; short courses, conferences, and seminars; or professional self-study. In addition, graduates will have demonstrated evidence of increasing technical and/or managerial impact.

Requirements for the degree of Bachelor of Science in Interdisciplinary Computing (Physics) Degree
A total of 124 credit hours is required for the BSIC (Physics) degree, as follows:

Computer Science (50 credit hours)		HRS	SEM	GRD
EECS 101	New Student Seminar (part of AE51)	1		
EECS 140	Intro to Digital Logic Design ♦	4		
EECS 168	Programming I ♦	4		
EECS 268	Programming II	4		
EECS 330	Data Structures & Algorithms	4		
EECS 348	Programming Paradigms	3		
EECS 388	Embedded Systems	4		
EECS 468	Software Engineering I	4		
EECS 565	Intro to Info & Cmptr Security	3		
EECS 581	Software Engineering II	3		
	(part of AE51)			
EECS 582	CS / IC Capstone (AE61)	3		
EECS 678	Introduction to Operating Systems	4		
CS electives ✣		3		
		3		
		3		

Mathematics (24 credit hours)				
MATH 125	Calculus I (GE12)	4		
MATH 126	Calculus II	4		
MATH 127	Calculus III	4		
MATH 220	Applied Differential Equations	3		
MATH 290	Elementary Linear Algebra	2		
EECS 210	Discrete Structures	4		
EECS 461	Probability & Statistics	3		

Satisfy GE21: Written Communication (6 hours) ❖
(Typically satisfied by ENGL 101 and 102)   3 _____ _____
                                              3 _____ _____

Satisfy GE22: Oral Communication (3 hours) ❖
(Typically satisfied by COMS 130)   3 _____ _____

Arts/Humanities/Social Science (6 hours) ❖			
Satisfy GE3H: Arts/Humanities	3		
Satisfy GE3S: Social Science	3		

Satisfy AE 41 and AE42: Diversity, Global Awareness (6 hours)❖
                                              3 _____ _____
                                              3 _____ _____

Physics (29 hours)			
PHSX 210 General Physics I for Engrs (GE11)	3		
PHSX 216 General Physics I lab (part AE51)	1		
PHSX 212 General Physics 2 (GE3N)	3		
PHSX 236 General Physics 2 lab	1		
PHSX 313 General Physics 3	3		
PHSX 316 General Physics 3 lab	1		
PHSX 503 Undergraduate Research	2		
PHSX 611 Introductory Quantum Mechanics	3		
PHSX 521 Mechanics I	3		
PHSX 531 Electricity and Magnetism	3		
Physics Electives Δ	3		
	3		

♦ Electrical Engineering & Computer Engineering students take EECS 140 in fall and EECS 168 in spring. Computer Science & Interdisciplinary Computing students take EECS 168 in fall and EECS 140 in spring.

❖ Means of satisfying KU Core Goals are chosen from a variety of options (see http://kucore.ku.edu). Hours listed are assuming the goals are satisfied with course work.

✣ Nine hours of Computer Science Electives are chosen from a list of EECS courses (see page 9).

Δ Six hours of Physics electives are chosen from PHSX 516 and PHSX 536 and 600 level and above Physics courses.
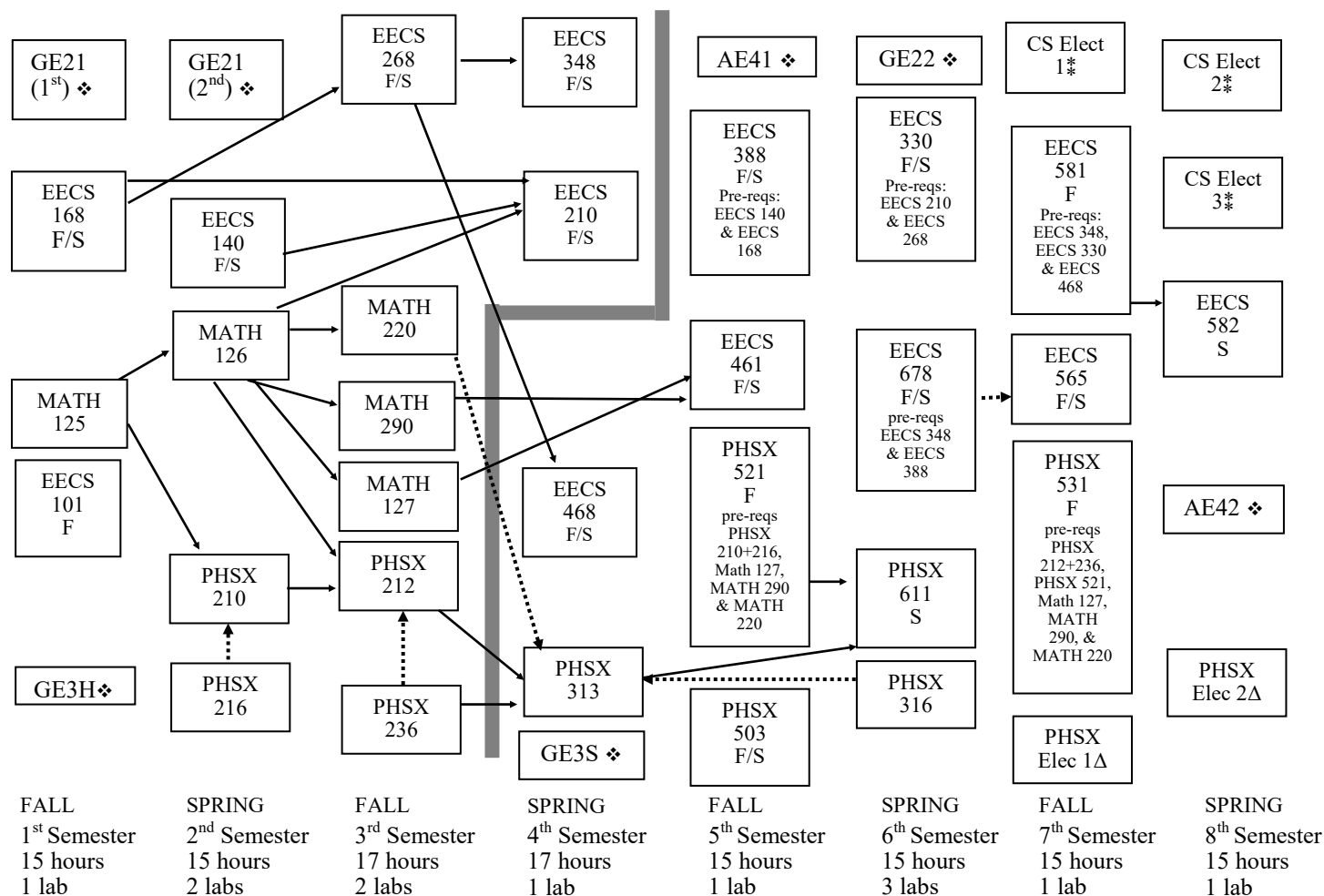
Interdisciplinary Computing (Physics) Suggested Course Sequence

(Symbol key on previous page)

Fall 1st Semester		Spring 2nd Semester		Fall 3rd Semester		Spring 4th Semester	
EECS 101 (part of AE51) ❖	1	GE21 (second) ❖	3	EECS 268	4	EECS 210	4
GE21 (first) ❖	3	MATH 126	4	MATH 127	4	EECS 468	3
MATH 125 (GE12) ❖	4	EECS 140 ♦	4	MATH 290	2	EECS 348	4
EECS 168 ♦	4	PHSX 210 (GE11) ❖	3	Math 220	3	GE3S ❖	3
GE3H ❖	3	PHSX 216 (part of AE51) ❖	1	PHSX 212 (GE3N) ❖	3	PHSX 313	3
				PHSX 236	1		
Total hours	15	Total hours	15	Total Hours	17	Total Hours	17
Fall 5th Semester		**Spring 6th Semester**		**Fall 7th Semester**		**Spring 8th Semester**	
EECS 388	4	EECS 330	4	EECS 581 (part of AE51) ❖	3	EECS 582 (AE61) ❖	3
EECS 461	3	EECS 678	4	CS Elective 1 ⁂	3	CS Elective 2⁂	3
AE41 ❖	4	GE22 ❖	3	EECS 565	3	CS Elective 2⁂	3
PHSX 503	3	PHSX 316	1	PHSX 531	3	AE42❖	3
PHSX 521	3	PHSX 611	3	PHSX Elective 1Δ	3	PHSX Elective 1Δ	3
Total hours	15	Total hours	15	Total Hours	15	Total Hours	15

Interdisciplinary Computing (Physics) Course Flow Chart

The following flow chart shows the prerequisite relationships among the technical portions of the BS-IC program. This chart, the latest catalog, and your advisor should be consulted if deviations from the suggested course sequence are contemplated.

FALL	SPRING	FALL	SPRING	FALL	SPRING	FALL	SPRING
1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester
15 hours	15 hours	17 hours	17 hours	15 hours	15 hours	15 hours	15 hours
1 lab	2 labs	2 labs	1 lab	1 lab	3 labs	1 lab	1 lab

F=course offered in Fall only; S=course offered in spring only; F/S=course offered in Fall and Spring; S/SU=course offered in Spring and Summer

Upper Level Eligibility Established �   Prerequisite ⟶   Corequisite ┈┈▶

Undergraduate Certificate in Cybersecurity

The Undergraduate Certificate in Cybersecurity is a 12-credit undergraduate-level certificate designed to provide fundamental knowledge of information security concepts, cryptography, information and network security and computer systems security, as well as real-world practice with hand-on experiences in cyber defense. The purpose of this undergraduate certificate is to offer a credential that covers both the theoretical and practical aspects of cybersecurity to students who are currently pursuing baccalaureate work in KU EECS department.

Program-level Learning Outcomes

The program enables students to achieve:
1. An ability to apply knowledge of security.
2. An ability to analyze a problem and identify the security requirements appropriate to its solution.
3. An ability to design, implement and evaluate the security of a computer-based system, process, component, or program to meet desired needs.
4. An ability to apply design and development principles in the construction of secure software systems.
5. An ability to use current techniques, skills, and tools for security practices.
6. An understanding of security, ethical, and social issues and responsibilities.
7. An ability to communicate security requirements and controls effectively with a range of audiences.

Admissions Requirements

The entrance requirements for students entering the undergraduate certificate of cybersecurity program include:

- Upper-level eligibility in KU EECS **AND**
- Overall GPA of 2.8 or better **AND**
- Three letters of recommendation

Certificate Requirements

The proposed Undergraduate Certificate in Cybersecurity requires the completion of three core courses[1] and one elective course[2] at a total of 12 credit hours[3].

