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EP.22.030
October 18, 2021

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN SENATE
COMMITTEE ON EDUCATIONAL POLICY
(Final; Information)

EP.22.030 Report of Administrative Approvals through October 11, 2021

Senate committees are authorized to act for and in the name of the Senate on minor matters. Below is a listing of the administrative approvals the Senate Committee on Educational Policy approved at its meeting on October 11, 2021. Additional information for each approval is attached.

A. Undergraduate Programs

1) **BS in Computer Engineering** – in the "Graduate Requirements" text at the top of the Program of Study table, add a link to the campus' General Education requirements website, noting students must complete these requirements along with the language requirement. In the Technical Electives section, add a note to clarify these are taken from the Departmentally Approved List of Technical Electives and are to include at least 1 Electrical Engineering Foundations course, at least 3 Advanced Computing Electives courses, and at least 1 Design Electives course for a total of 29 hours. Organize the list of courses so they are under each of these appropriate subcategories of Technical Electives and have headers accordingly. Remove AE 427, Mechanicals of Polymers (3 hours); ATMS 425, Air Quality Modeling (4 hours); CS 173, Discrete Structures (3 hours); CS 225, Data Structures (4 hours); ECE 374, Introduction to Algorithms & Models of Computation (4 hours); ECE 391, Computer Systems Engineering (4 hours); MATH 213, Basic Discrete Mathematics (3 hours); MATH 416, Abstract Linear Algebra (3 or 4 hours); ME 450, Modeling Materials Processing (3 hours); CS 498, Special Topics sections MP: Logic for Computer Science; VR: Virtual Reality; and AML, Applied Machine Learning (1-4 hours); and ECE 498, Special Topics in ECE section RC: Smart Phone Computing and Applications (0-4 hours). Add BIOE 485, Computational Mathematics for Machine Learning and Imaging (4 hours); CS 435, Cloud Networking (3 or 4 hours); ECE 407, Cryptography (3 or 4 hours); ECE 442, Silicon Photonics (3 or 4 hours); ECE 298, Special Topics – as approved (1-4 hours); STAT 425, Statistical Modeling I (3 or 4 hours); CS 441, Applied Machine Learning (3 or 4 hours); and ECE 484, Principles of Safe Autonomy (4 hours). There is no change to the total hours required for the degree.
2) **BS in Electrical Engineering** – in the "Graduate Requirements" text at the top of the Program of Study table, add a link to the campus' General Education requirements website, noting students must complete these requirements along with the language requirement. In the Technical Electives section, add a note to clarify these are taken from the Departmentally Approved List of Technical Electives and are to include at least 6 hours of non-ECE electives, at least 20 hours of ECE electives, at least 3 Advanced Core Electives, and at least 3 ECE Labs, where at least 1 must be a Hardware Lab for a total of 30 hours. Organize the list of courses so they are under each of these appropriate subcategories of Technical Electives and have headers accordingly. Remove AE 427, Mechanicals of Polymers (3 hours); ATMS 425, Air Quality Modeling (4 hours); ECE 329, Fields and Waves I (3 hours); ECE 340, Semiconductor Electronics (3 hours); ECE 445, Senior Design Project Lab (4 hours); ECE 496, Senior Research Project (2 hours); ECE 499, Senior Thesis (2 hours); MATH 416, Abstract Linear Algebra (3 or 4 hours); and ME 450, Modeling Materials Processing (3 hours). Add BIOE 485, Computational Mathematics for Machine

Learning and Imaging (4 hours); CS 416, Data Visualization (3 or 4 hours); CS 435, Cloud Networking (3 or 4 hours); CS 441, Applied Machine Learning (3 or 4 hours); ECE 407, Cryptography (3 or 4 hours); ECE 442, Silicon Photonics (3 or 4 hours); ECE 298, Special Topics – as approved (1-4 hours); STAT 425, Statistical Modeling I (3 or 4 hours); and ECE 484, Principles of Safe Autonomy (4 hours)/ There is no change to the total hours required for the degree.

3) **Minor in Electrical and Computer Engineering** – in the Programming Requirement section, clarify the "Select one of the following (with no particular preference)" to add "unless ECE 220 is taken. Remove CS 125, Intro Computing: Engrg & Sci (4 hours) and add CS 124, Introduction to Computer Science I (3 hours). In the "Select one of the following options…" lists, add the total number of hours required from each list for clarity (10-11 for the Electrical Engineering Option and 15-16 for the Computing Engineering Option). There is no change to the total hours required for the minor.

10KP0109BS: COMPUTER ENGINEERING, BS

In Workflow

1. U Program Review (dforgacs@illinois.edu; eastuby@illinois.edu; aledward@illinois.edu)
2. 1933 Head (b-hajek@illinois.edu; oelze@illinois.edu; erhan@illinois.edu)
3. KP Committee Chair (bsnewell@illinois.edu; kcp@illinois.edu; jmakela@illinois.edu; amccul2@illinois.edu; bodony@illinois.edu)
4. KP Dean (candyd@illinois.edu)
5. University Librarian (jpwilkin@illinois.edu)
6. Provost (kmartens@illinois.edu)
7. Senate EPC (bjlehman@illinois.edu; moorhouz@illinois.edu; kmartens@illinois.edu)
8. Senate (jtempel@illinois.edu)
9. U Senate Conf (none)
10. Board of Trustees (none)
11. IBHE (none)
12. HLC (kmartens@illinois.edu)
13. DMI (eastuby@illinois.edu; aledward@illinois.edu; dforgacs@illinois.edu)

Approval Path

1. Fri, 17 Sep 2021 20:55:47 GMT
   Deb Forgacs (dforgacs): Approved for U Program Review
2. Fri, 17 Sep 2021 21:07:12 GMT
   Erhan Kudeki (erhan): Approved for 1933 Head
3. Tue, 05 Oct 2021 18:30:37 GMT
   Brooke Newell (bsnewell): Approved for KP Committee Chair
4. Tue, 05 Oct 2021 18:34:19 GMT
   Candy Deaville (candyd): Approved for KP Dean
5. Tue, 05 Oct 2021 18:35:04 GMT
   John Wilkin (jpwilkin): Approved for University Librarian
6. Wed, 06 Oct 2021 16:44:04 GMT
   Kathy Martensen (kmartens): Approved for Provost

History

1. Apr 24, 2019 by Deb Forgacs (dforgacs)
2. Aug 12, 2019 by Deb Forgacs (dforgacs)
3. Feb 26, 2020 by Brooke Newell (bsnewell)
4. Mar 31, 2020 by Deb Forgacs (dforgacs)
5. Apr 14, 2020 by Deb Forgacs (dforgacs)
6. Apr 19, 2021 by Erhan Kudeki (erhan)
7. May 10, 2021 by Deb Forgacs (dforgacs)

Date Submitted:Fri, 17 Sep 2021 16:12:58 GMT

Viewing:10KP0109BS : Computer Engineering, BS

Changes proposed by: Erhan Kudeki

Proposal Type:

Major (ex. Special Education)

This proposal is for a:

Revision

Administration Details

Official Program Name

Computer Engineering, BS

Sponsor College

Grainger College of Engineering

Sponsor Department

Electrical and Computer Engineering

Sponsor Name

Erhan Kudeki

Sponsor Email

erhan@illinois.edu

College Contact

Brooke Newell

College Contact Email

bsnewell@illinois.edu

Does this program have inter-departmental administration?

No

Proposal Title

Effective Catalog Term

Fall 2021

Provide a brief, concise description (not justification) of your proposal.

Administrative approval: Updating the course list related to Technical Electives, numerically ordering the MATH courses in the Foundational Mathematics and Science courses, and providing clarifying language.

Program Justification

Why are these changes necessary?

Update requested by the College to make corrections related to Technical Electives.

Instructional Resources

Will there be any reduction in other course offerings, programs or concentrations by your department as a result of this new program/proposed change?

No

Does the program include other courses/subjects impacted by the creation/revision of this program?

No

Program Regulation and Assessment

Briefly describe the plan to assess and improve student learning, including the program's learning objectives; when, how, and where these learning objectives will be assessed; what metrics will be used to signify student's achievement of the stated learning objectives; and the process to ensure assessment results are used to improve student learning. (Describe how the program is aligned with or meets licensure, certification, and/or entitlement requirements, if applicable).

CE BS program is ABET Accredited.
The Program Educational Objectives of the CE program presented to ABET is as follows:
The University of Illinois Computer Engineering program will produce graduates having the choice, talents, and knowledge to:
1. Pursue a diverse range of careers as engineers, consultants, and entrepreneurs.
2. Continue their education in leading graduate programs in engineering and interdisciplinary areas to emerge as researchers, experts, and educators.
3. Learn and create new knowledge in ever-changing environments of the 21st century, and communicate their work and ideas to colleagues and the public at large.
4. Practice and inspire high ethical and technical standards, and lead their professional disciplines, organizations, and communities globally.
All four of these objectives require a student to possess all seven of the skills listed as Student Outcomes of our program (see below). The particular career paths listed in the first two objectives are engineers, consultants, entrepreneurs --- reachable directly after the B.S. degree --- as well as researchers, experts, and educators, typically for those graduates who choose to continue their education in some graduate program. Each of these six career choices will critically depend on students acquiring all seven of the particular skills enumerated as Student Outcomes, namely:
1. (Principles) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. (Design) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. (Communication) an ability to communicate effectively with a range of audiences.
4. (Professionalism) an ability to recognize ethical and professional responsibilities in
engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. (Teamwork) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. (Analysis) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. (Learning) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
Student's achievement of these objectives and outcomes are monitored and assessed using using a strategy that depends on Self-Assessment reports written by ECE instructors and course directors as well as student and alumni surveys.

Is the career/profession for graduates of this program regulated by the State of Illinois?

No

Program of Study

"Baccalaureate degree requires at least 120 semester credit hours or 180 quarter credit hours and at least 40 semester credit hours (60 quarter credit hours) in upper division courses" (source: https://www.ibhe.org/assets/files/PrivateAdminRules2017.pdf). For proposals for new bachelor's degrees, if this minimum is not explicitly met by specifically-required 300- and/or 400-level courses, please provide information on how the upper-division hours requirement will be satisfied.

All proposals must attach the new or revised version of the Academic Catalog program of study entry. Contact your college office if you have questions.

Revised programs

Computer Engineering BS_Minor Revision_Side by Side Table.xlsx

Attach a side-by-side comparison with the existing program AND, if the revision references or adds "chose-from" lists of courses students can select from to fulfill requirements, a listing of these courses, including the course rubric, number, title, and number of credit hours.

Catalog Page Text - Overview Tab

Text for Overview tab on the Catalog Page. This is not official content, it is used to help build the new catalog page for the program. Can be edited in the catalog by the college or department.

Computer Engineering at The Grainger College of Engineering focuses on the development of vital computing technologies, ranging from chips to computers to networks to programming tools to key algorithms for building exciting applications. Fundamentally, Computer Engineering addresses the problem of building scalable, trustworthy computing systems, and the faculty's interests span a broad spectrum of issues pertinent to this theme. Computer engineering has taken the lead in revolutionizing many science and engineering disciplines with parallel computing, from chips to clouds to planet-scale critical infrastructures, and has defined new standards of security, privacy, and dependability for systems ranging from small circuits to the electric power grids of many nations. Students need a broad and sound set of mathematical and computing skills, and are well-served by a flexible curriculum that enables them to pursue topics of interest among the many subdisciplines in computing.

The computer engineering core curriculum focuses on fundamental computer engineering knowledge: circuits, systems, electromagnetics, computer systems, electronics for information processing and communication, and computer science. The rich set of ECE elective courses permits students to concentrate in any sub-discipline of computer engineering including: hardware systems; cyberphysical systems; foundations and theory; software and languages; algorithms and mathematical tools; trust, reliability, security; networking, mobile and distributed computing; big data analytics and systems; artificial intelligence, robotics, cybernetics.

Statement for Programs of Study Catalog

Graduation Requirements

Minimum Technical GPA (https://go.grainger.illinois.edu/TechnicalGPA/)**:2.0**
TGPA is required for ECE courses (except ECE 316). SeeTechnical GPA (https://go.grainger.illinois.edu/TechnicalGPA/)to clarify requirements.