Core Courses/Theory (2 courses, 6 credit hours required)

EECS 563: Introduction to Communication Networks (3 credits)
EECS 565: Introduction to Information and Computer Security (3 credits)

Choose one course from the Core Courses/Practice list (1 course, 3 credit hours required)

EECS 465: Cyber Defense (3 credits)

Choose one course from the Elective Courses list (1 course, 3 credit hours required)
EECS 569 Digital Forensics: (3 credits)
EECS 665 Compiler Construction (4 credits)
EECS 700: Special Topics: Mobile Security (3 credits)
EECS 700: Special Topics: IoT Security (3 credits)
EECS 711 Security Management and Audit (3 credits)
EECS 738: Machine Learning (3 credits)
EECS 742: Static Analysis
EECS 755: Software Modeling and Analysis
EECS 765: Introduction to Cryptography & Computer Security

The completion requirements of the cybersecurity certificate include:

- Students must have a GPA of 3.0 or better in all certificate courses **AND**
- The minimum grade for any course to be applied toward the certificate is a grade of C

Note 1: Prerequisite and corequisite of three core courses include: EECS 140, EECS 168, EECS 268, EECS 388, EECS 448, EECS 461, and EECS 678.

Note 2: Under unusual circumstances other EECS 690 or EECS 700 security-related courses may be petitioned to satisfy elective requirement, subject to approval.

Note 3: For students who have been enrolled in the BSEE/CoE/CS/IC programs, all the credits obtained in the certification program will count toward the degree. For students who have enrolled in the BSEE/CoE/CS/IC programs, all the credits obtained before applying to the certificate will count toward the certificate. .

Department Academic Policies

This section details department policies and procedures concerning completion of the curricula. In addition, each student is responsible for seeking out and complying with policies of the School of Engineering and the University. These are contained in the current Undergraduate Catalog of the University, or in sources referred to therein.

Transfer Credits

The University accepts and will place on the student's permanent KU record credits for all academic courses taken at an accredited college or university. Vocational and remedial courses are excluded. Not all courses accepted by the University will apply toward a degree in engineering. A student will not receive engineering degree transfer credit for:

a. Courses in which the grade was lower than C, or which were graded credit/no-credit or pass/fail.
b. More than 64 hours from community or junior colleges.
c. Courses in advanced engineering sciences or engineering design unless they were taken in an engineering program accredited by ABET.

To clearly document the application of engineering transfer course credits toward a specific degree in engineering, there is a "transfer contract" form, to be completed by the student and submitted for approval by the appropriate Department and School representatives. Copies of this form are available in the Department or School office. This process should normally be completed during the student's first semester in the Department.

Academic Requirements

All School of Engineering undergraduates are subject to certain academic requirements (detailed in the Undergraduate Catalog) which call in part for maintaining a GPA of 2.0 or better, and which provide for academic probation and eventual dismissal from the School for failure to do so. You are expected to be familiar with these requirements.

Progress through the curriculum requires not just passing all courses required for a particular degree, but passing them at certain levels and/or in the proper sequence.

Course Prerequisites and Corequisites

You must pass (at the appropriate grade level) all prerequisite courses for a given course **before** taking the subsequent course. If Course A is a Corequisite for Course B, Course A must be taken in the same semester as Course B *or* be completed prior to taking Course B.

Upper Level Eligibility

In addition to prerequisites and co-requisites, EECS undergraduates are required to earn ***Upper Level Course Eligibility*** by attaining grades of C or better (C– does not qualify) in each of the following courses:

EE Major	**CoE Major**	**CS Major**	**IC (Astronomy) Major**
(16 courses)	(17 courses)	(13 courses)	(16 courses)
GE21 (both)	GE21 (both)	GE21 (both)	GE21 (both)
PHSX 210 & 216	PHSX 210 & 216	PHSX 210 & 216	PHSX 210 & 216
MATH 125, 126, 127, 220, 290	MATH 125, 126, 127, 220, 290	MATH 125, 126, 127, 290	MATH 125, 126, 127, 220, 290
EECS 101, 140, 168, 202, 212, 220	EECS 101, 140, 168, 210, 202, 212, 220, 268	EECS 101, 140, 168, 210, 268	EECS 101, 140, 168, 210, 268
CHEM 130/150			

IC (Biology) Major	**IC (Chemistry) Major**	**IC (Economics) Major**	**IC (Geography) Major**
(15 courses)	(18 courses)	(12 courses)	(13 courses)
GE21 (both)	GE21 (both)	ENGL 101, GE21	GE21 (both)
MATH 125, 126, 127, 290	MATH 125, 126, 127, 220, 290	MATH 125, 126, 127, 290	MATH 125, 126, 127, 290
EECS 101, 140, 168, 210, 268	EECS 101, 140, 168, 210, 268	EECS 101, 140, 168, 268	EECS 101, 140, 168, 210, 268
CHEM 130, 135	CHEM 130, 135	ECON 142, 144, 520	
BIOL 150, 152			

IC (Journalism) Major	**IC (Physics) Major**
(11 courses)	(16 courses)
GE21 (both)	GE21 (both)
MATH 125, 126, 127, 290	PHSX 210 & 216, 212 & 236
EECS 101, 140, 168, 210, 268	MATH 125, 126, 127, 290
	EECS 101, 140, 168, 210, 268

If you earn less than a C in any of the above listed courses, you must repeat the course at the next available opportunity and you must *not* take a course for which that course is a prerequisite. A grade of a C- will not satisfy the upper level eligibility requirement.

It is *your responsibility* to contact your advisor *before beginning the new semester* regarding any required repetitions and the associated enrollment adjustments (drops and adds).

To enroll in any upper-level EECS course beyond the ULE list , students must have fulfilled the Upper Level Eligibility Requirements detailed above. Exceptions: EECS 312, EECS 330, EECS 361, and EECS 388 may be taken in the same semester as students are completing their upper level eligibility. Students may also petition for a Partial Waiver of Upper Level Eligibility Requirements by completing the appropriate petition, found in the EECS office or at www.eecs.ku.edu.

Schedule of Course Offerings

The semester that courses are offered is indicated on the Suggested Course Sequence flow chart for each major (F=Fall only; S=Spring only; F/S=Fall and Spring; S/SU=Spring and Summer.

Graduation Requirements

In addition to completing each of the required and elective courses listed in the curriculum:

1. You must attain a cumulative grade-point average of at least 2.0 in courses applied toward the degree. You must also have a KU cumulative grade-point average of 2.0 whether or not all courses are being applied to the degree.

2. You must attain a cumulative grade-point average of at least 2.0 in all courses taken in the School of Engineering, including courses not applied toward a degree.

3. If you entered with advanced standing (transfer credit), you must attain a cumulative grade-point average of at least 2.0 in the resident courses applied toward the degree and at least a 2.0 in all courses taken in the school.

4. You must take the last 30 hours of credit toward the degree at KU and be officially enrolled in the School of Engineering during this time.

Departmental Honors

A student may graduate with departmental honors in any of the four majors by satisfying the requirements below. Most of the requirements for graduation with Honors are completed during the final two semesters of the undergraduate program.

1. The student must file an application to graduate with Departmental Honors during the semester preceding the student's final two semesters (a summer semester may count as one of these). This must be done prior to enrolling in any EECS 498 course (see step 3 below). These forms are available in 2001Eaton Hall. Applicants must have an overall GPA of 3.25 or higher and an engineering GPA of 3.5 or higher. Applicants must identify a research topic and obtain consent of a faculty member to supervise the Honors research.

2. Applicants who receive preliminary approval must remain enrolled full-time and must maintain the above minimum cumulative overall and engineering GPAs until graduation.

3. Applicants who receive preliminary approval must enroll in EECS 498: Honors Research for one credit hour for his/her last two semesters (a summer semester may count as one of theses) under the supervision of the faculty member named in the Honors application. These credits are in addition to those required for the degree.

4. The student must complete an independent research project paper and oral presentation to a panel of three faculty members, including the research supervisor. This panel makes the recommendation concerning graduating with honors.

Scheduling Your Time

Obtaining a degree in Electrical Engineering, Computer Engineering, Computer Science or Interdisciplinary Computing requires a commitment to organization and planning, as well as dedicating a large portion of time to in-class work, lab-work, and homework.

Time is probably the most important factor when deciding how many classes to take each semester. If you have job or family commitments, you need to consider taking fewer courses in order to successfully proceed through the curriculum. The Department suggests planning for two to three hours out-of-class study time for every one hour spent in the classroom. Students are strongly discouraged from violating the following "60-hour rule". (Total-credit-hours x 3) + weekly-employment-hours ≤ 60 hours. If you are not closely following the Suggested Course Sequence for your degree, you should develop and keep current a complete plan of study for your chosen degree. This should be done at each semester's meeting with your faculty advisor (see below).

Advising and Enrollment

General Procedures

Each entering freshman or transfer student is encouraged to attend one of the University's summer orientation programs. At the summer orientation program, students are advised on course selection for the fall semester and given the opportunity to enroll. Students who cannot attend an orientation program confer with faculty advisors a day or two before the fall semester begins. Similar orientation programs are offered in January.

After the initial orientation advising, every EECS undergraduate is assigned a permanent faculty advisor. You should consult with your advisor at enrollment time and at any other time when questions or problems arise concerning your progress at the University or your professional future.

All continuing EECS students are to enroll during the regular enrollment periods that occur about half-way through a given semester for courses to be taken in the subsequent semester, i.e. in October/November for the following Spring semester and in March/April for the following Summer session and Fall semester. Residual enrollment is only for new students and for continuing students who, for very good reasons, were unable to utilize the regular enrollment periods.

Each semester, all first year undergrads and all undergrads who are on probation are required to meet with their assigned EECS faculty advisor to plan your schedule and discuss other academic and career interests. Non-first year undergrads (and those not on probation) are not required to meet with their faculty advisor, but are strongly encouraged. You should watch for department notices that includes information related to advising and enrollment. At the time of the appointment you should bring an Academic Program Planning Form (available at the EECS office or at www.eecs.ku.edu) filled out with preliminary course selections. You should also arrive with definite notions (preferably written down so they will not be forgotten) about both (a) what you are sure of in terms of plans for the coming semester and about degree requirements in general, and (b) what you are unsure of that you need to discuss. This will make it possible for you and your advisor to deal effectively with whatever problems or concerns you have. You and our advisor must sign your Academic Program Planning Form before you will be allowed to enroll.

You are also encouraged to contact on your advisor any time during the school year if you wish to change your enrollment or discuss any other school or career related matters. Consultation with an advisor is strongly encouraged before making enrollment changes.

There are a number of Department and School policies concerning course selection and enrollment in both engineering and non-engineering courses. Many of these are discussed below, and the latest University catalog may have more information on some topics. Also, you should regularly check the EECS web site at www.eecs.ku.edu. Important notices regarding advising and enrollment are sent to your EECS student email account; make sure you check your KU email account regularly or arrange to have your KU account email forwarded to another account that you check regularly.

Auditors

A person enrolled at KU may, with permission of the instructor of the course involved, audit a course. Auditors may not take examinations, submit daily assignments, or use laboratory equipment if a laboratory is part of the course. When auditing is allowed, students enroll and pay tuition, but not fees. No University credit is awarded.

Change of Advisor

If for good reason (change of major, extreme conflict) you need to change advisor, you must seek permission of the person with whom you wish to be assigned. The new advisor must inform the department undergraduate administrative assistant of their acceptance of an existing student as a new advisee. This must be done by e-mail or signed note.

Change of Major

If you wish to change majors within the School of Engineering, you must complete a Change of Major form found online at http://engr.ku.edu/forms.

If you wish to change your major to something other than engineering, you need to complete a Change of School Application form at www.registrar.ku.edu.

Curriculum Changes

When degree requirements are revised, students already admitted to that degree and making normal progress toward that degree generally have two options: (1) change to the revised curriculum, or (2) continue under the curriculum in effect when entering the degree program. If no additional time is needed for completion, it is generally advisable to choose the new curriculum.

Double Major

If you wish to double-major (earn two degrees), you must fulfill all the requirements for the degrees in question. You must also consult the Engineering Dean's office and the department and/or school of the second major to find out if there are any additional requirements. If you wish to obtain two degrees offered by the EECS department, the following rule applies: a course that is required for one EECS degree program may not be used to satisfy a Senior Elective or Professional Elective requirement of another EECS degree program.

Graduate Courses

Courses 700-999 are designed for graduate students. Undergraduates may NOT enroll in courses numbered 800-999. An undergraduate student may not enroll in an EECS course numbered 700-799 unless the student's engineering GPA is 3.0 or higher. In addition, it is strongly recommended that the student have a grade of B or higher in each prerequisite course.

Limitation on Enrollment in Engineering Courses

After the 5th day of classes, enrollment in a course offered by the School of Engineering is permissible only with approval of the instructor and special permission of the dean.

The School of Engineering reserves the right to deny admission to courses offered by the school to any student who is officially enrolled in another division of the university and who does not meet the standards established by the School of Engineering for admission or readmission.

Minimum and Maximum Enrollments

The maximum enrollment without the permission of the Dean of the School of Engineering is 19 hours in a semester and 9 hours in a summer session. There is no general minimum enrollment. However, for a particular student, a minimum enrollment requirement may be specified by the terms of a scholarship, student visa, or readmission agreement.

Substitutions

There are frequently times when it is necessary or desirable to make substitutions for a required course. This may occur when courses are transferred from another institution, or when there is a sound reason to substitute a course that lies outside the stated guidelines of the stated curriculum. Substitutions fall into one of the following three categories. Specific forms for cases 2 and 3 are available from the EECS Office.

Case 1:

Courses transferred from another institution that automatically fulfill a course requirement. This occurs when the Advising Report in the KYou portal shows this course with the necessary KU course equivalent number. These courses should also appear on the DPR (Degree Progress Report), but if they don't, a *Transfer Contract* should be filled out, signed by the advisor, and submitted to the Undergraduate Committee who will then forward it to the Associate Dean of The School of Engineering. The DPR, Advising Report, and other information available in the KYou portal show all courses for which KU has given you credit hours and other pertinent information to track your progress as a student at KU.

Case 2:

Technical courses transferred from another accredited institution that clearly contain the appropriate course material for required courses, but do not appear on the DPR form with the necessary KU course number. In this case, a *Transfer Contract* form should be filled out, signed by the advisor and submitted to the Undergraduate Committee who will then forward it to the Associate Dean of The School of Engineering.

Case 3:

Courses transferred from another institution or KU courses that may contain the appropriate course material for required courses, but this equivalence is not obvious. In this case, a *Transfer Contract* should be filled out, signed by the advisor and submitted to the Undergraduate Committee who will then forward it to the Associate Dean of The School of Engineering. If at all possible, these petitions are to be submitted for approval *before* the substituting courses are taken, and in any case at the earliest possible time.

Dropping a Course

General Information:

Dropping courses should be avoided, since dropping almost always carries consequences of some sort; it is better to plan carefully. During advising and enrollment, students will be strongly discouraged from enrolling in more courses than they can realistically be expected to complete. The practice of over-enrolling and dropping excess courses denies other students the opportunity to enroll in the first place. If a student is insistent about enrolling in more courses than the advisor believes is appropriate, the advisor may choose to approve 'with reservations', by recording these reservations on the Academic Program Planning Form.

Even with careful planning, however, you may at some point wish to drop a course that you have already enrolled in. Your advisor should always be consulted before making changes to your class schedule.

Procedural Details:

Deadline dates on dropping procedures and conditions for a given semester are available in the University academic calendar (currently available at http://www.registrar.ku.edu/calendar) in effect for that semester. Learn more about dropping by visiting https://advising.ku.edu/add-swap-drop-repeat

Readmission

Under various circumstances a student may leave the School of Engineering. Depending upon the reason for leaving and the student's current status, there are different procedures to be followed to be reconsidered for a major in the EECS Department.

1. If you leave the School of Engineering but remain a student in good standing at the University of Kansas and then wish to return to the School of Engineering, you would file an *Application for Change of School*. (www.registrar.ku.edu).

2. If you leave the School of Engineering and the University of Kansas and then wish to return to the School of Engineering, you would file an *Application for Readmission.* (https://admissions.ku.edu/apply)

If you have completed additional course work since being dropped from the School of Engineering or leaving the University, you will need to include an up-to-date transcript or a combination of a previous transcript and grade reports for all subsequent work.

University Course Repeat Policy

You can view the Course Repeat Policy at: https://documents.ku.edu/policies/governance/USRR.htm#art2sect2. The Engineering Dean's Office can provide answers to specific questions.

Academic Misconduct

The EECS Department regards academic misconduct as a very serious matter. Students who violate conduct policies will be subject to severe penalties, up through and including dismissal from the School of Engineering. Please refer to the KU Policy Library website under Academic at http://www.policy.ku.edu/ for specific guidelines about actions considered to be academic misconduct and the repercussions of such action.

These actions include, but are not limited to disruption of classes, threatening an instructor or fellow student in an academic setting; giving or receiving of unauthorized aid on examinations or in the preparation of notebooks, themes, reports or other assignments; knowingly misrepresenting the source of any academic work; unauthorized changing of grades; unauthorized use of University approvals or forging of signatures; falsification of research results; plagiarizing of another's work; violation of regulations or ethical codes for the treatment of human and animal subjects; or otherwise acting dishonestly in research.

Honors Programs

University and School of Engineering Honors

The School of Engineering encourages all qualified students to participate in the Honors Program. Students must meet with an engineering advisor every semester and may also meet with an honors program advisor. See the Honors Program website (http://www.honors.ku.edu/).

Frequently Asked Questions

a. ***Who is my advisor? Where can I find their contact information?***

Your advisor assignment can be found using Jayhawk GPS, myKU Portal, or Enroll & Pay. Faculty contact information can be found online: http://eecs.ku.edu/faculty.

b. ***How can I create my own graduation plan?***

Link to EECS online graduation planner: https://gradplan.eecs.ku.edu/login/. You should also use the suggested course sequence flow chart for your degree (found in this handbook) as a guide when creating your graduation plan.

c. ***How do I know when courses are offered?***

The semester that courses are offered is indicated on the Suggested Course Sequence flow chart for each major (F=Fall only; S=Spring only; F/S=Fall and Spring; S/Su=Spring and Summer.

d. ***What is the Degree Progress Report? How can I generate a Degree Progress Report? What if my Degree Progress Report is incorrect?***

The Degree Progress Report (DPR), is an online self-serve tool that allows you to track your progress toward completion of degree requirements. The generated report will: 1) list course work completed at KU and at other schools from which you submitted official transcripts, 2) list course work currently in progress, 3) place course work into degree requirement sections, 4) and identify KU school requirements you still need to satisfy to graduate. You can generate a DPR through the myKU Portal. Use the DPR to monitor your progress and prepare for meetings with your academic adviser. Always consult your adviser before finalizing any decisions related to your academic plan. **The DPR is for tracking your academic progress only and is not an official document.**

e. ***Is it OK for me to take the next course in a sequence, for example Math 126, at the same time I am repeating the prerequisite course, for example Math 125, to raise the grade to C or better?***

Almost never -- for at least two reasons. First, the intent of the C-or-better policy is to get you to build solid foundations. This is not likely to happen if you haven't attained a C or better in the prerequisite course before taking the next course. Second, you may have an impossible examination schedule. For the example cited, Math 125-126, the Math department frequently schedules exams for both courses at the same time. If, in some unusual case, the *academic facts* convince your advisor that it would be appropriate for you to take the two courses at the same time, you should obtain the permission of the department(s) teaching the courses.

f. ***When and for what classes is the Credit/No Credit Option allowed?***

Not recommended. Although the credit/no credit (CR/NC) option is allowed to fulfill GE 2.2 Oral Communication, GE 3H Arts & Humanities, GE 3S Social Sciences, AE 4.1 Human Diversity, AE 4.2 Cultural & Global Awareness, this option has the potential of lowering (not raising) your grade point average, since CR/NC courses are not included in GPA calculations. A Credit/No Credit option is available to all degree-seeking undergraduates. You may enroll in one course a semester under the option, if the course is not in your major or minor. For more information, visit the KU Policy Library. **Warning:** Certain undesirable consequences may result from exercising the option. Some schools, scholarship committees, and honorary societies do not accept this grading system and convert grades of No Credit to "F" when computing grade-point averages.