Minimum Overall GPA:2.0
Minimum hours required for graduation:128 hours
General education:Students must complete the Campus General Education (https://courses.illinois.edu/gened/DEFAULT/DEFAULT/)**requirements including the campus general education language requirement.Specific Advanced Composition courses required for this degree are listed below.**

Orientation and Professional Development

Code	Title	Hours
ENG 100	Engineering Orientation[1]	0
Total Hours		0

Foundational Mathematics and Science

Code	Title	Hours
MATH 221	Calculus I[2]	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257	Linear Algebra with Computational Applications (Linear Algebra)	3
or MATH 416	Abstract Linear Algebra	
MATH 285	Intro Differential Equations (Linear Algebra)	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
PHYS 214	Univ Physics: Quantum Physics	2
Total Hours		29

Computer Engineering Technical Core

Code	Title	Hours
ECE 110	Introduction to Electronics[3]	3
ECE 120	Introduction to Computing	4
ECE 210	Analog Signal Processing	4
ECE 220	Computer Systems & Programming	4
CS 173	Discrete Structures[4]	3
CS 225	Data Structures	4
ECE 313	Probability with Engrg Applic[5]	3
ECE 374	Introduction to Algorithms & Models of Computation	4
ECE 385	Digital Systems Laboratory	3
ECE 391	Computer Systems Engineering	4
Total Hours		36

Technical Electives

Code	Title	Hours
From the Departmentally Approved List of Technical Electives to include: at least 1 Electrical Engineering Foundations course, at least 3 Advanced Computing Electives, at least 1 Design Elective		**29**
AE 202	Aerospace Flight Mechanics	3
AE 302	Aerospace Flight Mechanics II	3
AE 311	Incompressible Flow	3
AE 312	Compressible Flow	3
AE 321	Mechs of Aerospace Structures	3
AE 352	Aerospace Dynamical Systems	3
AE 353	Aerospace Control Systems	3
AE 402	Orbital Mechanics	3 or 4
AE 403	Spacecraft Attitude Control	3 or 4
AE 410	Computational Aerodynamics	3 or 4
AE 412	Viscous Flow & Heat Transfer	4
AE 416	Applied Aerodynamics	3 or 4
AE 419	Aircraft Flight Mechanics	3 or 4
AE 420	Finite Element Analysis	3 or 4
AE 427	Course AE 427 Not Found	
AE 428	Mechanics of Composites	3
AE 433	Aerospace Propulsion	3 or 4
AE 434	Rocket Propulsion	3 or 4
AE 435	Electric Propulsion	3 or 4
AE 451	Aeroelasticity	3 or 4

AE 460	Aerodynamics & Propulsion Lab	2
Agri. Bio Eng. (ABE): all 300 and 400 level courses except 440. Exceptions for seminars and special topics will be reviewed in Advising Office.		
ASTR 210	Introduction to Astrophysics	3
ASTR 310	Computing in Astronomy	3
ASTR 330	Extraterrestrial Life	3
ASTR 350	The Big Bang, Black Holes, and the End of the Universe	3
ASTR 404	Stellar Astrophysics	3
ASTR 405	Planetary Systems	3
ASTR 406	Galaxies and the Universe	3
ASTR 414	Astronomical Techniques	4
ASTR 450	Astrochemistry	4
ATMS 201	General Physical Meteorology	3
ATMS 301	Atmospheric Thermodynamics	3
ATMS 302	Atmospheric Dynamics I	3
ATMS 303	Synoptic-Dynamic Wea Analysis	4
ATMS 304	Radiative Transfer-Remote Sens	3
ATMS 305	Computing and Data Analysis	3
ATMS 404	Risk Analysis in Earth Science	3 or 4
ATMS 405	Boundary Layer Processes	4
ATMS 406	Tropical Meteorology	4
ATMS 410	Radar Remote Sensing	4
ATMS 411	Satellite Remote Sensing	4
ATMS 420	Atmospheric Chemistry	4
ATMS 421	Earth Systems Modeling	4
ATMS 425	Course ATMS 425 Not Found	
ATMS 447	Climate Change Assessment	3
ATMS 449	Biogeochemical Cycles	4
BIOC 406	Gene Expression & Regulation	3
BIOC 440	Physical Chemistry Principles	4
BIOC 446	Physical Biochemistry	3
BIOC 455	Technqs Biochem & Biotech	4
BIOE 201	Conservation Principles Bioeng	3
BIOE 202	Cell & Tissue Engineering Lab	2
BIOE 302	Modeling Human Physiology	3
BIOE 414	Biomedical Instrumentation	3
BIOE 415	Biomedical Instrumentation Lab	2
BIOE 461	Cellular Biomechanics	4
BIOE 467	Biophotonics	3
BIOE 476	Tissue Engineering	3
BIOE 480	Magnetic Resonance Imaging	3 or 4
BIOE 485	Computational Mathematics for Machine Learning and Imaging	4
Biophysics (BIOP): All 400 level courses except seminars and special topics, which may be reviewed in the Advising Office		
CHBE 221	Principles of CHE	3
CHBE 321	Thermodynamics	4
CHBE 421	Momentum and Heat Transfer	4
CHBE 422	Mass Transfer Operations	4
CHBE 424	Chemical Reaction Engineering	3
CHBE 430	Unit Operations Laboratory	4
CHBE 431	Process Design	4
CHBE 440	Process Control and Dynamics	3
CHBE 451	Transport Phenomena	3

CHBE 452	Chemical Kinetics & Catalysis	3
CHBE 453	Electrochemical Engineering	2 or 3
CHBE 456	Polymer Science & Engineering	3
CHBE 457	Microelectronics Processing	3
CHBE 471	Biochemical Engineering	3 or 4
CHBE 472	Techniques in Biomolecular Eng	3 or 4
CHBE 473	Biomolecular Engineering	3 or 4
CHBE 474	Metabolic Engineering	3 or 4
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab II	1
Chemistry (CHEM): All 200, 300 and 400 level courses except 397, 497, 499, and seminars and special topics, which may be reviewed in the Advising Office		
CEE 310	Transportation Engineering	3
CEE 330	Environmental Engineering	3
CEE 408	Railroad Transportation Engrg	3 or 4
CEE 410	Railway Signaling & Control	3 or 4
CEE 416	Traffic Capacity Analysis	3 or 4
CEE 430	Ecological Quality Engineering	2
CEE 447	Atmospheric Chemistry	4
CEE 491	Decision and Risk Analysis	3 or 4
CPSC 265	Genetic Engineering Lab	3
CS 101	Intro Computing: Engrg & Sci (By Approval)	3
CS 173	Discrete Structures	3
CS 225	Data Structures	4
CS 242	Programming Studio	3
CS 357	Numerical Methods I	3
CS 410	Text Information Systems	3 or 4
CS 411	Database Systems	3 or 4
CS 412	Introduction to Data Mining	3 or 4
CS 413	Intro to Combinatorics	3 or 4
CS 414	Multimedia Systems	3 or 4
CS 416	Data Visualization	3 or 4
CS 418	Interactive Computer Graphics	3 or 4
CS 419	Production Computer Graphics	3 or 4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 421	Programming Languages & Compilers	3 or 4
CS 422	Programming Language Design	3 or 4
CS 423	Operating Systems Design	3 or 4
CS 424	Real-Time Systems	3 or 4
CS 425	Distributed Systems	3 or 4
CS 426	Compiler Construction	3 or 4
CS 427	Software Engineering I	3 or 4
CS 428	Software Engineering II	3 or 4
CS 429	Software Engineering II, ACP	3
CS 431	Embedded Systems	3 or 4
CS 433	Computer System Organization	3 or 4
CS 435	Cloud Networking	3 or 4
CS 436	Computer Networking Laboratory	3 or 4
CS 438	Communication Networks	3 or 4
CS 439	Wireless Networks	3 or 4

CS 440	Artificial Intelligence	3 or 4
CS 445	Computational Photography	3 or 4
CS 446	Machine Learning	3 or 4
CS 447	Natural Language Processing	3 or 4
CS 450	Numerical Analysis	3 or 4
CS 460	Security Laboratory	3 or 4
CS 461	Computer Security I	4
CS 463	Computer Security II	3 or 4
CS 465	User Interface Design	4
CS 466	Introduction to Bioinformatics	3 or 4
CS 467	Social Visualization	3 or 4
CS 473	Algorithms	4
CS 475	Formal Models of Computation	3 or 4
CS 476	Program Verification	3 or 4
CS 477	Formal Software Development Methods	3 or 4
CS 481	Advanced Topics in Stochastic Processes & Applications	3 or 4
CS 484	Parallel Programming	3 or 4
CS 398	Special Topics (As approved)	1 to 4
CS 498	Special Topics (As approved)	1 to 4
ECE 297	Individual Study	1
ECE 304	Photonic Devices	3
ECE 307	Techniques for Engrg Decisions	3
ECE 310	Digital Signal Processing	3
ECE 311	Digital Signal Processing Lab	1
ECE 314	Probability in Engineering Lab	1
ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3
ECE 333	Green Electric Energy	3
ECE 340	Semiconductor Electronics	3
ECE 342	Electronic Circuits	3
ECE 343	Electronic Circuits Laboratory	1
ECE 350	Fields and Waves II	3
ECE 365	Data Science and Engineering	3
ECE 374	Introduction to Algorithms & Models of Computation	4
ECE 380	Biomedical Imaging	3
ECE 391	Computer Systems Engineering	4
ECE 395	Advanced Digital Projects Lab	2 or 3
ECE 396	Honors Project	1 to 4
ECE 397	Individual Study in ECE	0 to 4
ECE 402	Electronic Music Synthesis	3
ECE 403	Audio Engineering	3
ECE 407	Cryptography	3 or 4
ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4
ECE 412	Microcomputer Laboratory	3
ECE 414	Biomedical Instrumentation	3
ECE 415	Biomedical Instrumentation Lab	2
ECE 416	Biosensors	3
ECE 417	Multimedia Signal Processing	4
ECE 418	Image & Video Processing	4
ECE 419	Security Laboratory	3 or 4
ECE 420	Embedded DSP Laboratory	2

ECE 422	Computer Security I	4
ECE 424	Computer Security II	3 or 4
ECE 425	Intro to VLSI System Design	3
ECE 428	Distributed Systems	3 or 4
ECE 431	Electric Machinery	4
ECE 432	Advanced Electric Machinery	3
ECE 435	Computer Networking Laboratory	3 or 4
ECE 437	Sensors and Instrumentation	3
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 441	Physcs & Modeling Semicond Dev	3
ECE 442	Silicon Photonics	3 or 4
ECE 443	LEDs and Solar Cells	4
ECE 444	IC Device Theory & Fabrication	4
ECE 445	Senior Design Project Lab	4
ECE 446	Principles of Experimental Research in Electrical Engineering	4
ECE 447	Active Microwave Ckt Design	3
ECE 448	Artificial Intelligence	3 or 4
ECE 451	Adv Microwave Measurements	3
ECE 452	Electromagnetic Fields	3
ECE 453	Wireless Communication Systems	4
ECE 454	Antennas	3
ECE 455	Optical Electronics	3 or 4
ECE 456	Global Nav Satellite Systems	4
ECE 457	Microwave Devices & Circuits	3
ECE 458	Applic of Radio Wave Propag	3
ECE 459	Communications Systems	3
ECE 460	Optical Imaging	4
ECE 461	Digital Communications	3
ECE 462	Logic Synthesis	3
ECE 463	Digital Communications Lab	2
ECE 464	Power Electronics	3
ECE 465	Optical Communications Systems	3
ECE 466	Optical Communications Lab	1
ECE 467	Biophotonics	3
ECE 468	Optical Remote Sensing	3
ECE 469	Power Electronics Laboratory	2
ECE 470	Introduction to Robotics	4
ECE 472	Biomedical Ultrasound Imaging	3
ECE 473	Fund of Engrg Acoustics	3 or 4
ECE 476	Power System Analysis	3
ECE 478	Formal Software Development Methods	3 or 4
ECE 480	Magnetic Resonance Imaging	3 or 4
ECE 481	Nanotechnology	4
ECE 482	Digital IC Design	3
ECE 483	Analog IC Design	3
ECE 485	MEMS Devices & Systems	3
ECE 486	Control Systems	4
ECE 487	Intro Quantum Electr for EEs	3
ECE 488	Compound Semicond & Devices	3
ECE 489	Robot Dynamics and Control	4
ECE 490	Introduction to Optimization	3 or 4

ECE 491	Numerical Analysis	3 or 4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4
ECE 493	Advanced Engineering Math	3 or 4
ECE 495	Photonic Device Laboratory	3
ECE 496	Senior Research Project	2
ECE 499	Senior Thesis	2
ECE 298	Special Topics (As approved)	1 to 4
ECE 398	Special Topics in ECE (As approved)	0 to 4
ECE 498	Special Topics in ECE (As approved)	0 to 4
ENG 491	Interdisciplinary Design Proj (CubeSat, Solar Decathlon, Formula SAE, Baja SAE or by approval)	1 to 4
GEOL 107	Physical Geology	4
GEOL 208	History of the Earth System	4
GEOL 333	Earth Materials and the Env	4
GEOL 380	Environmental Geology	4
GEOL 411	Structural Geol and Tectonics	4
GEOL 417	Geol Field Methods, Western US	6
GEOL 432	Mineralogy and Mineral Optics	4
GEOL 436	Petrology and Petrography	4
GEOL 440	Sedimentology and Stratigraphy	4
GEOL 450	Probing the Earth's Interior	3
GEOL 452	Introduction to Geophysics	4
GEOL 460	Geochemistry	3
IE 310	Deterministic Models in Optimization	3
IE 330	Industrial Quality Control	3
IE 360	Facilities Planning and Design	3
IE 361	Production Planning & Control	3
IE 400	Design & Anlys of Experiments	3 or 4
IE 410	Advanced Topics in Stochastic Processes & Applications	3 or 4
IE 411	Optimization of Large Systems	3 or 4
IE 412	OR Models for Mfg Systems	3 or 4
IE 413	Simulation	3 or 4
IE 420	Financial Engineering	3 or 4
IE 430	Economic Found of Quality Syst	3 or 4
IE 431	Design for Six Sigma	3
IB 150	Organismal & Evolutionary Biol	4
IB 202	Physiology	3 or 4
IB 203	Ecology	4
IB 204	Genetics	3 or 4
IB 302	Evolution	4
IB 335	Plant Systematics	4
IB 348	Fish and Wildlife Ecology	3
IB 368	Vertebrate Natural History	4
IB 401	Introduction to Entomology	3 or 4
IB 405	Evolution of Traits and Genomes	3
IB 420	Plant Physiology	3
IB 421	Photosynthesis	3
IB 426	Env and Evol Physl of Animals	3
IB 427	Insect Physiology	4
IB 431	Behavioral Ecology	3
IB 432	Genes and Behavior	3
IB 440	Plants and Global Change	3