Please note: Courses required for Upper Level Eligibility are NOT eligible for Credit/No Credit. Students should see their Engineering advisor.

g. ***What is the ROTC policy for electrical engineering, computer engineering, computer science and interdisciplinary computing majors?***

Students who are in training for a commission as a regular or reserve officer in the Reserve Officers Training Corps (ROTC) may petition to apply credit earned in technical courses in aerospace studies, military science, or naval science for graduation. Up to six hours may be petitioned to count toward the Professional Elective requirement.

h. ***How do I locate computer science books, journals and conference proceedings in the KU libraries?***

Print materials on computer science are housed in two different buildings at KU: **Anschutz Library,** 2nd floor (one floor below entry level), Call number QA 75.5-76.9. Anschutz covers mainly computer programming and software. Topics include general theory and application of computers, data processing, parallel processing, computer programming, programming languages, specific makes and models of computers and microprocessors, computer security, database and file management, etc. **Spahr Engineering Library,** 2nd floor, Call number TK 5100-7895. Spahr covers mainly computer engineering and hardware. Topics include telecommunication, signal processing, wireless, data transmission, computer networks, electronic circuits and apparatus, semiconductors, microelectronics, integrated circuits, microwaves, and computer hardware, components, and auxiliary equipment, etc. Sometimes there are materials on a topic in both Anschutz and Spahr.

i. What online publications are available?

The Spahr Engineering Library's web site provides online access to many computer science publications. These include the ACM Digital Library, the IEEE Xplore journals and proceedings since 1998, and many other electronic journals and databases. Online publications are accessible from anywhere on campus. Regardless of location, all computer science books, journals, and conference proceedings are listed in the library's online catalog. The same is true of all library materials at KU in every field of engineering. The catalog gives the location of each and every item .

Entry to the Profession

Job Search Assistance

The Engineering Career Center offers a comprehensive array of services to graduating students seeking permanent employment and to undergraduates seeking career-related summer or coop employment. These services include the on-campus interviewing program; a career fair each February and September; individual counseling and group workshops on resumes, interviewing, and job search strategies; resume-writing software; job postings from many employers not interviewing on campus; a library of employer and career literature; and mailing of student resumes to employers with job vacancies.

Although employment for engineering graduates depends on economic conditions, graduates from the KU School of Engineering consistently have been able to find responsible, high-paying positions in the profession. The Career Services Center does not guarantee employment to any graduate, but it makes every effort to help students who have initiated job searches. Services are available only to employers who support and implement the spirit and letter of state and federal laws in the matter of equal employment opportunity and nondiscriminatory practices.

Licensing

Engineering licensure laws vary from state to state, but, in general, to become a Professional Engineer (PE) an individual must be a graduate of an engineering program accredited by the Accreditation Board for Engineering and Technology, pass the Fundamentals of Engineering exam (usually taken during a student's senior year), gain four years of experience working under a PE, and pass the Principles and Practice of Engineering exam.

Students in the School of Engineering are encouraged to supplement their academic programs by participating in professional activities offered by the school's student organizations.

Student Activities/Organizations

Engineering Student Council

The Engineering Student Council, composed of elected representatives of the engineering student body, is the student governance organization for the School of Engineering. The purpose of Engineering Student Council (ESC) is to facilitate communication between the faculty and staff of the University of Kansas School of Engineering and its students, promoting engineering education and involvement within the school, and serving as a collective voice for the engineering student community . Engineering Student Council also sponsors an Engineering Exposition each year. Student groups and organizations plan and create exhibits that describe specialized areas of engineering and demonstrate engineering processes and resultant products. Awards are given for the best student displays.

Honor Societies

In their junior and senior years, outstanding engineering students may be invited to join one or more of the engineering honor societies on campus. These include Tau Beta Pi, all engineering disciplines; Eta Kappa Nu, electrical engineering and computer engineering; and Upsilon Pi Epsilon, computer science.

Diversity, Equity, Inclusion & Belonging

The University of Kansas School of Engineering is committed to serving our state, nation, and the world by increasing the number of diverse engineers, including women and underrepresented minorities, that can address and create solutions for the complex, multicultural, multidisciplinary challenges that exist in today's global society. The Diversity and Women's Programs department is home to the IHAWKe and KUEST programs. IHAWKe is an academic support program for college students that is designed to help students connect with others, change the world, and conquer their classes. The KUEST (KU Engineering, Science, and Technology) program is geared toward engaging underrepresented minority and female middle and high school level students with engineering, including students from low-income and first generation families.

National Professional Societies

Most national professional societies have student chapters on campus. In EECS, the primary societies are the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE).

Student Publication

Students in the School of Engineering publish a magazine, the *Kansas Engineer*, for distribution on campus and to alumni who subscribe.

Catalog Description of Courses Open to Undergraduates Offered by the EECS Department

EECS 101 New Student Seminar (1)
A seminar intended to help connect freshmen and transfer EECS students to the EECS department, their chosen profession, and each other. Topics include overviews of the various disciplines, curricula and advising, ethics and professionalism, student organizations and extracurricular activities, senior projects, and career planning. Co-requisite: Math 104

EECS 137 Visual Basic for Engineers (3)
Introduction of computer-based problem solving techniques for engineering practice with emphasis on good programming practices and the integration of appropriate computational and related tools. Solutions are computed using Visual Basic, specifically VBA within Excel. Elementary numerical and statistical methods are applied to the solution of sets of linear and nonlinear algebraic equations, linear regression, and root finding. Microsoft Office is used with the computational tools to provide integrated report generation capability. Two lectures and a weekly laboratory instruction. Prerequisite: MATH 104.

EECS 138 Introduction to Computing (3)
Algorithm development, basic computer organization, syntax and semantics of a high-level programming language, including testing and debugging. Concept of structure in data and programs, arrays, top-down design, subroutines and library programs. Abstract data types. System concepts such as compilation and files. Nature and scope of computer science. Prerequisite: MATH 101 or MATH 104, or meeting the requirements to enroll in MATH 115 or MATH 125 or MATH 145.

EECS 140 Introduction to Digital Logic Design (4)
An introductory course in digital logic circuits covering number representation, digital codes, Boolean Algebra, combinatorial logic design, sequential logic design, and programmable logic devices. Grade of C (not C-) required to progress. Corequisite: MATH 104.

EECS 141 Introduction to Digital Logic: Honors (4)
An introductory course in digital logic circuits covering number representation, digital codes, Boolean algebra, combinatorial logic design, sequential logic design, and programmable logic devices. This course is intended for highly motivated students and includes honors-level assignments. Grade of C (not C-) required to progress. Corequisite: MATH 104, plus either acceptance into the KU Honors Program or consent of instructor.

EECS 168 Programming I (4)
Problem solving using a high level programming language and object oriented software design. Fundamental stages of software development are discussed: problem specification, program design, implementation, testing, and documentation. Introduction to programming using an object oriented language: using classes, defining classes, and extending classes. Introduction to algorithms and data structures useful for problem solving: arrays, lists, files, searching, and sorting. Student will be responsible for designing, implementing, testing, and documenting independent programming projects. Professional ethics are defined and discussed in particular with respect to computer rights and responsibilities. Grade of C (not C-) required to progress. Corequisite: MATH 104.

EECS 169 Programming I: Honors (4)
Problem solving using a high level programming language and object oriented software design. Fundamental stages of software development are discussed: problem specification, program design, implementation, testing, and documentation. Introduction to programming using an object oriented language: using classes, defining classes, extending classes. Introduction to algorithms and data structures useful for problem solving: arrays, lists, files, searching, and sorting. Students will be responsible for designing, implementing, testing, and documenting independent programming projects. Professional ethics are defined and discussed in particular with respect to computer rights and responsibilities. This course is intended for highly motivated students and includes honors-level assignments. Grade of C (not C-) required to progress. Corequisite: MATH 104, plus either acceptance into the KU Honors Program or consent of instructor.

EECS 202 Circuits I (4)
Analysis of linear electrical circuits: Kirchoff's laws; source, resistor, capacitor and inductor models; nodal and mesh analysis; network theorems; transient analysis; Laplace transform analysis; steady-state sinusoidal analysis. The lab provides training and practice in the use of computational tools (e.g., Matlab), computer-aided circuit analysis (e.g., Pspice), and laboratory skills. Corequisites: Math 220 and Math 290.

EECS 210 Discrete Structures (4)
Mathematical foundations including logic, sets and functions, general proof techniques, mathematical induction, sequences and summations, number theory, basic and advanced counting techniques, solution of recurrence relations, equivalence relations, partial order relations, lattices, graphs and trees, algorithmic complexity, and algorithm design and analysis. Throughout there will be an emphasis on the development of general problem solving skills including algorithmic specification of solutions and the use of discrete structures in a variety of applications. Grade of C (not C-) required to progress. Prerequisites: EECS 168 or 169 (or equivalent) and MATH 122 or MATH 126 or MATH 146.

EECS 212 Circuits II (4)
Continued study of electrical circuits: Steady-state power analysis, three-phase circuits, transformers, frequency response, and two-port network analysis. Grade of C (not C-) required to progress. Prerequisite: EECS 202.

EECS 220 Electromagnetics I (4)
Vector analysis. Electrostatic and magnetostatic fields in a vacuum and material media. Electromagnetic fields and Maxwell's equations for time-varying sources. The relationship between field and circuit theory. Simple applications of Maxwell's equations. Grade of C (not C-) required to progress. Prerequisites: MATH 220, MATH 290, PHSX 210 or PHSX 211, and EECS 202.

EECS 221 Electromagnetics I (3)
Electrostatic and magnetostatic fields in a vacuum and material media. Electromagnetic fields and Maxwell's equations for time-varying sources. The relationship between field and circuit theory. Simple applications of Maxwell's equations. Grade of C (not C-) required to progress. Prerequisites: MATH 127, MATH 220, EECS 202, and either PHSX 210 or PHSX 211.

EECS 268 Programming II (4)
This course continues developing problem solving techniques by focusing on the imperative and object-oriented styles using Abstract Data Types. Basic data structures such as queues, stacks, trees, and graphs will be covered. Recursion. Basic notions of algorithmic efficiency and performance analysis in the context of sorting algorithms. Basic Object-Oriented techniques. An associated laboratory will develop projects reinforcing the lecture material. Three class periods and one laboratory period per week. Grade of C (not C-) required to progress. Prerequisite: EECS 168 or EECS 169.

EECS 312 Electronic Circuits I (3)
Introduction to diodes, BJTs and MOSFETs, and their use in electronic circuits, especially digital circuits. Prerequisite: Upper-level eligibility. Corequisite: EECS 212.

EECS 315 Electric Circuits and Machines (3)
Introduction to DC and AC electrical circuit analysis techniques, AC power calculations, transformers, three-phase systems, magnetic circuits, and DC and AC machines with a focus on applications. Not open to electrical or computer engineering majors. Prerequisite: A course in differential equations and eight hours of physics.

EECS 316 Circuits, Electronics and Instrumentation (3)
Introduction to DC and AC electrical circuit analysis, operational amplifiers, semiconductors, digital circuits and systems, and electronic instrumentation and measurements with a focus on applications. Not open to electrical or computer engineering majors. Students may not receive credit for both EECS 316 and EECS 317. Prerequisite: A course in differential equations and eight hours of physics.