IB 443	Evolutionary Ecology	3
IB 444	Insect Ecology	3 or 4
IB 451	Conservation Biology	4
IB 452	Ecosystem Ecology	3
IB 453	Community Ecology	3
IB 461	Ornithology	4
IB 462	Mammalogy	4
IB 463	Ichthyology	4
IB 464	Herpetology	4
IB 467	Principles of Systematics	4
IB 468	Insect Classification and Evol	4
IB 471	General Mycology	4
IB 472	Plant Molecular Biology	1
IB 473	Plant Genomics	1
IB 481	Vector-borne Diseases	4
IB 482	Insect Pest Management	3
IB 483	Insect Pathology	3
IB 485	Environ Toxicology & Health	3
IB 486	Pesticide Toxicology	3 or 4
LING 300	Anat & Physiol Spch Mechanism	4
LING 406	Introduction to Computational Linguistics	3 or 4
LING 407	Logic and Linguistic Analysis	3 or 4
LING 427	Language and the Brain	3 or 4
MSE 280	Engineering Materials	3
Material Science and Engineering (MSE): All 300 and 400 level courses except 304, 460, 461, and seminars/special topics, which may be reviewed by the Advising Office		
MATH 213	Basic Discrete Mathematics	3
MATH 347	Fundamental Mathematics	3
MATH 348	Fundamental Mathematics-ACP	4
MATH 357	Numerical Methods I	3
MATH 402	Non Euclidean Geometry	3 or 4
MATH 403	Euclidean Geometry	3 or 4
MATH 412	Graph Theory	3 or 4
MATH 413	Intro to Combinatorics	3 or 4
MATH 414	Mathematical Logic	3 or 4
MATH 416	Abstract Linear Algebra	3 or 4
MATH 417	Intro to Abstract Algebra	3 or 4
MATH 418	Intro to Abstract Algebra II	3 or 4
MATH 423	Differential Geometry	3 or 4
MATH 424	Honors Real Analysis	3
MATH 425	Honors Advanced Analysis	3
MATH 427	Honors Abstract Algebra	3
MATH 428	Honors Topics in Mathematics	3
MATH 432	Set Theory and Topology	3 or 4
MATH 442	Intro Partial Diff Equations	3 or 4
MATH 444	Elementary Real Analysis	3 or 4
MATH 446	Applied Complex Variables	3 or 4
MATH 447	Real Variables	3 or 4
MATH 448	Complex Variables	3 or 4
MATH 450	Numerical Analysis	3 or 4
MATH 453	Number Theory	3 or 4
MATH 473	Algorithms	4

MATH 475	Formal Models of Computation	3 or 4
MATH 481	Vector and Tensor Analysis	3 or 4
MATH 482	Linear Programming	3 or 4
MATH 484	Nonlinear Programming	3 or 4
MATH 487	Advanced Engineering Math	3 or 4
MATH 489	Dynamics & Differential Eqns	3 or 4
MCB 150	Molec & Cellular Basis of Life	4
MCB 250	Molecular Genetics	3
MCB 251	Exp Techniqs in Molecular Biol	2
MCB 252	Cells, Tissues & Development	3
MCB 253	Exp Techniqs in Cellular Biol	2
MCB 300	Microbiology	3
MCB 301	Experimental Microbiology	3
MCB 314	Introduction to Neurobiology	3
MCB 316	Genetics and Disease	4
MCB 354	Biochem & Phys Basis of Life	3
MCB 400	Cancer Cell Biology	3
MCB 401	Cellular Physiology	3
MCB 402	Sys & Integrative Physiology	3
MCB 403	Cell & Membrane Physiology Lab	1 or 2
MCB 404	Sys & Integrative Physiol Lab	1 to 2
MCB 406	Gene Expression & Regulation	3
MCB 408	Immunology	3
MCB 410	Developmental Biology, Stem Cells and Regenerative Medicine	3
MCB 413	Endocrinology	3
MCB 419	Brain, Behavior & Info Process	3
MCB 421	Microbial Genetics	3
MCB 424	Microbial Biochemistry	3
MCB 426	Bacterial Pathogenesis	3
MCB 430	Molecular Microbiology	3
MCB 431	Microbial Physiology	3
MCB 433	Virology & Viral Pathogenesis	3
MCB 435	Evolution of Infectious Disease	3
MCB 446	Physical Biochemistry	3
MCB 480	Eukaryotic Cell Signaling	3
ME 200	Thermodynamics	3
ME 310	Fundamentals of Fluid Dynamics	4
ME 320	Heat Transfer	4
ME 330	Engineering Materials	4
ME 340	Dynamics of Mechanical Systems	3.5
ME 370	Mechanical Design I	3
ME 371	Mechanical Design II	3
ME 400	Energy Conversion Systems	3 or 4
ME 401	Refrigeration and Cryogenics	3 or 4
ME 402	Design of Thermal Systems	3 or 4
ME 403	Internal Combustion Engines	3 or 4
ME 404	Intermediate Thermodynamics	4
ME 410	Intermediate Gas Dynamics	3 or 4
ME 411	Viscous Flow & Heat Transfer	4
ME 412	Numerical Thermo-Fluid Mechs	2 to 4
ME 420	Intermediate Heat Transfer	4
ME 430	Failure of Engrg Materials	3 or 4

ME 431	Mechanical Component Failure	3 or 4
ME 440	Kinem & Dynamics of Mech Syst	3 or 4
ME 445	Introduction to Robotics	4
ME 450	Course ME 450 Not Found	
ME 451	Computer-Aided Mfg Systems	3 or 4
ME 452	Num Control of Mfg Processes	3 or 4
ME 460	Industrial Control Systems	4
ME 461	Computer Cntrl of Mech Systems	3 or 4
ME 471	Finite Element Analysis	3 or 4
ME 472	Introduction to Tribology	3 or 4
ME 485	MEMS Devices & Systems	3
ME 487	MEMS-NEMS Theory & Fabrication	4
MUS 407	Elect Music Techniques I	3
MUS 409	Elec Music Techniques II	2
NEUR 453	Cog Neuroscience of Vision	3 or 4
NPRE 201	Energy Systems	2 or 3
NPRE 247	Modeling Nuclear Energy System	3
NPRE 402	Nuclear Power Engineering	3 or 4
NPRE 412	Nuclear Power Econ & Fuel Mgmt	3 or 4
NPRE 421	Plasma and Fusion Science	3
NPRE 423	Plasma Laboratory	2
NPRE 429	Plasma Engineering	3
NPRE 431	Materials in Nuclear Engrg	3
NPRE 432	Nuclear Engrg Materials Lab	2
NPRE 435	Radiological Imaging	3
NPRE 441	Radiation Protection	4
NPRE 442	Radioactive Waste Management	3
NPRE 444	Nuclear Analytical Methods Lab	2 or 3
NPRE 446	Radiation Interact w/Matter I	3
NPRE 447	Radiation Interact w/Matter II	3
NPRE 448	Nuclear Syst Engrg & Design	4
NPRE 451	NPRE Laboratory	3
NPRE 455	Neutron Diffusion & Transport	4
NPRE 457	Safety Anlys Nucl Reactor Syst	3 or 4
NPRE 458	Design in NPRE	4
NPRE 470	Fuel Cells & Hydrogen Sources	3
NPRE 475	Wind Power Systems	3 or 4
PHYS 225	Relativity & Math Applications	2
PHYS 325	Classical Mechanics I	3
PHYS 326	Classical Mechanics II	3
PHYS 401	Classical Physics Lab	3
PHYS 402	Light	3 or 4
PHYS 403	Modern Experimental Physics	4 or 5
PHYS 406	Acoustical Physics of Music	4
PHYS 419	Space, Time, and Matter-ACP	3 or 4
PHYS 420	Space, Time, and Matter	2
PHYS 427	Thermal & Statistical Physics	4
PHYS 460	Condensed Matter Physics	4
PHYS 466	Atomic Scale Simulations	3 or 4
PHYS 470	Subatomic Physics	4
PHYS 485	Atomic Phys & Quantum Theory	3
PHYS 486	Quantum Physics I	4

PHYS 487	Quantum Physics II	4
PSYC 204	Intro to Brain and Cognition	3
SHS 200	General Phonetics	3
SHS 240	Intro Sound & Hearing Science	3
SHS 300	Anat & Physiol Spch Mechanism	4
SHS 301	General Speech Science	4
SHS 320	Development of Spoken Language	3
SHS 450	Intro Audiol & Hear Disorders	4
SHS 470	Neural Bases Spch Lang	4
STAT 420	Methods of Applied Statistics	3 or 4
STAT 424	Analysis of Variance	3 or 4
STAT 425	Statistical Modeling I	3 or 4
STAT 428	Statistical Computing	3 or 4
STAT 429	Time Series Analysis	3 or 4
STAT 440	Statistical Data Management	3 or 4
SE 411	Reliability Engineering	3 or 4
SE 420	Digital Control Systems	4
SE 423	Mechatronics	3
SE 424	State Space Design for Control	3
TAM 211	Statics	3
TAM 212	Introductory Dynamics	3
TAM 251	Introductory Solid Mechanics	3
TAM 324	Behavior of Materials	4
TAM 335	Introductory Fluid Mechanics	4
TAM 412	Intermediate Dynamics	4
TAM 435	Intermediate Fluid Mechanics	4
TAM 445	Continuum Mechanics	4
TAM 451	Intermediate Solid Mechanics	4
Select one course from the following list of Electrical Engineering Foundations Courses		
ECE 310	Digital Signal Processing	3
ECE 330	Power Ckts & Electromechanics	3
ECE 329	Fields and Waves I	3
ECE 340	Semiconductor Electronics	3
ECE 461	Digital Communications	3
ECE 486	Control Systems	4
Select three courses from the following list of Advanced Computing Electives		
CS 357	Numerical Methods I	3
CS 411	Database Systems	3 or 4
CS 412	Introduction to Data Mining	3 or 4
CS 414	Multimedia Systems	3 or 4
CS 418	Interactive Computer Graphics	3 or 4
CS 419	Production Computer Graphics	3 or 4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 421	Programming Languages & Compilers	3 or 4
CS 423	Operating Systems Design	3 or 4
CS 424	Real-Time Systems	3 or 4
CS 425	Distributed Systems	3 or 4
CS 426	Compiler Construction	3 or 4
CS 431	Embedded Systems	3 or 4
CS 436	Computer Networking Laboratory	3 or 4
CS 438	Communication Networks	3 or 4
CS 440	Artificial Intelligence	3 or 4

CS 441	Applied Machine Learning	3 or 4
CS 446	Machine Learning	3 or 4
CS 450	Numerical Analysis	3 or 4
CS 461	Computer Security I	4
CS 475	Formal Models of Computation	3 or 4
CS 476	Program Verification	3 or 4
CS 477	Formal Software Development Methods	3 or 4
CS 483	Applied Parallel Programming	4
CS 498	Special Topics (MP: Logic for Computer Science)	1 to 4
CS 498	Special Topics (VR: Virtual Reality)	1 to 4
CS 498	Special Topics (AML: Applied Machine Learning)	1 to 4
ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4
ECE 412	Microcomputer Laboratory	3
ECE 419	Security Laboratory	3 or 4
ECE 422	Computer Security I	4
ECE 424	Computer Security II	3 or 4
ECE 425	Intro to VLSI System Design	3
ECE 428	Distributed Systems	3 or 4
ECE 435	Computer Networking Laboratory	3 or 4
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 448	Artificial Intelligence	3 or 4
ECE 462	Logic Synthesis	3
ECE 470	Introduction to Robotics	4
ECE 478	Formal Software Development Methods	3 or 4
ECE 484	Principles of Safe Autonomy	4
ECE 491	Numerical Analysis	3 or 4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4
ECE 498	Special Topics in ECE (RC: Smart Phone Computing and Applications)	0 to 4
One course from departmentally approved list below:		
Select one course from departmentally approved list below:		
ECE 411	Computer Organization & Design	4
ECE 445	Senior Design Project Lab[6]	4
ECE 496	Senior Research Project (andECE 499- Senior Thesis)[6]	4

Electives

Code	Title	Hours
The Grainger College of Engineering Liberal Education course list, or additional courses from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts[7]		6
Free electives. Additional unrestricted course work, subject to certain exceptions as noted by the College, so that there are at least 128 credit hours earned toward the degree.[8]		12
Total Hours of Curriculum to Graduate		**128**

1 *External transfer students take*ENG 300 *instead.*

2 MATH 220*may be substituted, with four of the five credit hours applying toward the degree.*MATH 220*is appropriate for students with no background in calculus.*

3 *Freshmen take*ECE 110*for 3 credit hours. Lab-only version taken by transfer students (with special permission) is 1 credit hour.*

4 MATH 213*may be substituted.*

5 STAT 410*may be substituted.*

6 *Advanced Composition may be satisfied by completing*ECE 445*or*ECE 496*and*ECE 499*or a course within either the general education or free elective categories which has the Advanced Composition designation.*

[7] *The Grainger College of Engineering*approved liberal education course list *(*https://go.grainger.illinois.edu/LiberalEducation/*). Note that these credit hours could carry the required cultural studies designation required for campus general education requirements.*

[8] *The Grainger College of Engineering*restrictions to free electives *(*https://go.grainger.illinois.edu/FreeElectives/*).*

Corresponding Degree

BS Bachelor of Science

Program Features

Academic Level

Undergraduate

Does this major have transcripted concentrations?

No

What is the typical time to completion of this program?

4 years

What are the minimum Total Credit Hours required for this program?

128 hours

CIP Code

140901 - Computer Engineering, General.

Is This a Teacher Certification Program?

No

Will specialized accreditation be sought for this program?

No

Delivery Method

This program is available:

On Campus - Students are required to be on campus, they may take some online courses.

Enrollment

Describe how this revision will impact enrollment and degrees awarded.

No impact

Estimated Annual Number of Degrees Awarded

What is the matriculation term for this program?

Fall

Budget

Are there budgetary implications for this revision?

No

Will the program or revision require staffing (faculty, advisors, etc.) beyond what is currently available?

No

Financial Resources

Will the unit need to seek campus or other external resources?

No

Are you seeking a change in the tuition rate or differential for this program?

No

Resource Implications

Facilities

Will the program require new or additional facilities or significant improvements to already existing facilities?

No

Technology

Will the program need additional technology beyond what is currently available for the unit?

No

Non-Technical Resources

Will the program require additional supplies, services or equipment (non-technical)?

No

Resources

For each of these items, be sure to include in the response if the proposed new program or change will result in replacement of another program(s). If so, which program(s), what is the anticipated impact on faculty, students, and instructional resources? Please attach any letters of support/ acknowledgement from faculty, students, and/or other impacted units as appropriate.

Faculty Resources

Please address the impact on faculty resources including any changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc. Describe how the unit will support student advising, including job placement and/or admission to advanced studies.

No impact

Library Resources

Describe your proposal's impact on the University Library's resources, collections, and services. If necessary please consult with the appropriate disciplinary specialist within the University Library.

No impact

EP Documentation

EP Control Number

EP.030

This proposal requires HLC inquiry

No

DMI Documentation

Banner/Codebook Name

BS:Computer Engineering -UIUC

Program Code:

10KP0109BS

Degree Code

BS

Major Code

0109

Program Reviewer Comments

Deb Forgacs (dforgacs) (Wed, 15 Sep 2021 14:49:49 GMT): Rollback: requested.
Deb Forgacs (dforgacs) (Mon, 27 Sep 2021 13:51:38 GMT): Changes to the proposal type the corresponding program and the CIP code due to system bug 09/27/2021
Kathy Martensen (kmartens) (Wed, 06 Oct 2021 16:30:07 GMT): Administrative approval: Doesn't change total hours required, doesn't restrict students' options.

Key: 248

Addition
Removal
Revision

Current Program of Study

Orientation and Professional Development		
ENG 100	Engineering Orientation [1]	0
Total Hours		0
Foundational Mathematics and Science		
MATH 221	Calculus I [2]	4
MATH 257 or MATH 416	Linear Algebra with Computational Applications (Linear Algebra) Abstract Linear Algebra	3
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 285	Intro Differential Equations (Linear Algebra)	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
PHYS 214	Univ Physics: Quantum Physics	2
Total Hours		29
Computer Engineering Technical Core		
ECE 110	Introduction to Electronics [3]	3
ECE 120	Introduction to Computing	4
ECE 210	Analog Signal Processing	4
ECE 220	Computer Systems & Programming	4
CS 173	Discrete Structures [4]	3
CS 225	Data Structures	4
ECE 313	Probability with Engrg Applic [5]	3
ECE 374	Introduction to Algorithms & Models of Computation	4
ECE 385	Digital Systems Laboratory	3
ECE 391	Computer Systems Engineering	4
Total Hours		36
Technical Electives		
29 hours to be selected from departmentally approved List of Technical Electives below:		
AE 202	Aerospace Flight Mechanics	3
AE 302	Aerospace Flight Mechanics II	3
AE 311	Incompressible Flow	3
AE 312	Compressible Flow	3
AE 321	Mechs of Aerospace Structures	3
AE 352	Aerospace Dynamical Systems	3
AE 353	Aerospace Control Systems	3
AE 402	Orbital Mechanics	3 or 4
AE 403	Spacecraft Attitude Control	3 or 4
AE 410	Computational Aerodynamics	3 or 4
AE 412	Viscous Flow & Heat Transfer	4
AE 416	Applied Aerodynamics	3 or 4
AE 419	Aircraft Flight Mechanics	3 or 4
AE 420	Finite Element Analysis	3 or 4
AE 427	Course AE 427 Not Found	
AE 428	Mechanics of Composites	3
AE 433	Aerospace Propulsion	3 or 4
AE 434	Rocket Propulsion	3 or 4
AE 435	Electric Propulsion	3 or 4
AE 451	Aeroelasticity	3 or 4
AE 460	Aerodynamics & Propulsion Lab	2
Agri. Bio Eng. (ABE): all 300 and 400 level courses except 440. Exceptions		
ASTR 210	Introduction to Astrophysics	3
ASTR 310	Computing in Astronomy	3
ASTR 330	Extraterrestrial Life	3
ASTR 350	The Big Bang, Black Holes, and the End of the Universe	3
ASTR 404	Stellar Astrophysics	3
ASTR 405	Planetary Systems	3
ASTR 406	Galaxies and the Universe	3
ASTR 414	Astronomical Techniques	4
ASTR 450	Astrochemistry	4
ATMS 201	General Physical Meteorology	3
ATMS 301	Atmospheric Thermodynamics	3
ATMS 302	Atmospheric Dynamics I	3
ATMS 303	Synoptic-Dynamic Wea Analysis	4
ATMS 304	Radiative Transfer-Remote Sens	3
ATMS 305	Computing and Data Analysis	3

New Program of Study

Orientation and Professional Development		
ENG 100	Engineering Orientation [1]	0
Total Hours		**0**
Foundational Mathematics and Science		
MATH 221	Calculus I [2]	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257 or MATH 416	Linear Algebra with Computational Applications Abstract Linear Algebra	3
MATH 285	Intro to Differential Eq	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
PHYS 214	Univ Physics: Quantum Physics	2
Total Hours		29
Computer Engineering Technical Core		
ECE 110	Introduction to Electronics [3]	3
ECE 120	Introduction to Computing	4
ECE 210	Analog Signal Processing	4
ECE 220	Computer Systems & Programming	4
CS 173	Discrete Structures [4]	3
CS 225	Data Structures	4
ECE 313	Probability with Engrg Applic [5]	3
ECE 374	Introduction to Algorithms & Models of Computation	4
ECE 385	Digital Systems Laboratory	3
ECE 391	Computer Systems Engineering	4
Total Hours		36
Technical Electives		
From the Departmentally Approved List of Technical Electives, to include: at least 1 Electrical Engineering Foundations course at least 3 Advanced Computing electives at least 1 Design Elective		29
AE 202	Aerospace Flight Mechanics	3
AE 302	Aerospace Flight Mechanics II	3
AE 311	Incompressible Flow	3
AE 312	Compressible Flow	3
AE 321	Mechs of Aerospace Structures	3
AE 352	Aerospace Dynamical Systems	3
AE 353	Aerospace Control Systems	3
AE 402	Orbital Mechanics	3 or 4
AE 403	Spacecraft Attitude Control	3 or 4
AE 410	Computational Aerodynamics	3 or 4
AE 412	Viscous Flow & Heat Transfer	4
AE 416	Applied Aerodynamics	3 or 4
AE 419	Aircraft Flight Mechanics	3 or 4
AE 420	Finite Element Analysis	3 or 4
AE 428	Mechanics of Composites	3
AE 433	Aerospace Propulsion	3 or 4
AE 434	Rocket Propulsion	3 or 4
AE 435	Electric Propulsion	3 or 4
AE 451	Aeroelasticity	3 or 4
AE 460	Aerodynamics & Propulsion Lab	2
Agri. Bio Eng. (ABE): all 300 and 400 level courses except 440. Exceptions		
ASTR 210	Introduction to Astrophysics	3
ASTR 310	Computing in Astronomy	3
ASTR 330	Extraterrestrial Life	3
ASTR 350	The Big Bang, Black Holes, and the End of the Universe	3
ASTR 404	Stellar Astrophysics	3
ASTR 405	Planetary Systems	3
ASTR 406	Galaxies and the Universe	3
ASTR 414	Astronomical Techniques	4
ASTR 450	Astrochemistry	4
ATMS 201	General Physical Meteorology	3
ATMS 301	Atmospheric Thermodynamics	3
ATMS 302	Atmospheric Dynamics I	3
ATMS 303	Synoptic-Dynamic Wea Analysis	4
ATMS 304	Radiative Transfer-Remote Sens	3
ATMS 305	Computing and Data Analysis	3

ATMS 404	Risk Analysis in Earth Science	3 or 4
ATMS 405	Boundary Layer Processes	4
ATMS 406	Tropical Meteorology	4
ATMS 410	Radar Remote Sensing	4
ATMS 411	Satellite Remote Sensing	4
ATMS 420	Atmospheric Chemistry	4
ATMS 421	Earth Systems Modeling	4
ATMS 425	Air Quality Modeling	4
ATMS 447	Climate Change Assessment	3
ATMS 449	Biogeochemical Cycles	4
BIOC 406	Gene Expression & Regulation	3
BIOC 440	Physical Chemistry Principles	4
BIOC 446	Physical Biochemistry	3
BIOC 455	Technqs Biochem & Biotech	4
BIOE 201	Conservation Principles Bioeng	3
BIOE 202	Cell & Tissue Engineering Lab	2
BIOE 302	Modeling Human Physiology	3
BIOE 414	Biomedical Instrumentation	3
BIOE 415	Biomedical Instrumentation Lab	2
BIOE 461	Cellular Biomechanics	4
BIOE 467	Biophotonics	3
BIOE 476	Tissue Engineering	3
BIOE 480	Magnetic Resonance Imaging	3 or 4
Biophysics (BIOP): All 400 level courses except seminars and special		
CHBE 221	Principles of CHE	3
CHBE 321	Thermodynamics	4
CHBE 421	Momentum and Heat Transfer	4
CHBE 422	Mass Transfer Operations	4
CHBE 424	Chemical Reaction Engineering	3
CHBE 430	Unit Operations Laboratory	4
CHBE 431	Process Design	4
CHBE 440	Process Control and Dynamics	3
CHBE 451	Transport Phenomena	3
CHBE 452	Chemical Kinetics & Catalysis	3
CHBE 453	Electrochemical Engineering	2 or 3
CHBE 456	Polymer Science & Engineering	3
CHBE 457	Microelectronics Processing	3
CHBE 471	Biochemical Engineering	3 or 4
CHBE 472	Techniques in Biomolecular Eng	3 or 4
CHBE 473	Biomolecular Engineering	3 or 4
CHBE 474	Metabolic Engineering	3 or 4
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab II	1
Chemistry (CHEM): All 200, 300 and 400 level courses except 397, 497,		
CEE 310	Transportation Engineering	3
CEE 330	Environmental Engineering	3
CEE 408	Railroad Transportation Engrg	3 or 4
CEE 410	Railway Signaling & Control	3 or 4
CEE 416	Traffic Capacity Analysis	3 or 4
CEE 430	Ecological Quality Engineering	2
CEE 447	Atmospheric Chemistry	4
CEE 491	Decision and Risk Analysis	3 or 4
CPSC 265	Genetic Engineering Lab	3
CS 101	Intro Computing: Engrg & Sci (By Approval)	3
CS 173	Discrete Structures	3
CS 225	Data Structures	4
CS 242	Programming Studio	3
CS 357	Numerical Methods I	3
CS 410	Text Information Systems	3 or 4
CS 411	Database Systems	3 or 4
CS 412	Introduction to Data Mining	3 or 4
CS 413	Intro to Combinatorics	3 or 4
CS 414	Multimedia Systems	3 or 4
CS 418	Interactive Computer Graphics	3 or 4
CS 419	Production Computer Graphics	3 or 4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 421	Programming Languages & Compilers	3 or 4
CS 422	Programming Language Design	3 or 4
CS 423	Operating Systems Design	3 or 4
CS 424	Real-Time Systems	3 or 4
CS 425	Distributed Systems	3 or 4
CS 426	Compiler Construction	3 or 4
CS 427	Software Engineering I	3 or 4
CS 428	Software Engineering II	3 or 4
CS 429	Software Engineering II, ACP	3
CS 431	Embedded Systems	3 or 4
CS 433	Computer System Organization	3 or 4
CS 436	Computer Networking Laboratory	3 or 4
CS 438	Communication Networks	3 or 4
CS 439	Wireless Networks	3 or 4
CS 440	Artificial Intelligence	3 or 4
CS 445	Computational Photography	3 or 4