EECS 317 Electronics and Instrumentation (2)
Introduction to operational amplifiers, semiconductors, digital circuits and systems, and electronic instrumentation and measurements with a focus on applications. Not open to Electrical or Computer Engineering majors. Students may not receive credit for both EECS 316 and EECS 317. Prerequisite: EECS 315.

EECS 318 Circuits and Electronics Lab (1)
Laboratory exercises intended to complement EECS 316 and EECS 317. Experiments include DC circuits, analog electronics, and digital electronics. Not open to electrical or computer engineering majors. Corequisites: EECS 316 or EECS 317.

EECS 330 Data Structures & Algorithms (4)
A first course in abstract data structures and algorithmic design making use of these structures. Topics include asymptotic analysis, trees, dictionaries, heaps, disjoint set structures; divide and conquer, greedy, and dynamic programming algorithms. Prerequisites: EECS 210, EECS 268, and Upper-level eligibility.

EECS 348 Software Engineering I (3)
This course is an introduction to software development fundamentals and software engineering. It incorporates a thorough introduction to a compiled programming language. A baseline knowledge of tools and utilities is covered including the shell, common programs, version control, IDEs, editors, and build tools. Topics include: software development principles (e.g., design patterns, modularity, loose coupling), extending larger codebases, developing larger codebases, continuous integration, continuous deployment, debugging, unit testing, test-driven development, and databases. Grade of C (not C-) required to progress. Prerequisite: EECS 268.

EECS 360 Signal and System Analysis (4)
Fourier signal analysis (series and transform); linear system analysis (continuous and discrete); Z-transforms; analog and digital filter analysis. Analysis and design of continuous and discrete time systems using MATLAB. Prerequisites: upper-level EECS Eligibility and EECS 212.

EECS 361 Signal and System Analysis (3)
Fourier signal analysis (series and transform); linear system analysis (continuous and discrete); z-transforms, analog and digital filter analysis; analysis and design of continuous and discrete time system using MATLAB. Prerequisites: EECS 212 and upper-level EECS Eligibility.

EECS 368 Programming Language Paradigms (3)
The course is a survey of programming languages: their attributes, uses, advantages, and disadvantages. Topics include scopes, parameter passing, storage management, control flow, exception handling, encapsulation and modularization mechanism, reusability through genericity and inheritance, and type systems. In particular, several different languages will be studied which exemplify different language philosophies (e.g., procedural, functional, object-oriented, logic, scripting). Prerequisites: EECS 268 and upper-level EECS eligibility.

EECS 388 Embedded Systems (4)
This course will address internal organization of micro-controller systems, sometimes called embedded systems, used in a wide variety of engineered systems: programming in C and assembly language; input and output systems; collecting data from sensors; and controlling external devices. This course will focus on one or two specific microprocessors, software development and organization, and building embedded systems. Prerequisites: EECS 140 or 141 and EECS 168 or 169 and upper-level EECS eligibility.

EECS 399 Projects (1-5)
An electrical engineering, computer engineering, or computer science project pursued under the student's initiative, culminating in a comprehensive report, with special emphasis on orderly preparation and effective composition. Prerequisites: upper-level EECS eligibility and consent of instructor.

EECS 412 Electronic Circuits II (4)
Discrete and integrated amplifier analysis and design. Introduction to feedback amplifier analysis and design. Introduction to feedback amplifiers. Prerequisites: EECS 312 and upper-level EECS eligibility.

EECS 420 Electromagnetics II (4)
This course applies electromagnetic analysis to high frequency devices and systems where wave propagation effects cannot be neglected. Topics covered include transmission lines, space waves, waveguides, radiation, and antennas. Laboratory experiments include transmission line, waveguide, and antenna measurements and characterizations. 3 hours lecture, 1 hour laboratory. Prerequisites: EECS 220 and upper-level EECS eligibility.

EECS 441 Power Systems Engineering II (3)
A continuation of ARCE 640 that integrates system components into functional, safe, and reliable power distribution systems for commercial, industrial and institutional (CII) facilities. Service entrance design, distribution system layout and reliability, emergency and standby power system design, medium-voltage distribution systems, symmetrical fault analysis and special equipment and occupancies. (Same as ARCE 641.) Prerequisites: Either ARCE 640 or EECS 212, and upper-level EECS Eligibility.

EECS 443 Digital Systems Design (4)
The design of computer systems from the hardware point of view. The implementation of functional and control units. Introduction to VHDL, and its use in modeling and designing digital systems. Prerequisite: EECS 388.

EECS 444 Control Systems (3)
An introduction to the modeling, analysis, and design of linear control systems. Topics include mathematical models, feedback concepts, state-space methods, time response, system stability in the time and transform domains, design using PID control and series compensation, and digital controller implementation. Prerequisites: EECS 212 and EECS 360.

EECS 447 Introduction to Database Systems (3)
Introduction to the concept of databases and their operations. Basic concepts, database architectures, storage structures and indexing, data structures: hierarchical, network, and relational database organizations. Database design and normalization: ER model, candidates keys, functional dependencies, normal forms, decomposition. Emphasis on relational databases, relational algebra, and SQL. Introduction to views, transactions, and database access control. Introduction to database security, big data, NoSQL, CAP theorem, key-value stores. Prerequisites: upper-level EECS Eligibility or departmental consent.

EECS 448 Software Engineering I (4)
This course is an introduction to software engineering, and it covers the systematic development of software products. It outlines the scope of software engineering, including life-cycle models, software process, teams, tools, testing, planning, and estimating. It concentrates on requirements, analysis, design, implementation, and maintenance of software products. The laboratory covers CASE tools, configuration control tools, UML diagrams, integrated development environments, and project specific components. Prerequisites: EECS 268 and upper-level EECS eligibility.

EECS 455 Cyber Defense Practice (1)
The course introduces cyber defense methods and skills through hands-on practice. Each section will focus on aspects of securing operating systems, securing network access, and securing file systems. To earn three (3) credits, a student must complete three (3) sections.

EECS 461 Probability & Statistics (3)
Introduction to probability and statistics with applications. Reliability of systems. Discrete and continuous random variables. Expectations, functions of random variables, and linear regression. Sampling distributions, confidence intervals, and hypothesis testing. Joint, marginal, and conditional distribution and densities. Prerequisites: Math 127 or 147, Math 290 or 291, and upper-level EECS eligibility.

EECS 465 Cyber Defense (3)
An introduction to critical knowledge and skills needed to administer and defend computer networks and systems. This course focuses on hands-on activities, learning cybersecurity defensive techniques, and understanding well know techniques used by adversaries. Prerequisites: EECS 268. Corequisite: EECS 388.

EECS 468 Programming Paradigms (3)
This course is a survey of programming languages: their attributes, uses, advantages, and disadvantages. Topics include the evolution of programming languages; programming language processing (i.e., compilation, interpretation, and mixed approaches); imperative, functional, and declarative languages; parameter passing and evaluation order; iteration, recursion, and continuation; and the basics of cloud programming (i.e., web services, client/server, synchronous vs. asynchronous programming, building reliable systems, and programming at scale). Prerequisites: EECS 268 and upper-level EECS eligibility.

EECS 470 Electronic Devices and Properties of Materials (3)
An introduction to crystal structures, and metal, insulator, and semiconductor properties. Topics covered include the thermal, electric, dielectric, and optical properties of these materials. A significant portion of this course is devoted to the properties of semiconductors and semiconductor devices. Prerequisites: PHSX 313 and upper-level EECS eligibility.

EECS 498 Honors Research (1-2)
Arranged to allow students to satisfy the independent research requirement for graduation with departmental honors. Prerequisites: Consent of instructor and upper-level EECS eligibility.

EECS 501 Senior Design Laboratory I (3)
A lecture/laboratory course involving the design and implementation of prototypes of electrical and computer type products and systems. The project specifications require consideration of ethics, economics, manu-facturing, and safety. Intended for students graduating the following calendar year. EECS 501 should be immediately followed by EECS 502 in the following semester. Prerequisites: EECS 221, EECS 360, and EECS 412.

EECS 502 Senior Design Laboratory II (3)
A lecture/ laboratory course involving the design and implementation of prototypes of electrical and computer type products and systems. The project specifications require consideration of ethics, economics, health, manufacturing and safety. EECS 501 and EECS 502 must be taken in consecutive fall/spring semesters. Can only be taken during the senior year. Prerequisite: EECS 501.

EECS 510 Introduction to the Theory of Computing (3)
Finite state automata and regular expressions. Context-free grammars and pushdown automata. Turing machines. Models of computable func-tions and undecidable problems. The course emphasis is on the theory of computability, especially on showing limits of computation. May be taken for graduate credit. (Same as MATH 510.) Prerequisites: EECS 210 and upper-level EECS eligibility.

EECS 512 Electronic Circuits III (3)
Feedback amplifier circuit analysis, power amplifiers, analog IC op-amp techniques and analysis, filter approximation and realization, oscillators, wave generators and shapers. Prerequisite: EECS 412.

EECS 541 Computer Systems Design Laboratory I (3)
A two semester lecture/laboratory course involving the specification, design, implementation, analysis, and documentation of a significant hardware and software computer system. Laboratory work involves soft-ware, hardware, and hardware/software trade-offs. Project requirements include consideration of ethics, economics, manufacturing, safety, and health aspects of product development. Intended for students graduating the following calendar year. EECS 541 should be immediately followed by EECS 542 in the following semester. Prerequisites: EECS 443 and EECS 348.

EECS 542 Computer Systems Design Laboratory II (3)
A two semester lecture/laboratory course involving the specification, design, implementation, analysis, and documentation of a significant hardware and software computer system. Laboratory work involves soft-ware, hardware, and hardware/software trade-offs. Project requirements include consideration of ethics, economics, manufacturing, safety, and health aspects of product development. EECS 541 and EECS 542 must be taken in consecutive fall/spring semesters. Can be taken only during the senior year. Prerequisite: EECS 541.

EECS 544 Electric Machines and Drives (3)
Fall 2011 Introduction to electric machine theory, operation, and control. Electric machine covered include DC generators and motors, AC syn-chronous generators and motors, AC induction generators and motors, as well as fractional horsepower and special purpose motors. Motor starting and controls for both DC and AC machines are also covered including as introduction to power electronics and variable frequency drives (VFD). (Same as ARCE 644). Prerequisites: Either ARCE 640 or EECS 212, and upper-level EECS Eligibility.