ATMS 404	Risk Analysis in Earth Science	3 or 4
ATMS 405	Boundary Layer Processes	4
ATMS 406	Tropical Meteorology	4
ATMS 410	Radar Remote Sensing	4
ATMS 411	Satellite Remote Sensing	4
ATMS 420	Atmospheric Chemistry	4
ATMS 421	Earth Systems Modeling	4
ATMS 447	Climate Change Assessment	3
ATMS 449	Biogeochemical Cycles	4
BIOC 406	Gene Expression & Regulation	3
BIOC 440	Physical Chemistry Principles	4
BIOC 446	Physical Biochemistry	3
BIOC 455	Technqs Biochem & Biotech	4
BIOE 201	Conservation Principles Bioeng	3
BIOE 202	Cell & Tissue Engineering Lab	2
BIOE 302	Modeling Human Physiology	3
BIOE 414	Biomedical Instrumentation	3
BIOE 415	Biomedical Instrumentation Lab	2
BIOE 461	Cellular Biomechanics	4
BIOE 467	Biophotonics	3
BIOE 476	Tissue Engineering	3
BIOE 480	Magnetic Resonance Imaging	3 or 4
BIOE 485	Computational Mathematics for Machine Learning and Imaging	4
Biophysics (BIOP): All 400 level courses except seminars and special		
CHBE 221	Principles of CHE	3
CHBE 321	Thermodynamics	4
CHBE 421	Momentum and Heat Transfer	4
CHBE 422	Mass Transfer Operations	4
CHBE 424	Chemical Reaction Engineering	3
CHBE 430	Unit Operations Laboratory	4
CHBE 431	Process Design	4
CHBE 440	Process Control and Dynamics	3
CHBE 451	Transport Phenomena	3
CHBE 452	Chemical Kinetics & Catalysis	3
CHBE 453	Electrochemical Engineering	2 or 3
CHBE 456	Polymer Science & Engineering	3
CHBE 457	Microelectronics Processing	3
CHBE 471	Biochemical Engineering	3 or 4
CHBE 472	Techniques in Biomolecular Eng	3 or 4
CHBE 473	Biomolecular Engineering	3 or 4
CHBE 474	Metabolic Engineering	3 or 4
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab II	1
Chemistry (CHEM): All 200, 300 and 400 level courses except 397, 497,		
CEE 310	Transportation Engineering	3
CEE 330	Environmental Engineering	3
CEE 408	Railroad Transportation Engrg	3 or 4
CEE 410	Railway Signaling & Control	3 or 4
CEE 416	Traffic Capacity Analysis	3 or 4
CEE 430	Ecological Quality Engineering	2
CEE 447	Atmospheric Chemistry	4
CEE 491	Decision and Risk Analysis	3 or 4
CPSC 265	Genetic Engineering Lab	3
CS 101	Intro Computing: Engrg & Sci (By Approval)	3
CS 242	Programming Studio	3
CS 357	Numerical Methods I	3
CS 410	Text Information Systems	3 or 4
CS 411	Database Systems	3 or 4
CS 412	Introduction to Data Mining	3 or 4
CS 413	Intro to Combinatorics	3 or 4
CS 414	Multimedia Systems	3 or 4
CS 416	Data Visualization	3 or 4
CS 418	Interactive Computer Graphics	3 or 4
CS 419	Production Computer Graphics	3 or 4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 421	Programming Languages & Compilers	3 or 4
CS 422	Programming Language Design	3 or 4
CS 423	Operating Systems Design	3 or 4
CS 424	Real-Time Systems	3 or 4
CS 425	Distributed Systems	3 or 4
CS 426	Compiler Construction	3 or 4
CS 427	Software Engineering I	3 or 4
CS 428	Software Engineering II	3 or 4
CS 429	Software Engineering II, ACP	3
CS 431	Embedded Systems	3 or 4
CS 433	Computer System Organization	3 or 4
CS 435	Cloud Networking	3 or 4
CS 436	Computer Networking Laboratory	3 or 4
CS 438	Communication Networks	3 or 4
CS 439	Wireless Networks	3 or 4
CS 440	Artificial Intelligence	3 or 4
CS 445	Computational Photography	3 or 4

CS 446	Machine Learning	3 or 4
CS 447	Natural Language Processing	3 or 4
CS 450	Numerical Analysis	3 or 4
CS 460	Security Laboratory	3 or 4
CS 461	Computer Security I	4
CS 463	Computer Security II	3 or 4
CS 465	User Interface Design	4
CS 466	Introduction to Bioinformatics	3 or 4
CS 467	Social Visualization	3 or 4
CS 473	Algorithms	4
CS 475	Formal Models of Computation	3 or 4
CS 476	Program Verification	3 or 4
CS 477	Formal Software Development Methods	3 or 4
CS 481	Advanced Topics in Stochastic Processes & Applications	3 or 4
CS 484	Parallel Programming	3 or 4
CS 398	Special Topics (As approved)	1 to 4
CS 498	Special Topics (As approved)	1 to 4
ECE 297	Individual Study	1
ECE 304	Photonic Devices	3
ECE 307	Techniques for Engrg Decisions	3
ECE 310	Digital Signal Processing	3
ECE 311	Digital Signal Processing Lab	1
ECE 314	Probability in Engineering Lab	1
ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3
ECE 333	Green Electric Energy	3
ECE 340	Semiconductor Electronics	3
ECE 342	Electronic Circuits	3
ECE 343	Electronic Circuits Laboratory	1
ECE 350	Fields and Waves II	3
ECE 365	Data Science and Engineering	3
ECE 374	Introduction to Algorithms & Models of Computation	4
ECE 380	Biomedical Imaging	3
ECE 391	Computer Systems Engineering	4
ECE 395	Advanced Digital Projects Lab	2 or 3
ECE 396	Honors Project	1 to 4
ECE 397	Individual Study in ECE	0 to 4
ECE 402	Electronic Music Synthesis	3
ECE 403	Audio Engineering	3
ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4
ECE 412	Microcomputer Laboratory	3
ECE 414	Biomedical Instrumentation	3
ECE 415	Biomedical Instrumentation Lab	2
ECE 416	Biosensors	3
ECE 417	Multimedia Signal Processing	4
ECE 418	Image & Video Processing	4
ECE 419	Security Laboratory	3 or 4
ECE 420	Embedded DSP Laboratory	2
ECE 422	Computer Security I	4
ECE 424	Computer Security II	3 or 4
ECE 425	Intro to VLSI System Design	3
ECE 428	Distributed Systems	3 or 4
ECE 431	Electric Machinery	4
ECE 432	Advanced Electric Machinery	3
ECE 435	Computer Networking Laboratory	3 or 4
ECE 437	Sensors and Instrumentation	3
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 441	Physcs & Modeling Semicond Dev	3
ECE 443	LEDs and Solar Cells	4
ECE 444	IC Device Theory & Fabrication	4
ECE 445	Senior Design Project Lab	4
ECE 446	Principles of Experimental Research in Electrical Engineering	4
ECE 447	Active Microwave Ckt Design	3
ECE 448	Artificial Intelligence	3 or 4
ECE 451	Adv Microwave Measurements	3
ECE 452	Electromagnetic Fields	3
ECE 453	Wireless Communication Systems	4
ECE 454	Antennas	3
ECE 455	Optical Electronics	3 or 4
ECE 456	Global Nav Satellite Systems	4
ECE 457	Microwave Devices & Circuits	3
ECE 458	Applic of Radio Wave Propag	3
ECE 459	Communications Systems	3
ECE 460	Optical Imaging	4
ECE 461	Digital Communications	3
ECE 462	Logic Synthesis	3
ECE 463	Digital Communications Lab	2
ECE 464	Power Electronics	3
ECE 465	Optical Communications Systems	3
ECE 466	Optical Communications Lab	1
ECE 467	Biophotonics	3
ECE 468	Optical Remote Sensing	3

CS 446	Machine Learning	3 or 4
CS 447	Natural Language Processing	3 or 4
CS 450	Numerical Analysis	3 or 4
CS 460	Security Laboratory	3 or 4
CS 461	Computer Security I	4
CS 463	Computer Security II	3 or 4
CS 465	User Interface Design	4
CS 466	Introduction to Bioinformatics	3 or 4
CS 467	Social Visualization	3 or 4
CS 473	Algorithms	4
CS 475	Formal Models of Computation	3 or 4
CS 476	Program Verification	3 or 4
CS 477	Formal Software Development Methods	3 or 4
CS 481	Advanced Topics in Stochastic Processes & Applications	3 or 4
CS 484	Parallel Programming	3 or 4
CS 398	Special Topics (As approved)	1 to 4
CS 498	Special Topics (As approved)	1 to 4
ECE 297	Individual Study	1
ECE 304	Photonic Devices	3
ECE 307	Techniques for Engrg Decisions	3
ECE 310	Digital Signal Processing	3
ECE 311	Digital Signal Processing Lab	1
ECE 314	Probability in Engineering Lab	1
ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3
ECE 333	Green Electric Energy	3
ECE 340	Semiconductor Electronics	3
ECE 342	Electronic Circuits	3
ECE 343	Electronic Circuits Laboratory	1
ECE 350	Fields and Waves II	3
ECE 365	Data Science and Engineering	3
ECE 380	Biomedical Imaging	3
ECE 395	Advanced Digital Projects Lab	2 or 3
ECE 396	Honors Project	1 to 4
ECE 397	Individual Study in ECE	0 to 4
ECE 402	Electronic Music Synthesis	3
ECE 403	Audio Engineering	3
ECE 407	Cryptography	3 or 4
ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4
ECE 412	Microcomputer Laboratory	3
ECE 414	Biomedical Instrumentation	3
ECE 415	Biomedical Instrumentation Lab	2
ECE 416	Biosensors	3
ECE 417	Multimedia Signal Processing	4
ECE 418	Image & Video Processing	4
ECE 419	Security Laboratory	3 or 4
ECE 420	Embedded DSP Laboratory	2
ECE 422	Computer Security I	4
ECE 424	Computer Security II	3 or 4
ECE 425	Intro to VLSI System Design	3
ECE 428	Distributed Systems	3 or 4
ECE 431	Electric Machinery	4
ECE 432	Advanced Electric Machinery	3
ECE 435	Computer Networking Laboratory	3 or 4
ECE 437	Sensors and Instrumentation	3
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 441	Physcs & Modeling Semicond Dev	3
ECE 442	Silicon Photonics	3 or 4
ECE 443	LEDs and Solar Cells	4
ECE 444	IC Device Theory & Fabrication	4
ECE 445	Senior Design Project Lab	4
ECE 446	Principles of Experimental Research in Electrical Engineering	4
ECE 447	Active Microwave Ckt Design	3
ECE 448	Artificial Intelligence	3 or 4
ECE 451	Adv Microwave Measurements	3
ECE 452	Electromagnetic Fields	3
ECE 453	Wireless Communication Systems	4
ECE 454	Antennas	3
ECE 455	Optical Electronics	3 or 4
ECE 456	Global Nav Satellite Systems	4
ECE 457	Microwave Devices & Circuits	3
ECE 458	Applic of Radio Wave Propag	3
ECE 459	Communications Systems	3
ECE 460	Optical Imaging	4
ECE 461	Digital Communications	3
ECE 462	Logic Synthesis	3
ECE 463	Digital Communications Lab	2
ECE 464	Power Electronics	3
ECE 465	Optical Communications Systems	3
ECE 466	Optical Communications Lab	1
ECE 467	Biophotonics	3
ECE 468	Optical Remote Sensing	3

ECE 469	Power Electronics Laboratory	2
ECE 470	Introduction to Robotics	4
ECE 472	Biomedical Ultrasound Imaging	3
ECE 473	Fund of Engrg Acoustics	3 or 4
ECE 476	Power System Analysis	3
ECE 478	Formal Software Development Methods	3 or 4
ECE 480	Magnetic Resonance Imaging	3 or 4
ECE 481	Nanotechnology	4
ECE 482	Digital IC Design	3
ECE 483	Analog IC Design	3
ECE 485	MEMS Devices & Systems	3
ECE 486	Control Systems	4
ECE 487	Intro Quantum Electr for EEs	3
ECE 488	Compound Semicond & Devices	3
ECE 489	Robot Dynamics and Control	4
ECE 490	Introduction to Optimization	3 or 4
ECE 491	Numerical Analysis	3 or 4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4
ECE 493	Advanced Engineering Math	3 or 4
ECE 495	Photonic Device Laboratory	3
ECE 496	Senior Research Project	2
ECE 499	Senior Thesis	2
ECE 398	Special Topics in ECE (As approved)	0 to 4
ECE 498	Special Topics in ECE (As approved)	0 to 4
ENG 491	Interdisciplinary Design Proj (CubeSat, Solar Decathlon, Formula SAE, Baja SAE or by approval)	1 to 4
GEOL 107	Physical Geology	4
GEOL 208	History of the Earth System	4
GEOL 333	Earth Materials and the Env	4
GEOL 380	Environmental Geology	4
GEOL 411	Structural Geol and Tectonics	4
GEOL 417	Geol Field Methods, Western US	6
GEOL 432	Mineralogy and Mineral Optics	4
GEOL 436	Petrology and Petrography	4
GEOL 440	Sedimentology and Stratigraphy	4
GEOL 450	Probing the Earth's Interior	3
GEOL 452	Introduction to Geophysics	4
GEOL 460	Geochemistry	3
IE 310	Deterministic Models in Optimization	3
IE 330	Industrial Quality Control	3
IE 360	Facilities Planning and Design	3
IE 361	Production Planning & Control	3
IE 400	Design & Anlys of Experiments	3 or 4
IE 410	Advanced Topics in Stochastic Processes & Applications	3 or 4
IE 411	Optimization of Large Systems	3 or 4
IE 412	OR Models for Mfg Systems	3 or 4
IE 413	Simulation	3 or 4
IE 420	Financial Engineering	3 or 4
IE 430	Economic Found of Quality Syst	3 or 4
IE 431	Design for Six Sigma	3
IB 150	Organismal & Evolutionary Biol	4
IB 202	Physiology	3 or 4
IB 203	Ecology	4
IB 204	Genetics	3 or 4
IB 302	Evolution	4
IB 335	Plant Systematics	4
IB 348	Fish and Wildlife Ecology	3
IB 368	Vertebrate Natural History	4
IB 401	Introduction to Entomology	3 or 4
IB 405	Evolution of Traits and Genomes	3
IB 420	Plant Physiology	3
IB 421	Photosynthesis	3
IB 426	Env and Evol Physl of Animals	3
IB 427	Insect Physiology	4
IB 431	Behavioral Ecology	3
IB 432	Genes and Behavior	3
IB 440	Plants and Global Change	3
IB 443	Evolutionary Ecology	3
IB 444	Insect Ecology	3 or 4
IB 451	Conservation Biology	4
IB 452	Ecosystem Ecology	3
IB 453	Community Ecology	3
IB 461	Ornithology	4
IB 462	Mammalogy	4
IB 463	Ichthyology	4
IB 464	Herpetology	4
IB 467	Principles of Systematics	4
IB 468	Insect Classification and Evol	4
IB 471	General Mycology	4
IB 472	Plant Molecular Biology	1
IB 473	Plant Genomics	1
IB 481	Vector-borne Diseases	4
IB 482	Insect Pest Management	3
IB 483	Insect Pathology	3

ECE 469	Power Electronics Laboratory	2
ECE 470	Introduction to Robotics	4
ECE 472	Biomedical Ultrasound Imaging	3
ECE 473	Fund of Engrg Acoustics	3 or 4
ECE 476	Power System Analysis	3
ECE 478	Formal Software Development Methods	3 or 4
ECE 480	Magnetic Resonance Imaging	3 or 4
ECE 481	Nanotechnology	4
ECE 482	Digital IC Design	3
ECE 483	Analog IC Design	3
ECE 485	MEMS Devices & Systems	3
ECE 486	Control Systems	4
ECE 487	Intro Quantum Electr for EEs	3
ECE 488	Compound Semicond & Devices	3
ECE 489	Robot Dynamics and Control	4
ECE 490	Introduction to Optimization	3 or 4
ECE 491	Numerical Analysis	3 or 4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4
ECE 493	Advanced Engineering Math	3 or 4
ECE 495	Photonic Device Laboratory	3
ECE 496	Senior Research Project	2
ECE 499	Senior Thesis	2
ECE 298	Special Topics in ECE (As approved)	1 to 4
ECE 398	Special Topics in ECE (As approved)	0 to 4
ECE 498	Special Topics in ECE (As approved)	0 to 4
ENG 491	Interdisciplinary Design Proj (CubeSat, Solar Decathlon, Formula SAE, Baja SAE or by approval)	1 to 4
GEOL 107	Physical Geology	4
GEOL 208	History of the Earth System	4
GEOL 333	Earth Materials and the Env	4
GEOL 380	Environmental Geology	4
GEOL 411	Structural Geol and Tectonics	4
GEOL 417	Geol Field Methods, Western US	6
GEOL 432	Mineralogy and Mineral Optics	4
GEOL 436	Petrology and Petrography	4
GEOL 440	Sedimentology and Stratigraphy	4
GEOL 450	Probing the Earth's Interior	3
GEOL 452	Introduction to Geophysics	4
GEOL 460	Geochemistry	3
IE 310	Deterministic Models in Optimization	3
IE 330	Industrial Quality Control	3
IE 360	Facilities Planning and Design	3
IE 361	Production Planning & Control	3
IE 400	Design & Anlys of Experiments	3 or 4
IE 410	Advanced Topics in Stochastic Processes & Applications	3 or 4
IE 411	Optimization of Large Systems	3 or 4
IE 412	OR Models for Mfg Systems	3 or 4
IE 413	Simulation	3 or 4
IE 420	Financial Engineering	3 or 4
IE 430	Economic Found of Quality Syst	3 or 4
IE 431	Design for Six Sigma	3
IB 150	Organismal & Evolutionary Biol	4
IB 202	Physiology	3 or 4
IB 203	Ecology	4
IB 204	Genetics	3 or 4
IB 302	Evolution	4
IB 335	Plant Systematics	4
IB 348	Fish and Wildlife Ecology	3
IB 368	Vertebrate Natural History	4
IB 401	Introduction to Entomology	3 or 4
IB 405	Evolution of Traits and Genomes	3
IB 420	Plant Physiology	3
IB 421	Photosynthesis	3
IB 426	Env and Evol Physl of Animals	3
IB 427	Insect Physiology	4
IB 431	Behavioral Ecology	3
IB 432	Genes and Behavior	3
IB 440	Plants and Global Change	3
IB 443	Evolutionary Ecology	3
IB 444	Insect Ecology	3 or 4
IB 451	Conservation Biology	4
IB 452	Ecosystem Ecology	3
IB 453	Community Ecology	3
IB 461	Ornithology	4
IB 462	Mammalogy	4
IB 463	Ichthyology	4
IB 464	Herpetology	4
IB 467	Principles of Systematics	4
IB 468	Insect Classification and Evol	4
IB 471	General Mycology	4
IB 472	Plant Molecular Biology	1
IB 473	Plant Genomics	1
IB 481	Vector-borne Diseases	4
IB 482	Insect Pest Management	3
IB 483	Insect Pathology	3

IB 485	Environ Toxicology & Health	3
IB 486	Pesticide Toxicology	3 or 4
LING 300	Anat & Physiol Spch Mechanism	4
LING 406	Introduction to Computational Linguistics	3 or 4
LING 407	Logic and Linguistic Analysis	3 or 4
LING 427	Language and the Brain	3 or 4
MSE 280	Engineering Materials	3
Material Science and Engineering (MSE): All 300 and 400 level courses		
MATH 213	Basic Discrete Mathematics	3
MATH 347	Fundamental Mathematics	3
MATH 348	Fundamental Mathematics-ACP	4
MATH 357	Numerical Methods I	3
MATH 402	Non Euclidean Geometry	3 or 4
MATH 403	Euclidean Geometry	3 or 4
MATH 412	Graph Theory	3 or 4
MATH 413	Intro to Combinatorics	3 or 4
MATH 414	Mathematical Logic	3 or 4
MATH 416	Abstract Linear Algebra	3 or 4
MATH 417	Intro to Abstract Algebra	3 or 4
MATH 418	Intro to Abstract Algebra II	3 or 4
MATH 423	Differential Geometry	3 or 4
MATH 424	Honors Real Analysis	3
MATH 425	Honors Advanced Analysis	3
MATH 427	Honors Abstract Algebra	3
MATH 428	Honors Topics in Mathematics	3
MATH 432	Set Theory and Topology	3 or 4
MATH 442	Intro Partial Diff Equations	3 or 4
MATH 444	Elementary Real Analysis	3 or 4
MATH 446	Applied Complex Variables	3 or 4
MATH 447	Real Variables	3 or 4
MATH 448	Complex Variables	3 or 4
MATH 450	Numerical Analysis	3 or 4
MATH 453	Number Theory	3 or 4
MATH 473	Algorithms	4
MATH 475	Formal Models of Computation	3 or 4
MATH 481	Vector and Tensor Analysis	3 or 4
MATH 482	Linear Programming	3 or 4
MATH 484	Nonlinear Programming	3 or 4
MATH 487	Advanced Engineering Math	3 or 4
MATH 489	Dynamics & Differential Eqns	3 or 4
MCB 150	Molec & Cellular Basis of Life	4
MCB 250	Molecular Genetics	3
MCB 251	Exp Techniqs in Molecular Biol	2
MCB 252	Cells, Tissues & Development	3
MCB 253	Exp Techniqs in Cellular Biol	2
MCB 300	Microbiology	3
MCB 301	Experimental Microbiology	3
MCB 314	Introduction to Neurobiology	3
MCB 316	Genetics and Disease	4
MCB 354	Biochem & Phys Basis of Life	3
MCB 400	Cancer Cell Biology	3
MCB 401	Cellular Physiology	3
MCB 402	Sys & Integrative Physiology	3
MCB 403	Cell & Membrane Physiology Lab	1 or 2
MCB 404	Sys & Integrative Physiol Lab	1 to 2
MCB 406	Gene Expression & Regulation	3
MCB 408	Immunology	3
MCB 410	Developmental Biology, Stem Cells and Regenerative Medicine	3
MCB 413	Endocrinology	3
MCB 419	Brain, Behavior & Info Process	3
MCB 421	Microbial Genetics	3
MCB 424	Microbial Biochemistry	3
MCB 426	Bacterial Pathogenesis	3
MCB 430	Molecular Microbiology	3
MCB 431	Microbial Physiology	3
MCB 433	Virology & Viral Pathogenesis	3
MCB 435	Evolution of Infectious Disease	3
MCB 446	Physical Biochemistry	3
MCB 480	Eukaryotic Cell Signaling	3
ME 200	Thermodynamics	3
ME 310	Fundamentals of Fluid Dynamics	4
ME 320	Heat Transfer	4
ME 330	Engineering Materials	4
ME 340	Dynamics of Mechanical Systems	3.5
ME 370	Mechanical Design I	3
ME 371	Mechanical Design II	3
ME 400	Energy Conversion Systems	3 or 4
ME 401	Refrigeration and Cryogenics	3 or 4
ME 402	Design of Thermal Systems	3 or 4
ME 403	Internal Combustion Engines	3 or 4
ME 404	Intermediate Thermodynamics	4
ME 410	Intermediate Gas Dynamics	3 or 4
ME 411	Viscous Flow & Heat Transfer	4
ME 412	Numerical Thermo-Fluid Mechs	2 to 4
ME 420	Intermediate Heat Transfer	4
ME 430	Failure of Engrg Materials	3 or 4
ME 431	Mechanical Component Failure	3 or 4
ME 440	Kinem & Dynamics of Mech Syst	3 or 4

IB 485	Environ Toxicology & Health	3
IB 486	Pesticide Toxicology	3 or 4
LING 300	Anat & Physiol Spch Mechanism	4
LING 406	Introduction to Computational Linguistics	3 or 4
LING 407	Logic and Linguistic Analysis	3 or 4
LING 427	Language and the Brain	3 or 4
MSE 280	Engineering Materials	3
Material Science and Engineering (MSE): All 300 and 400 level courses		
MATH 347	Fundamental Mathematics	3
MATH 348	Fundamental Mathematics-ACP	4
MATH 357	Numerical Methods I	3
MATH 402	Non Euclidean Geometry	3 or 4
MATH 403	Euclidean Geometry	3 or 4
MATH 412	Graph Theory	3 or 4
MATH 413	Intro to Combinatorics	3 or 4
MATH 414	Mathematical Logic	3 or 4
MATH 417	Intro to Abstract Algebra	3 or 4
MATH 418	Intro to Abstract Algebra II	3 or 4
MATH 423	Differential Geometry	3 or 4
MATH 424	Honors Real Analysis	3
MATH 425	Honors Advanced Analysis	3
MATH 427	Honors Abstract Algebra	3
MATH 428	Honors Topics in Mathematics	3
MATH 432	Set Theory and Topology	3 or 4
MATH 442	Intro Partial Diff Equations	3 or 4
MATH 444	Elementary Real Analysis	3 or 4
MATH 446	Applied Complex Variables	3 or 4
MATH 447	Real Variables	3 or 4
MATH 448	Complex Variables	3 or 4
MATH 450	Numerical Analysis	3 or 4
MATH 453	Number Theory	3 or 4
MATH 473	Algorithms	4
MATH 475	Formal Models of Computation	3 or 4
MATH 481	Vector and Tensor Analysis	3 or 4
MATH 482	Linear Programming	3 or 4
MATH 484	Nonlinear Programming	3 or 4
MATH 487	Advanced Engineering Math	3 or 4
MATH 489	Dynamics & Differential Eqns	3 or 4
MCB 150	Molec & Cellular Basis of Life	4
MCB 250	Molecular Genetics	3
MCB 251	Exp Techniqs in Molecular Biol	2
MCB 252	Cells, Tissues & Development	3
MCB 253	Exp Techniqs in Cellular Biol	2
MCB 300	Microbiology	3
MCB 301	Experimental Microbiology	3
MCB 314	Introduction to Neurobiology	3
MCB 316	Genetics and Disease	4
MCB 354	Biochem & Phys Basis of Life	3
MCB 400	Cancer Cell Biology	3
MCB 401	Cellular Physiology	3
MCB 402	Sys & Integrative Physiology	3
MCB 403	Cell & Membrane Physiology Lab	1 or 2
MCB 404	Sys & Integrative Physiol Lab	1 to 2
MCB 406	Gene Expression & Regulation	3
MCB 408	Immunology	3
MCB 410	Developmental Biology, Stem Cells and Regenerative Medicine	3
MCB 413	Endocrinology	3
MCB 419	Brain, Behavior & Info Process	3
MCB 421	Microbial Genetics	3
MCB 424	Microbial Biochemistry	3
MCB 426	Bacterial Pathogenesis	3
MCB 430	Molecular Microbiology	3
MCB 431	Microbial Physiology	3
MCB 433	Virology & Viral Pathogenesis	3
MCB 435	Evolution of Infectious Disease	3
MCB 446	Physical Biochemistry	3
MCB 480	Eukaryotic Cell Signaling	3
ME 200	Thermodynamics	3
ME 310	Fundamentals of Fluid Dynamics	4
ME 320	Heat Transfer	4
ME 330	Engineering Materials	4
ME 340	Dynamics of Mechanical Systems	3.5
ME 370	Mechanical Design I	3
ME 371	Mechanical Design II	3
ME 400	Energy Conversion Systems	3 or 4
ME 401	Refrigeration and Cryogenics	3 or 4
ME 402	Design of Thermal Systems	3 or 4
ME 403	Internal Combustion Engines	3 or 4
ME 404	Intermediate Thermodynamics	4
ME 410	Intermediate Gas Dynamics	3 or 4
ME 411	Viscous Flow & Heat Transfer	4
ME 412	Numerical Thermo-Fluid Mechs	2 to 4
ME 420	Intermediate Heat Transfer	4
ME 430	Failure of Engrg Materials	3 or 4
ME 431	Mechanical Component Failure	3 or 4
ME 440	Kinem & Dynamics of Mech Syst	3 or 4