EECS 545 Electric Energy Production & Storage (3)
An introduction to utility scale and small scale (distributed generation) electric energy production and storage systems. This course addresses the technical, operational, economic, environmental, and social charac-teristics associated with both traditional and nontraditional electric ener-gy production systems along with associated grid integration, energy delivery, and regulatory issues. Traditional energy production systems covered include fossil fuel, hydroelectric, and nuclear power plants. Non-traditional energy production systems covered include fuel cells, photo-voltaics (PV), concentrated solar power (CSP), wind, geothermal, and other emerging technologies. (Same as ARCE 645) Prerequisites: Either ARCE 640 or EECS 212, and upper-level EECS Eligibility..

EECS 547 Power System Analysis I (3)
Introduction to the analysis of commercial, industrial, and utility power systems. Emphasis is placed on modeling system components which include transmission and distribution lines, transformers, induction ma-chines, and synchronous machines and the development of a power sys-tem model for analysis from these components. System modeling will be applied to short-circuit studies and used to analyze symmetrical faults, to develop sequence networks using symmetrical components, and analyze unsymmetrical faults. (Same as ARCE 647.) Prerequisites: Either

ARCE 640 or EECS 212, and upper-level EECS Eligibility.

EECS 548 Power System Analysis II (3)
Continuation of EECS 547 that uses power system modeling developed in EECS 547 to analyze power system load flow, operation and econom-ic dispatch, stability, and transient response. The impact of alternative energy sources, energy storage, DC transmission and interties, and other emerging technologies on power system operation and reliability will be addressed throughout the course. (Same as ARCE 648.) Prerequisites: Either ARCE 647 or EECS 547, and upper-level EECS Eligibility..

EECS 560 Data Structures (4)
Data abstraction and abstract data types. Topics include the design and implementation of dictionary, priority queues, concatenated queue, dis-joint set structures, graphs, and other advanced data structures based on balanced and unbalanced tree structures. Special emphasis will be placed on the implementations of these structures and their performance tradeoffs. Both asymptotic complexity analysis and experimental profil-ing techniques will be introduced. Labs will be used to provide students with hands-on experience in the implementations of various abstract data types and to perform experimental performance analysis. Prerequisite: EECS 210. Corequisite: EECS 448.

EECS 562 Introduction to Communication Systems (4)
A first course in communications, including lectures and integrated la-boratory experiments. After a review of spectral analysis and signal transmission, analog and digital communications are studied. Topics include: sampling, pulse amplitude modulation, and pulse code modula-tion; analog and digital amplitude, frequency, and phase modulation; frequency and time division multiplexing; noise performance of analog modulation techniques. Prerequisites: EECS 212 and EECS 360.

EECS 563 Introduction to Communication Networks (3)
An introduction to the principles used in communication networks is given in this course. Topics include a discussion of the uses of commu-nications networks, network traffic, network impairments, standards, layered reference models for organizing network functions. Local Area Network technology and protocols are discussed. Link, network, transport layer protocols, and security are introduced. TCP/IP networks are stressed. VoIP is used as an example, throughout the course. Basic concepts of network performance evaluation are studied, both analytical and simulation techniques are considered. Prerequisites: EECS 168 and either EECS 461 or Math 526.

EECS 565 Introduction to Information and Computer Security (3)
An introduction to the fundamentals of cryptography and information and computer security. Introduces the basic concepts, theories, and proto-cols in computer security. Discusses how to apply such knowledge to analyze, design and manage secure systems in the real world. Topic cov-ered: the basics of cryptography, software security, operating system security, database security, network security, privacy and anonymity, social engineering, digital forensics, etc. Corequisite: EECS 678. Pre-requisite: upper-level EECS Eligibility.

EECS 569 Computer Forensics (3)
This course covers both the theoretical and practical aspects of computer forensics. The course introduces the basic concepts, methodologies, and techniques to recover, preserve, and examine digital evidence on or transmitted by digital devices. Topics include: crime investigation and digital evidence, file system forensics, application analysis, network evidence acquisition and analysis, mobile device forensics, etc. Prerequi-site: EECS 565.

EECS 581 Software Engineering I (3)
This lecture/laboratory course covers the systematic development of software products. Topics include: scope of software engineering, life-cycle models, software process, teams, ethics, tools, testing, planning, and estimating. It concentrates on requirements, analysis, design, imple-mentation, and maintenance of software products. Prerequisites: EECS 348, EECS 330, EECS 468, and upper-level EECS Eligibility. Corequi-site: EECS 565.

EECS 582 Computer Science & Interdisciplinary Computing Cap-stone (3)
Team-orientated lecture/laboratory course involving the specification, design, implementation, testing, and documentation of a significant soft-ware project over the full course of the semester. The course includes the consideration of project management, economics, and technical writing. Pre-requisites: EECS 581 and upper-level EECS Eligibility.

EECS 611 Electromagnetic Compatibility (3)
A study of unwanted generation and reception of radio-frequency radiation from analog and digital electronic systems and how these emissions/receptions can be reduced. Topics covered include sources of radiation, grounding, shielding, crosstalk, electrostatic discharge, and practical design and layout schemes for reducing unwanted radiation and reception. Also covered are the major governmental electromagnetic compatibility (EMC) regulations and standards that apply to commercial electronic devices and systems. Prerequisites: EECS 220 and EECS 312.

EECS 622 Microwave and Radio Transmission Systems (3)
Introduction to radio transmission systems. Topics include radio transmitter and receiver design, radiowave propagation phenomenology, antenna performance and basic design, and signal detection in the presence of noise. Students will design radio systems to meet specified performance measure. Corequisites: EECS 420 and EECS 461.

EECS 628 Fiber Optic Communication Systems (3)
Description and analysis of the key components in optical communication systems. Topics covered include quantum sources, fiber cable propagation and dispersion characteristics, receiver characteristics, and system gain considerations. Prerequisites: EECS 220 and PHSX 313, or equivalent and upper-level EECS eligibility.

EECS 630 Advanced Data Structures & Algorithms (3)
A second course in abstract data structures and algorithmic design making use of these structures. Emphasis will be on understanding the high-level theoretical intuitions and principles, as well as a concrete understanding of implementation and applications. Topics include advanced treatment of trees, heaps, disjoint set structures, network flow, greedy algorithms, divide and conquer, dynamic programming, and complexity theory. Prerequisites: upper-level EECS Eligibility, EECS 330, and either EECS 461 or Math 526.

EECS 638 Fundamentals of Expert Systems (3)
Basic information about expert systems: architecture of an expert system, building expert systems, uncertainty in expert systems, taxonomy of expert systems. Knowledge representation: first order logic, production systems, semantic nets, frames. Uncertainty in expert systems, one-valued approaches: probability theory, systems using Bayes' rule, and systems using certainty theory; two-valued approaches: systems using Dempster-Shafer theory and system INFERNO; set-valued approaches: systems using fuzzy set theory and systems using rough set theory. Prerequisites: EECS 560 or consent of instructor.

EECS 639 Intro to Scientific Computing (3)
A basic introduction to scientific computing and numerical analysis. Topics include linear equation solving, least squares, nonlinear equation-solving, interpolation, numeral integration and differentiation, ordinary differential equations, and the fast Fourier transform (FFT). Vectorization, efficiency, reliability, and stability of numerical algorithms will be stressed. Applications of algorithms to real-world problems, such as image processing, medicine, electronic circuits, flight trajectories, and molecular modeling, will be emphasized. Students cannot receive credit for both EECS 639 and EECS 781 or Math 781. Prerequisites: Math 127, Math 290, and EECS 168 or equivalent.

EECS 643 Computer Architecture (3)
The structure and design of computing systems. Examination and analysis of computing systems. Examination and analysis of instruction set architectures, pipelined control and arithmetic units, vector processors, memory hierarchies, and performance evaluation. Prerequisites: EECS 443.

EECS 644 Introduction to Digital Signal Processing (3)
Discrete time signal and systems theory, sampling theorem, z-transforms, digital filter design, discrete Fourier transform, FFT, and hardware considerations. Prerequisite: EECS 360.

EECS 645 Computer Systems Architecture (3)
This is an introductory course to the design of single-chip microprocessors and systems. The course covers materials including instruction set architecture, datapath design, control path design, pipelining, multiple-issue superscalar processors, out-of-order processors, memory hierarchy, memory management, multicore, caches, memory technologies, data parallel architectures, interrupts and I/O structures. Only one of EECS 643 and EECS 645 may be used to satisfy EECS degree requirements. Prerequisite: EECS 388.

EECS 647 Introduction to Database Systems (3)
Introduction to the concept of databases and their operations. Basic concepts, database architectures, storage structures and indexing, data structures: hierarchical, network, and relational database organizations. Emphasis on relational databases and retrieval languages SQL, QBE, and ones based on relational algebra and relational calculus; brief description of predicate calculus. Theory of databases, normal forms, normalization, candidates keys, decomposition, functional dependencies, multi-valued dependencies. Introduction to the design of a simple database structure and a data retrieval language. Prerequisites: EECS 448. Student cannot receive credit for both EECS 647 and EECS 746.

EECS 649 Introduction to Artificial Intelligence (3)
General concepts, search procedures, two-person games, predicate calculus and automated theorem proving, nonmonotonic logic, probabilistic reasoning, rule based systems, semantic networks, frames, dynamic memory, planning, machine learning, natural language understanding, neural networks. Corequisite: EECS 368.

EECS 658 Introduction to Machine Learning (3)
This course provides an introduction to the basic methods of machine learning and how to apply them to solve software engineering problems. Topics covered are: supervised learning, unsupervised learning, and reinforcement learning methods; feature selection techniques; structuring machine learning solutions; and evaluation metrics. Prerequisites: EECS 348 and upper-level EECS eligibility.

EECS 660 Fundamentals of Computer Algorithms (3)
Basic concepts and techniques in the design and analysis of computer algorithms. Models of computations. Simple lower bound theory and optimality of algorithms. Computationally hard problems and the theory of NP-Completeness. Introduction to parallel algorithms. Prerequisite: EECS 560 and either EECS 461 or MATH 526.

EECS 662 Programming Languages (3)
Formal definition of programming languages including specification of syntax and semantics. Simple statements including precedence, infix, prefix, and postfix notation. Global properties of algorithmic languages including scope of declaration, storage allocation, grouping of statements, binding time of constituents, subroutines, co-routines, and tasks. Run-time representation of program and data structures. Prerequisites: EECS 368, EECS 388 and EECS 560.

EECS 664 Introduction to Digital Communication Systems (3)
An introduction to building digital communication systems in discrete time, including lectures and integrated laboratory exercises. Topics covered include signal spaces, base-band modulation, bandpass modulation, phase-locked loops, carrier phase recovery, symbol timing recovery, and basic performance analysis. Prerequisites: EECS 360 and EECS 461 or MATH 526.