ME 445	Introduction to Robotics	4
ME 450	Course ME 450 Not Found	
ME 451	Computer-Aided Mfg Systems	3 or 4
ME 452	Num Control of Mfg Processes	3 or 4
ME 460	Industrial Control Systems	4
ME 461	Computer Cntrl of Mech Systems	3 or 4
ME 471	Finite Element Analysis	3 or 4
ME 472	Introduction to Tribology	3 or 4
ME 485	MEMS Devices & Systems	3
ME 487	MEMS-NEMS Theory & Fabrication	4
MUS 407	Elect Music Techniques I	3
MUS 409	Elec Music Techniques II	2
NEUR 453	Cog Neuroscience of Vision	3 or 4
NPRE 201	Energy Systems	2 or 3
NPRE 247	Modeling Nuclear Energy System	3
NPRE 402	Nuclear Power Engineering	3 or 4
NPRE 412	Nuclear Power Econ & Fuel Mgmt	3 or 4
NPRE 421	Plasma and Fusion Science	3
NPRE 423	Plasma Laboratory	2
NPRE 429	Plasma Engineering	3
NPRE 431	Materials in Nuclear Engrg	3
NPRE 432	Nuclear Engrg Materials Lab	2
NPRE 435	Radiological Imaging	3
NPRE 441	Radiation Protection	4
NPRE 442	Radioactive Waste Management	3
NPRE 444	Nuclear Analytical Methods Lab	2 or 3
NPRE 446	Radiation Interact w/Matter I	3
NPRE 447	Radiation Interact w/Matter II	3
NPRE 448	Nuclear Syst Engrg & Design	4
NPRE 451	NPRE Laboratory	3
NPRE 455	Neutron Diffusion & Transport	4
NPRE 457	Safety Anlys Nucl Reactor Syst	3 or 4
NPRE 458	Design in NPRE	4
NPRE 470	Fuel Cells & Hydrogen Sources	3
NPRE 475	Wind Power Systems	3 or 4
PHYS 225	Relativity & Math Applications	2
PHYS 325	Classical Mechanics I	3
PHYS 326	Classical Mechanics II	3
PHYS 401	Classical Physics Lab	3
PHYS 402	Light	3 or 4
PHYS 403	Modern Experimental Physics	4 or 5
PHYS 406	Acoustical Physics of Music	4
PHYS 419	Space, Time, and Matter-ACP	3 or 4
PHYS 420	Space, Time, and Matter	2
PHYS 427	Thermal & Statistical Physics	4
PHYS 460	Condensed Matter Physics	4
PHYS 466	Atomic Scale Simulations	3 or 4
PHYS 470	Subatomic Physics	4
PHYS 485	Atomic Phys & Quantum Theory	3
PHYS 486	Quantum Physics I	4
PHYS 487	Quantum Physics II	4
PSYC 204	Intro to Brain and Cognition	3
SHS 200	General Phonetics	3
SHS 240	Intro Sound & Hearing Science	3
SHS 300	Anat & Physiol Spch Mechanism	4
SHS 301	General Speech Science	4
SHS 320	Development of Spoken Language	3
SHS 450	Intro Audiol & Hear Disorders	4
SHS 470	Neural Bases Spch Lang	4
STAT 420	Methods of Applied Statistics	3 or 4
STAT 424	Analysis of Variance	3 or 4
STAT 428	Statistical Computing	3 or 4
STAT 429	Time Series Analysis	3 or 4
STAT 440	Statistical Data Management	3 or 4
SE 411	Reliability Engineering	3 or 4
SE 420	Digital Control Systems	4
SE 423	Mechatronics	3
SE 424	State Space Design for Control	3
TAM 211	Statics	3
TAM 212	Introductory Dynamics	3
TAM 251	Introductory Solid Mechanics	3
TAM 324	Behavior of Materials	4
TAM 335	Introductory Fluid Mechanics	4
TAM 412	Intermediate Dynamics	4
TAM 435	Intermediate Fluid Mechanics	4
TAM 445	Continuum Mechanics	4
TAM 451	Intermediate Solid Mechanics	4
One course from departmentally approved list of EE Foundations Courses		
ECE 310	Digital Signal Processing	3
ECE 330	Power Ckts & Electromechanics	3
ECE 329	Fields and Waves I	3
ECE 340	Semiconductor Electronics	3
ECE 461	Digital Communications	3
ECE 486	Control Systems	4
Three courses from departmentally approved list of Advanced Computing Electives below:		
CS 357	Numerical Methods I	3
CS 411	Database Systems	3 or 4

ME 445	Introduction to Robotics	4
ME 451	Computer-Aided Mfg Systems	3 or 4
ME 452	Num Control of Mfg Processes	3 or 4
ME 460	Industrial Control Systems	4
ME 461	Computer Cntrl of Mech Systems	3 or 4
ME 471	Finite Element Analysis	3 or 4
ME 472	Introduction to Tribology	3 or 4
ME 485	MEMS Devices & Systems	3
ME 487	MEMS-NEMS Theory & Fabrication	4
MUS 407	Elect Music Techniques I	3
MUS 409	Elec Music Techniques II	2
NEUR 453	Cog Neuroscience of Vision	3 or 4
NPRE 201	Energy Systems	2 or 3
NPRE 247	Modeling Nuclear Energy System	3
NPRE 402	Nuclear Power Engineering	3 or 4
NPRE 412	Nuclear Power Econ & Fuel Mgmt	3 or 4
NPRE 421	Plasma and Fusion Science	3
NPRE 423	Plasma Laboratory	2
NPRE 429	Plasma Engineering	3
NPRE 431	Materials in Nuclear Engrg	3
NPRE 432	Nuclear Engrg Materials Lab	2
NPRE 435	Radiological Imaging	3
NPRE 441	Radiation Protection	4
NPRE 442	Radioactive Waste Management	3
NPRE 444	Nuclear Analytical Methods Lab	2 or 3
NPRE 446	Radiation Interact w/Matter I	3
NPRE 447	Radiation Interact w/Matter II	3
NPRE 448	Nuclear Syst Engrg & Design	4
NPRE 451	NPRE Laboratory	3
NPRE 455	Neutron Diffusion & Transport	4
NPRE 457	Safety Anlys Nucl Reactor Syst	3 or 4
NPRE 458	Design in NPRE	4
NPRE 470	Fuel Cells & Hydrogen Sources	3
NPRE 475	Wind Power Systems	3 or 4
PHYS 225	Relativity & Math Applications	2
PHYS 325	Classical Mechanics I	3
PHYS 326	Classical Mechanics II	3
PHYS 401	Classical Physics Lab	3
PHYS 402	Light	3 or 4
PHYS 403	Modern Experimental Physics	4 or 5
PHYS 406	Acoustical Physics of Music	4
PHYS 419	Space, Time, and Matter-ACP	3 or 4
PHYS 420	Space, Time, and Matter	2
PHYS 427	Thermal & Statistical Physics	4
PHYS 460	Condensed Matter Physics	4
PHYS 466	Atomic Scale Simulations	3 or 4
PHYS 470	Subatomic Physics	4
PHYS 485	Atomic Phys & Quantum Theory	3
PHYS 486	Quantum Physics I	4
PHYS 487	Quantum Physics II	4
PSYC 204	Intro to Brain and Cognition	3
SHS 200	General Phonetics	3
SHS 240	Intro Sound & Hearing Science	3
SHS 300	Anat & Physiol Spch Mechanism	4
SHS 301	General Speech Science	4
SHS 320	Development of Spoken Language	3
SHS 450	Intro Audiol & Hear Disorders	4
SHS 470	Neural Bases Spch Lang	4
STAT 420	Methods of Applied Statistics	3 or 4
STAT 424	Analysis of Variance	3 or 4
STAT 425	Statistical Modeling I	3 or 4
STAT 428	Statistical Computing	3 or 4
STAT 429	Time Series Analysis	3 or 4
STAT 440	Statistical Data Management	3 or 4
SE 411	Reliability Engineering	3 or 4
SE 420	Digital Control Systems	4
SE 423	Mechatronics	3
SE 424	State Space Design for Control	3
TAM 211	Statics	3
TAM 212	Introductory Dynamics	3
TAM 251	Introductory Solid Mechanics	3
TAM 324	Behavior of Materials	4
TAM 335	Introductory Fluid Mechanics	4
TAM 412	Intermediate Dynamics	4
TAM 435	Intermediate Fluid Mechanics	4
TAM 445	Continuum Mechanics	4
TAM 451	Intermediate Solid Mechanics	4
Select one course from the following list of Electrical Engineering Foundation Courses		
ECE 310	Digital Signal Processing	3
ECE 330	Power Ckts & Electromechanics	3
ECE 329	Fields and Waves I	3
ECE 340	Semiconductor Electronics	3
ECE 461	Digital Communications	3
ECE 486	Control Systems	4
Select three courses from the following list of Advanced Computing Electives		
CS 357	Numerical Methods I	3
CS 411	Database Systems	3 or 4

CS 412	Introduction to Data Mining	3 or 4
CS 414	Multimedia Systems	3 or 4
CS 418	Interactive Computer Graphics	3 or 4
CS 419	Production Computer Graphics	3 or 4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 421	Programming Languages & Compilers	3 or 4
CS 423	Operating Systems Design	3 or 4
CS 424	Real-Time Systems	3 or 4
CS 425	Distributed Systems	3 or 4
CS 426	Compiler Construction	3 or 4
CS 431	Embedded Systems	3 or 4
CS 436	Computer Networking Laboratory	3 or 4
CS 438	Communication Networks	3 or 4
CS 440	Artificial Intelligence	3 or 4
CS 446	Machine Learning	3 or 4
CS 450	Numerical Analysis	3 or 4
CS 461	Computer Security I	4
CS 475	Formal Models of Computation	3 or 4
CS 476	Program Verification	3 or 4
CS 477	Formal Software Development Methods	3 or 4
CS 483	Applied Parallel Programming	4
CS 498	Special Topics (MP: Logic for Computer Science)	1 to 4
CS 498	Special Topics (VR: Virtual Reality)	1 to 4
CS 498	Special Topics (AML: Applied Machine Learning)	1 to 4
ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4
ECE 412	Microcomputer Laboratory	3
ECE 419	Security Laboratory	3 or 4
ECE 422	Computer Security I	4
ECE 424	Computer Security II	3 or 4
ECE 425	Intro to VLSI System Design	3
ECE 428	Distributed Systems	3 or 4
ECE 435	Computer Networking Laboratory	3 or 4
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 448	Artificial Intelligence	3 or 4
ECE 462	Logic Synthesis	3
ECE 470	Introduction to Robotics	4
ECE 478	Formal Software Development Methods	3 or 4
ECE 491	Numerical Analysis	3 or 4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4
ECE 498	Special Topics in ECE (RC: Smart Phone Computing and Applications)	0 to 4
One course from departmentally approved list below:		
ECE 411	Computer Organization & Design	4
ECE 445	Senior Design Project Lab [6]	4
ECE 496	Senior Research Project (and ECE 499 - Senior Thesis) 6	4

Electives	
Gen Ed (SBS + HA + Comp I)	16
The Grainger College of Engineering Liberal Education course list, or additional courses from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts [7]	6
Free electives. Additional unrestricted course work, subject to certain	12

Total Hours of Curriculum to Graduate	**128**

[1] External transfer students take ENG 300 instead.

[2] MATH 220 *may be substituted, with four of the five credit hours applying toward the degree.* MATH 220 *is appropriate for students with no background in calculus.*

[3] Freshmen take ECE 110 for 3 credit hours. Lab-only version taken by transfer students (with special permission) is 1 credit hour.

[4] MATH 213 may be substituted.

[5] STAT 410 may be substituted.

[6] *Advanced Composition may be satisfied by completing ECE 445 or ECE 496 and ECE 499 or a course within either the general education or free elective categories which has the Advanced Composition designation.*

CS 412	Introduction to Data Mining	3 or 4
CS 414	Multimedia Systems	3 or 4
CS 418	Interactive Computer Graphics	3 or 4
CS 419	Production Computer Graphics	3 or 4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 421	Programming Languages & Compilers	3 or 4
CS 423	Operating Systems Design	3 or 4
CS 424	Real-Time Systems	3 or 4
CS 425	Distributed Systems	3 or 4
CS 426	Compiler Construction	3 or 4
CS 431	Embedded Systems	3 or 4
CS 441	Applied Machine Learning	3 or 4
CS 436	Computer Networking Laboratory	3 or 4
CS 438	Communication Networks	3 or 4
CS 440	Artificial Intelligence	3 or 4
CS 446	Machine Learning	3 or 4
CS 450	Numerical Analysis	3 or 4
CS 461	Computer Security I	4
CS 475	Formal Models of Computation	3 or 4
CS 476	Program Verification	3 or 4
CS 477	Formal Software Development Methods	3 or 4
CS 483	Applied Parallel Programming	4
ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4
ECE 412	Microcomputer Laboratory	3
ECE 419	Security Laboratory	3 or 4
ECE 422	Computer Security I	4
ECE 424	Computer Security II	3 or 4
ECE 425	Intro to VLSI System Design	3
ECE 428	Distributed Systems	3 or 4
ECE 435	Computer Networking Laboratory	3 or 4
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 448	Artificial Intelligence	3 or 4
ECE 462	Logic Synthesis	3
ECE 470	Introduction to Robotics	4
ECE 478	Formal Software Development Methods	3 or 4
ECE 484	Principles of Safe Autonomy	4
ECE 491	Numerical Analysis	3 or 4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4
Select one from the following list of Design Electives		
ECE 411	Computer Organization & Design	4
ECE 445	Senior Design Project Lab [6]	4
ECE 496	Senior Research Project (and ECE 499 - Senior Thesis) 6	4

Electives	
Gen Ed (SBS + HA + Comp I)	16
The Grainger College of Engineering Liberal Education course list, or additional courses from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts [7]	6
Free electives. Additional unrestricted course work, subject to certain	12

Total Hours of Curriculum to Graduate	**128**

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[4] MATH 213 may be substituted.