EECS 665 Compiler Construction (4)
Compilation of programming language constructs. Organization of a compiler including symbol tables, lexical analysis, syntax analysis, intermediate and object code generation, error diagnostics, code optimization techniques and run-time structures in a block-structured language such as C or Rust. Programming assignments include construction of various modules of a compiler. Prerequisites: EECS 348, 468, 510, and upper-level EECS Eligibility.

EECS 670 Introduction to Semiconductor Processing (3)
An overview of various processes to fabricate semiconductor devices and integrated circuits. Topics covered include crystal growth, oxidation, solid-state diffusion, ion implantation, photolithography, chemical vapor deposition, epitaxial growth, metallization, and plasma etching of thin films. (Same as C&PE 655) Prerequisites: senior standing in C&PE or EECS, or consent of instructor.

EECS 672 Introduction to Computer Graphics (3)
Foundations of 2D or 3D computer graphics. Structured graphics application programming. Basic 2D and 3D graphics algorithms (modeling and viewing transformations, clipping, projects, visible line/surface determination, basic empirical lighting and shading models), and aliasing. Prerequisites: EECS 348 and upper-level EECS eligibility.

EECS 675 Introduction to Computer Graphics (3)
This course covers concepts of single-machine multi-threaded programming; multicore programming across a network of machines; and general-purpose computing on GPUs. Typically, more than half of the course focuses on GPUs, including relevant architectural aspects required in order to achieve optimal performance on GPUs. Projects use C++ thread-related tools, OpenMPI, CUDA, and OpenCL. Prerequisites: EECS 348 and upper-level EECS Eligibility.

EECS 678 Introduction to Operating Systems (4)

The objective of this course is to provide the students with the concepts necessary to enable them to: a) identify the abstract services common to all operating systems, b) define the basic system components that support the operating system's machine independent abstractions on particular target architectures, c) consider how the design and implementation of different systems components interact and constrain one another, not merely how one or two important parts work in isolation, and d) understand the means by which fundamental problems in operating systems can be analyzed and addressed. Programming assignments address topics including process creation, inter-process communication, system call implementation, process scheduling and virtual memory. Laboratory exercises primarily focus on use of tools and concepts required for the programming assignments but include a small number of independent topics. Prerequisites: EECS 388, EECS 348, and upper-level EECS eligibility.

EECS 690 Special Topics: __ (1-3)

Arranged as needed to present appropriate material to groups of students. May be repeated for additional credit. Prerequisites: Varies by topic, plus upper-level EECS eligibility and consent of instructor.

EECS 692 Directed Reading (1-3)

Reading under the supervision of an instructor on a topic chosen by the student with the advice of the instructor. May be repeated for additional credit. Consent of the department required for enrollment. Prerequisites: Upper-level EECS eligibility and consent of instructor.

EECS 700 Special Topics ___ (1-5)

Courses on special topics of current interest in electrical engineering, computer engineering, or computer science, given as the need arises. May be repeated for additional credit. Prerequisite: Varies by topic, plus upper-level EECS eligibility and consent of instructor.

EECS 710 Information Security and Assurance (3)

This introductory security course covers a wide range of topics in the area of information and network security, privacy, and risk: the basic concepts: confidentiality, integrity and availability; introduction to cryptography; authentication; security models; information and database security; computer systems security; network security; Internet and web security; risk analysis; social engineering; computer forensics. Prerequisites: Graduate standing in EECS, or permission of the instructor.

EECS 711 Security Management and Audit (3)

Administration and management of security of information systems and networks, intrusion detection systems, vulnerability analysis, anomaly detection, computer forensics, auditing and data management, risk management, contingency planning and incident handling, security planning, e-business and commerce security, privacy, traceability and cyber-evidence, legal issues in computer security. Prerequisite: EECS 710.

EECS 712 Network Security and its Application (3)

This course focuses on network-based information and communication systems, and examines network technologies and service applications to provide the students with a comprehensive introduction to the field of network security and its application. The course covers key concepts and critical network security services including authentication and access control, integrity and confidentiality of data, routing, firewalls, virtual private networks, web security, virus protection, and network security architecture and policy development. The students are expected to understand the technical vulnerabilities of networked systems and to develop methods to eliminate or mitigate those vulnerabilities. Prerequisites: EECS 710 and EECS 780, or the instructor's approval.

EECS 713 High Speed Digital Circuit Design (3)

Basic concepts and techniques in the design and analysis of high-frequency digital and analog circuits. Topics include: transmission lines, ground and power planes, layer stacking, substrate materials, terminations, vias, component issues, clock distribution, cross-talk, filtering and decoupling, shielding, signal launching. Prerequisites: EECS 312 and senior or graduate standing. EECS 420 recommended.

EECS 718 Graph Algorithms (3)

This course introduces students to computational graph theory and various graph algorithms and their complexities. Algorithms and applications covered will include those related to graph searching, connectivity and distance in graphs, graph isomorphism, spanning trees, shortest paths, matching, flows in network, independent and dominating sets, coloring and covering, and Traveling Salesman and Postman problems. Prerequisites: EECS 560 or graduate standing with consent of instructor.

EECS 721 Antennas (3)

Gain, Pattern, and Impedance concepts for antennas. Linear, loop, helical, and aperture antennas (arrays, reflectors, and lenses). Cylindrical and biconical antenna theory. Prerequisites: EECS 360, and EECS 420, or EECS 720 or permission of the instructor.

EECS 723 Microwave Engineering (3)

Survey of microwave systems, techniques, and hardware. Guided-wave theory, microwave network theory, active and passive microwave components. The four-hour version of the course includes a laboratory. Prerequisite: EECS 420.

EECS 725 Introduction to Radar Systems (3)

Basic radar principles and applications. Radar range equation. Pulsed and CS modes of operation for detection ranging, and extracting Doppler information. Prerequisites: EECS 360, EECS 420, EECS 461, EECS 622 recommended.

EECS 728 Fiber-Optic Measurement and Sensors (3)

The course will focus on fundamental theory and various methods and applications of fiber-optic measurements and sensors. Topics include: optical power and loss measurements, optical spectrum analysis, wavelength measurements, polarization measurements, dispersion measurements, PMD measurements, optical amplifier characterization, OTDR, optical components characterization and industrial applications of fiber-optic sensor. Prerequisites: EECS 628 or equivalent.

EECS 730 Introduction to Bioinformatics (3)

This course provides an introduction to bioinformatics. It covers computational tools and databases widely used in bioinformatics. The underlying algorithms of existing tools will be discussed. Topics include: molecular biology databases, sequence alignment, gene expression data analysis, protein structure and function, protein analysis, and proteomics. Prerequisites: Data Structures Class equivalent to EECS 560, and Introduction to Biology equivalent to BIOL 150, or consent of instructor.

EECS 731 introduction to Data Science (3)

This course covers topics in data collection, data transmission, and data analysis, in support of discoveries and innovations based on massive amounts of data. EECS 731 surveys current topics in data science. It provides a comprehensive review of theory, algorithms, and tools that are used in data science and prepares students to take in-depth following up courses in EECS. EECS 731 is a project-oriented course. It offers hands-on experience for students to integrate knowledge from a wide-range of topics in data science without dwelling on any particular subfield of data science. Prerequisites: EECS 268 or experience with object oriented programming and large programs. MATH 290 or experience with linear algebra. EECS 461 or MATH 526 or experience with probability and statistics. Or consent from the instructor.

EECS 738 Machine Learning (3)

Machine learning is the study of computer algorithms that improve automatically through experience" (Tom Mitchell). This course introduces basic concepts and algorithms in machine learning. A variety of topics such as Bayesian decision theory, dimensionality reduction, clustering, neural networks, hidden Markov models, combining multiple learners, reinforcement learning, Bayesian learning etc. will be covered. Prerequisites: Graduate standing in CS or CoE or consent of instructor.

EECS 739 Scientific Parallel Computing (3)

This course is concerned with the application of parallel processing to problems in the natural sciences and engineering. State-of-the-art computing methodologies are studied along with contemporary applications. The course takes a performance-oriented applied approach, with attention to parallel algorithms, parallel architecture, compilation issues, and system evaluation. Prerequisites: MATH 122 or MATH 126; MATH 290; experience programming in C, C++, or Fortran; EECS 639 (or equivalent). Highly recommended: MATH 127

EECS 740 Digital Image Processing (3)

This course gives a hands on introduction to the fundamentals of digital image processing. Topics include: image formation, image transforms, image enhancement, image restoration, image reconstruction, image compression, and image segmentation. Prerequisites: EECS 672 or EECS 744.

EECS 741 Computer Vision (3)

This course gives a hands-on introduction to the fundamentals of computer vision. Topics include: image formation, edge detection, image segmentation, line-drawing interpretation, shape from shading, texture analysis, stereo imaging, motion analysis, shape representation, object recognition. Prerequisites: EECS 672 or EECS 744.

EECS 742 Static Analysis (3)
This course presents an introduction to techniques for statically analyzing programs. Coverage includes theoretical analysis, definition and implementation of data flow analysis, control flow analysis, abstract interpretation, and type and effects systems. The course presents both the underlying definitions and pragmatic implementation of these systems. Prerequisites: EECS 662 or EECS 665 or equivalent.

EECS 743 Advanced Computer Architecture (3)
This course will focus on the emerging technologies to build high-performance, low-power, and resilient microprocessors. Topics include multiprocessing, reliability-and-variability-aware computer architecture designs, energy-efficient computer systems, on-chip networks, 3D microprocessor designs, general-purpose computation on graphics processing units, and non-volatile computer memory. The course responds to VLSI technologies ability to provide increasing numbers of transistors and clock speeds to allow computer architects to build powerful microprocessors and computer systems and the challenges (e.g. resilience, energy-efficiency) that the growth in microprocessor performance is facing from the aggressive technology scaling. Prerequisites: EECS 643 or EECS 645, or equivalent. A good understanding of C/C++ and having basic Unix/Linux skills is required.

EECS 744 Communications and Radar Digital Signal Processing (3)
 The application of DSP techniques to specialized communications and radar signal processing subsystems. Topics include A-D converters, specialized digital filters, software receiver systems, adaptive subsystems and timing. Prerequisites: An undergraduate course in DSP such as EECS 644.

EECS 745 Implementation of Networks (3)
Laboratory-focused implementation of networks. Topics include direct link networks (encoding, framing, error detection, reliable transmission, SONET, FDDL, network adapters, Ethernet, 802.11 wireless networks); packet and cell switching (ATM, switching hardware, bridges and extended LANs); internetworking (Internet concepts, IPv6, multicast, naming/DNS); end-to-end protocols (UDP, TCP, APIs and sockets, RPCs, performance); end-to-end data (presentation formatting, data compression, security); congestion control (queuing disciplines, TCP congestion control and congestion avoidance); high-speed networking (issues, services, experiences); voice over IP (peer-to-peer calling, call managers, call signalling, PBX and call attendant functionality). Prerequisites: EECS 563 and EECS 780.

EECS 746 Database Systems (3)
Introduction to the concept of databases and their operations. Basic database concepts, architectures, and data storage structures and indexing. Though other architectures are discussed, focus is on relational databases and the SQL retrieval language. Normalization, functional dependencies, and multivalued dependencies also covered. Culminates in the design and implementation of a simple database with a web interface. Prerequisites: EECS 448 or consent of instructor. Students cannot receive credit for both EECS 647 and EECS 746.

EECS 750 Advanced Operating Systems (3)
This course builds on the foundation established by an introductory course in operating systems concepts (e.. g. EECS 678). Some previously covered topics are revisited in far greater detail, including code review of relevant portions of the Linux kernel source code. Examples include: computation representation by processes, systems calls, interrupt processing and interrupt concurrency, process execution scheduling and concurrently control methods. Advanced topics, such as system performance analysis, time keeping, clock synchronization, virtualization, real-time implications for system design and scheduling and device implementation are introduced for the first time. Approximately one-quarter to one-third of the class is devoted to reading, presenting and discussing conference and journal papers and either illustrating classic breakthroughs in system architectures and methods or current research issues. Selection of the specific papers is done each semester, and students in the class are encouraged to suggest candidate topics and/or papers for consideration. Perquisites: An undergraduate course in operating systems fundamentals, For example, EECS 678 or equivalent.

EECS 753 Embedded and Real Time Computer Systems (3)
This course will cover emerging and proposed techniques and issues in embedded and real time computer systems. Topics will include new paradigms, enabling technologies, and challenges resulting from emerging application domains. Prerequisites: EECS 645 and EECS 678.

EECS 755 Software Modeling and Analysis (3)
Modern techniques for modeling and analyzing software systems. Course coverage concentrates on pragmatic, formal modeling techniques that support predictive analysis. Topics include formal modeling, static analysis, and formal analysis using model checking and theorem proving systems. Prerequisites: EECS 368 or equivalent.

EECS 759 Estimation and Control of Unmanned Autonomous Systems (3)
An introduction to the modeling, estimation, and control of unmanned autonomous systems. Topics include motion description, navigation sensors, complementary filters, Kalman filters, attitude estimation, position estimation, attitude keeping controller, etc. The successful completion of this course will prepare students for advanced studies in robotics & controls. Prerequisites: MATH 627, AE 551 or AE 552 or EECS 444, or by consent of instructor.

EECS 762 Programming Language Foundation I (3)
This course presents a basic introduction to the semantics of programming languages. The presentation begins with basic lambda calculus and mechanisms for evaluating lambda calculus terms. Types are introduced in the form of simply typed lambda calculus and techniques for type inference and defining type systems are presented. Finally, techniques for using lambda calculus to define, evaluate and type check common programming language constructs are presented. Prerequisites: EECS 662 or equivalent.

EECS 764 Analysis of Algorithms (3)
Models of computations and performance measures; asymptotic analysis of algorithms; basic design paradigms including divide-and-conquer, dynamic programming, backtracking, branch-and-bound, greedy method and heuristics; design and analysis of approximation algorithms; lower bound theory; polynomial transformation and the theory of NP-completeness; additional topics may be selected from arithmetic complexity, graph algorithms, string matching, and other combinatorial problems. Prerequisites: EECS 660 or equivalent.

EECS 765 Introduction to Cryptography and Computer Security (3)
Comprehensive coverage to the fundamentals of cryptography and computer and communication security. This course serves as the first graduate level security course, which introduces the core concepts, theories, algorithms and protocols in computer and communication security, and also prepares students for advanced security courses. This course first covers the mathematical foundation of cryptography and its applications in computer security. The course also covers a wide range of topics: information and database security, software and computer systems security, network security, Internet and web security. Prerequisites: EECS 678 and (EECS 780 or EECS 563), or the instructor's approval.

EECS 767 Information Retrieval (3)
This class introduces algorithms and applications for retrieving information from large document repositories, including the Web. Topics span from classic information retrieval methods for text documents and databases, to recent developments in Web search, including: text algorithms, indexing, probabilistic modeling, performance evaluation, web structures, link analysis, multimedia information retrieval, social network analysis. Prerequisites: EECS 647 or permission of instructor.

EECS 768 Virtual Machines (3)
Understand the fundamental principles and advanced implementation aspects of key virtual machine concepts. Topics include principles of virtualization, binary translation, process and system level virtual machines, JIT compilation and optimizations in managed environments, garbage collection, virtual machine implementation issues, and virtual machine security. Includes in-depth coverage of the latest developments and research issues in the field of virtual machines. Prerequisites: EECS 665 and either EECS 643 or EECS 645 or consent of instructor.

EECS 769 Information Theory (3)
Information theory is the science of operations on data such as compression, storage, and communication. It is one of the few scientific fields fortunate enough to have an identifiable beginning - Claude Shannon's 1948 paper. The main topics of mutual information, entropy, and relative entropy are essential for students, researchers, and practitioners in such diverse fields as communications, data compression, statistical signal processing, neuroscience, and machine learning. The topics covered in this course include mathematical definitions and properties of information, mutual information, source coding theorem, lossless compression of data, optimal lossless coding, noisy communication channels, channel coding theorem, the source channel separation theorem, multiple access channels, broadcast channels, Gaussian noise, time-varying channels, and network information theory. Prerequisites: EECS 461 or MATH 526 or an equivalent undergraduate probability course.

EECS 773 Advanced Graphics (3)
Advanced topics in graphics and graphics systems. Topics at the state of the art typically selected from: photorealistic rendering; physically-based lighting models; ray tracing; radiosity; physically-based modeling and rendering; animation; general texture mapping techniques; point-based graphics; collaborative techniques; and others. Prerequisites: EECS 672 or permission of instructor.

EECS 774 Geometric Modeling (3)
Introduction to the representation, manipulation, and analysis of geometric models of objects. Implicit and parametric representations of curves and surfaces, with an emphasis on parametric freeform curves and surfaces such as Bezier and Nonuniform Rational B-Splines (NURBS). Curve and surface design and rendering techniques. Introduction to solid modeling: representations and basic algorithms. Projects in C/C++ using OpenGL. Prerequisites: EECS 672 or permission of instructor.

EECS 775 Visualization (3)
Data representations, algorithms, and rendering techniques typically used in Visualization applications. The emphasis is on Scientific Visualization and generally includes topics such as contouring and volumetric rendering for scalar fields, glyph and stream (integral methods) for vector fields, and time animations. Multidimensional, multivariate (MDMV) visualization techniques; scattered data interpolation; perceptual issues. Prerequisites: General knowledge of 3D graphics programming or permission of instructor.

EECS 776 Functional Programming and Domain Specific Languages (3)
An introduction to functional programming. Topics include learning how to program in Haskell; IO and purity in software engineering; functional data structures and algorithms; monads and applicative functors; parsing combinators; Domain Specific Languages (DSLs) and DSL construction; advanced type systems; making assurance arguments; testing and debugging. Prerequisites: EECS 368 or equivalent or consent of instructor.

EECS 780 Communication Networks (3)
Comprehensive in-depth coverage to communication networks with emphasis on the Internet and the PSTN (wired and wireless). Extensive coverage of protocols and algorithms will be presented at all levels, including: social networking, overlay networks, client/server and peer-to-peer applications; session control; transport protocols, the end-to-end arguments and end-to-end congestion control; network architecture, forwarding, routing, signaling, addressing, and traffic management; quality of service, queueing and multimedia applications; LAN architecture, link protocols, access networks and MAC algorithms; physical media characteristics and coding; network security and information assurance; network management. Prerequisites: EECS 563 or equivalent or permission of instructor.

EECS 781 Numerical Analysis I (3)
Finite and divided differences. Interpolation, numerical differentiation, and integration. Gaussian quadrature. Numerical integration of ordinary differential equations. Curve fitting. (Same as MATH 781). Prerequisites: MATH 320 and knowledge of a programming language .

EECS 782 Numerical Analysis II (3)
Direct and interactive methods for solving systems of linear equations. Numerical solution of partial differential equations. Numerical determination of eigenvectors and eigenvalues. Solution of nonlinear equations. (Same as MATH 782). Prerequisite: EECS 781.

EECS 784 Science of Communication Networks (3)
Comprehensive introduction to the fundamental science that is the basis for the architecture, design, engineering, and analysis of computer networks. Topics covered will include foundations on: Structure of networks: graph theory, complex systems analysis, centrality, spectral analysis, network flows, and network topology; Identification of network entities: naming, addressing, indirection, translation, and location; Operation of protocols and information transfer: automata, control theory, Petri nets, layering and cross-layering, protocol data units; Policy and tussle: game theory, decision theory; Resilience: dependability (reliability, availability, and maintainability), performability, fault tolerance, and survivability. Open-source tools will be used for network modelling and analysis. Prerequisites: EECS upper-level eligibility, graduate standing, or permission of the instructor.

EECS 786 Digital Very-Large-Scale-Integration (3)
This course covers the basic concepts of Integrated Circuit (IC) design, various methods of designing VLSI circuits, and techniques to analyze and optimize performance metrics, such as: speed, area, power and signal integrity. Clocking, interconnect and scaling issues of IC will also be discussed. The topic will cover device, interconnect and circuit level implementation issues of both logic and memory circuits. It will also briefly introduce the high performance issues, fabrication technologies and system level implementation approaches of IC to establish bridges to the advanced courses. Prerequisite: EECS 312.

EECS 788 Analogy Circuit Design (3)
This course covers the analysis and design of analog and mixed signal integrated circuits, with an emphasis on design principles for realizing state-of-the-art analog circuits. Modern circuit design is a "mixed signal" endeavor thanks to the availability of sophisticated process technologies that allow bipolar and CMOS (Complementary Metal Oxide Semiconductor), power and signal, passive and active components on the same die. It is then up to the circuit designer's creativity and inclination to assemble these components into the analog and/or logic building blocks. The course will provide the critical concepts by giving physical and intuitive explanations in addition to the quantitative analysis of important analog building block circuits. First-order hand calculations and extensive computer simulations are utilized for performance evaluation and circuit design. Prerequisite: EECS 412.