[5] STAT 410 may be substituted.

[6] *Advanced Composition may be satisfied by completing ECE 445 or ECE 496 and ECE 499 or a course within either the general education or free elective categories which has the Advanced Composition designation.*

[7] The Grainger College of Engineering approved liberal education course list can be found here. Note that these credit hours could carry the required cultural studies designation required for campus general education requirements.

[8] The Grainger College of Engineering restrictions to free electives can be found here.

[7] The Grainger College of Engineering approved liberal education course list can be found here. Note that these credit hours could carry the required cultural studies designation required for campus general education requirements.

[8] The Grainger College of Engineering restrictions to free electives can be found here.

10KP0115BS: ELECTRICAL ENGINEERING, BS

Completed Workflow

1. U Program Review (dforgacs@illinois.edu; eastuby@illinois.edu; aledward@illinois.edu)
2. 1933 Head (b-hajek@illinois.edu; oelze@illinois.edu; erhan@illinois.edu)
3. KP Committee Chair (bsnewell@illinois.edu; kcp@illinois.edu; jmakela@illinois.edu; amccul2@illinois.edu; bodony@illinois.edu)
4. KP Dean (candyd@illinois.edu)
5. University Librarian (jpwilkin@illinois.edu)
6. Provost (kmartens@illinois.edu)
7. Senate EPC (bjlehman@illinois.edu; moorhouz@illinois.edu; kmartens@illinois.edu)
8. Senate (jtempel@illinois.edu)
9. U Senate Conf (none)
10. DMI (eastuby@illinois.edu; aledward@illinois.edu; dforgacs@illinois.edu)

Approval Path

1. Wed, 24 Feb 2021 21:59:29 GMT
   Deb Forgacs (dforgacs): Approved for U Program Review
2. Wed, 24 Feb 2021 22:01:23 GMT
   Erhan Kudeki (erhan): Approved for 1933 Head
3. Tue, 09 Mar 2021 19:48:51 GMT
   Brooke Newell (bsnewell): Approved for KP Committee Chair
4. Tue, 09 Mar 2021 19:51:08 GMT
   Candy Deaville (candyd): Approved for KP Dean
5. Tue, 09 Mar 2021 20:22:25 GMT
   John Wilkin (jpwilkin): Approved for University Librarian
6. Wed, 10 Mar 2021 21:48:25 GMT
   Kathy Martensen (kmartens): Rollback to KP Dean for Provost
7. Wed, 10 Mar 2021 21:52:01 GMT
   Candy Deaville (candyd): Rollback to KP Committee Chair for KP Dean
8. Thu, 18 Mar 2021 20:24:12 GMT
   Brooke Newell (bsnewell): Approved for KP Committee Chair
9. Thu, 18 Mar 2021 20:29:34 GMT
   Candy Deaville (candyd): Approved for KP Dean
10. Thu, 18 Mar 2021 20:31:37 GMT
    John Wilkin (jpwilkin): Approved for University Librarian
11. Mon, 22 Mar 2021 19:01:54 GMT
    Kathy Martensen (kmartens): Approved for Provost
12. Wed, 31 Mar 2021 20:53:23 GMT
    Barbara Lehman (bjlehman): Approved for Senate EPC
13. Thu, 08 Apr 2021 19:11:03 GMT
    Jennifer Roether (jtempel): Approved for Senate
14. Thu, 15 Apr 2021 22:32:01 GMT
    Kathy Martensen (kmartens): Approved for U Senate Conf
15. Mon, 19 Apr 2021 16:12:48 GMT
    Emily Stuby (eastuby): Approved for DMI

History

1. Apr 23, 2019 by Deb Forgacs (dforgacs)
2. Aug 12, 2019 by Deb Forgacs (dforgacs)
3. Feb 26, 2020 by Brooke Newell (bsnewell)
4. Mar 31, 2020 by Deb Forgacs (dforgacs)
5. Apr 14, 2020 by Deb Forgacs (dforgacs)
6. Apr 19, 2021 by Erhan Kudeki (erhan)

Date Submitted:Fri, 17 Sep 2021 16:10:08 GMT

Viewing:10KP0115BS : Electrical Engineering, BS

Changes proposed by: Erhan Kudeki

Proposal Type:

Major (ex. Special Education)

This proposal is for a:

Revision

Administration Details

Official Program Name

Electrical Engineering, BS

Sponsor College

Grainger College of Engineering

Sponsor Department

Electrical and Computer Engineering

Sponsor Name

Erhan Kudeki

Sponsor Email

erhan@illinois.edu

College Contact

Brooke Newell

College Contact Email

bsnewell@illinois.edu

Does this program have inter-departmental administration?

No

Proposal Title

Effective Catalog Term

Fall 2021

Provide a brief, concise description (not justification) of your proposal.

Administrative approval: Updating the course list related to Technical Electives, numerically ordering the MATH courses in the Foundational Mathematics and Science courses, and providing clarifying language.

Program Justification

Why are these changes necessary?

Update requested by the College to make corrections related to Technical Electives.

Instructional Resources

Will there be any reduction in other course offerings, programs or concentrations by your department as a result of this new program/proposed change?

No

Does the program include other courses/subjects impacted by the creation/revision of this program?

No

Program Regulation and Assessment

Briefly describe the plan to assess and improve student learning, including the program's learning objectives; when, how, and where these learning objectives will be assessed; what metrics will be used to signify student's achievement of the stated learning objectives; and the process to ensure assessment results are used to improve student learning. (Describe how the program is aligned with or meets licensure, certification, and/or entitlement requirements, if applicable).

EE BS program is ABET Accredited.

The Program Educational Objectives of the EE program presented to ABET is as follows:

The University of Illinois Electrical Engineering program will produce graduates having the choice, talents, and knowledge to:
1. Pursue a diverse range of careers as engineers, consultants, and entrepreneurs.
2. Continue their education in leading graduate programs in engineering and interdisciplinary areas to emerge as researchers, experts, and educators.
3. Learn and create new knowledge in ever-changing environments of the 21st century, and communicate their work and ideas to colleagues and the public at large.
4. Practice and inspire high ethical and technical standards, and lead their professional disciplines, organizations, and communities globally.

All four of these objectives require a student to possess all seven of the skills listed as Student Outcomes of our program (see below). The particular career paths listed in the first two objectives are engineers, consultants, entrepreneurs --- reachable directly after the B.S. degree --- as well as researchers, experts, and educators, typically for those graduates who choose to continue their education in some graduate program. Each of these six career choices will critically depend on students acquiring all seven of the particular skills enumerated as Student Outcomes, namely:

1. (Principles) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. (Design) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. (Communication) an ability to communicate effectively with a range of audiences.
4. (Professionalism) an ability to recognize ethical and professional responsibilities in
engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. (Teamwork) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. (Analysis) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. (Learning) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Student's achievement of these objectives and outcomes are monitored and assessed using using a strategy that depends on Self-Assessment reports written by ECE instructors and course directors as well as student and alumni surveys.

Is the career/profession for graduates of this program regulated by the State of Illinois?

No

Program of Study

“Baccalaureate degree requires at least 120 semester credit hours or 180 quarter credit hours and at least 40 semester credit hours (60 quarter credit hours) in upper division courses” (source: https://www.ibhe.org/assets/files/PrivateAdminRules2017.pdf). For proposals for new bachelor’s degrees, if this minimum is not explicitly met by specifically-required 300- and/or 400-level courses, please provide information on how the upper-division hours requirement will be satisfied.

All proposals must attach the new or revised version of the Academic Catalog program of study entry. Contact your college office if you have questions.

Revised programs

Electrical Engineering BS_Minor Revision_Side by Side Table.xlsx

Attach a side-by-side comparison with the existing program AND, if the revision references or adds “chose-from” lists of courses students can select from to fulfill requirements, a listing of these courses, including the course rubric, number, title, and number of credit hours.

Catalog Page Text - Overview Tab

Text for Overview tab on the Catalog Page. This is not official content, it is used to help build the new catalog page for the program. Can be edited in the catalog by the college or department.

Electrical engineering is a multifaceted discipline that over the last century has produced an astounding progression of technological innovations that have shaped virtually every aspect of modern life. Electrical engineers need a broad and solid foundation in mathematics and physics to support their education in the engineering principles of analysis, synthesis, design, implementation, and testing of the devices and systems that provide the bedrock of modern energy, communication, sensing, computing, medical, security, and defense infrastructures. Within each subdiscipline one can find application domains that strongly rely on hands-on experimental work or that are based on theoretical, mathematical and computational approaches. The multidisciplinary nature of the electrical engineering education addresses the growing demand for the innovation and design of sensing, communication, computing, and decision-making systems of increasing complexity in consumer, defense, and medical applications.

The curriculum starts with a core of fundamental courses on circuits, electromagnetics, solid-state electronics, and computer systems, leading to a comprehensive array of specialized courses and laboratories in all of the important areas of modern electrical engineering.

Statement for Programs of Study Catalog

Graduation Requirements

Minimum Technical GPA (https://go.grainger.illinois.edu/TechnicalGPA/)**:2.0**
TGPA is required for ECE courses (except ECE 316). SeeTechnical GPA (https://go.grainger.illinois.edu/TechnicalGPA/)to clarify requirements.

Minimum Overall GPA:2.0
Minimum hours required for graduation:128 hours
General education:Students must complete the Campus General Education (https://courses.illinois.edu/gened/DEFAULT/DEFAULT/)**requirements including the campus general education language requirement.Specific Advanced Composition courses required for this degree are listed below.**

Orientation and Professional Development

Code	Title	Hours
ENG 100	Engineering Orientation[1]	0
Total Hours		0

Foundational Mathematics and Science

Code	Title	Hours
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
MATH 221	Calculus I[2]	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257	Linear Algebra with Computational Applications (Linear Algebra)	3
or MATH 416	Abstract Linear Algebra	
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
PHYS 214	Univ Physics: Quantum Physics	2
Total Hours		33

Electrical Engineering Technical Core

Code	Title	Hours
ECE 110	Introduction to Electronics[3]	3
ECE 120	Introduction to Computing	4
ECE 220	Computer Systems & Programming	4
ECE 210	Analog Signal Processing	4
ECE 313	Probability with Engrg Applic[4]	3
ECE 329	Fields and Waves I	3
ECE 340	Semiconductor Electronics	3
ECE 385	Digital Systems Laboratory	3
ECE 445	Senior Design Project Lab[5,6]	4
Total Hours		31

Technical Electives

Code	Title	Hours
30 hours, to include:		
From Departmentally Approved List of Technical Electives, to include:at least 6 hours of non-ECE electives, at least 20 hours of ECE electives, at least 3 Advanced Core Electives, at least 3 ECE Labs, where at least one must be a Hardware Lab		**30**
Non-ECE courses from list below:		6
AE 202	Aerospace Flight Mechanics	3
AE 302	Aerospace Flight Mechanics II	3
AE 311	Incompressible Flow	3
AE 312	Compressible Flow	3
AE 321	Mechs of Aerospace Structures	3
AE 352	Aerospace Dynamical Systems	3
AE 353	Aerospace Control Systems	3
AE 402	Orbital Mechanics	3 or 4

AE 403	Spacecraft Attitude Control	3 or 4
AE 410	Computational Aerodynamics	3 or 4
AE 412	Viscous Flow & Heat Transfer	4
AE 416	Applied Aerodynamics	3 or 4
AE 419	Aircraft Flight Mechanics	3 or 4
AE 420	Finite Element Analysis	3 or 4
AE 427	Course AE 427 Not Found	
AE 428	Mechanics of Composites	3
AE 433	Aerospace Propulsion	3 or 4
AE 434	Rocket Propulsion	3 or 4
AE 435	Electric Propulsion	3 or 4
AE 451	Aeroelasticity	3 or 4
AE 460	Aerodynamics & Propulsion Lab	2
Ag and Bio Eng. - All 300 and 400 level courses exceptABE 440. Except seminars and special topics courses, which may be reviewed in the Advising Office		
ASTR 210	Introduction to Astrophysics	3
ASTR 310	Computing in Astronomy	3
ASTR 330	Extraterrestrial Life	3
ASTR 350	The Big Bang, Black Holes, and the End of the Universe	3
ASTR 404	Stellar Astrophysics	3
ASTR 405	Planetary Systems	3
ASTR 406	Galaxies and the Universe	3
ASTR 414	Astronomical Techniques	4
ASTR 450	Astrochemistry	4
ATMS 201	General Physical Meteorology	3
ATMS 301	Atmospheric Thermodynamics	3
ATMS 302	Atmospheric Dynamics I	3
ATMS 303	Synoptic-Dynamic Wea Analysis	4
ATMS 304	Radiative Transfer-Remote Sens	3
ATMS 305	Computing and Data Analysis	3
ATMS 404	Risk Analysis in Earth Science	3 or 4
ATMS 405	Boundary Layer Processes	4
ATMS 406	Tropical Meteorology	4
ATMS 410	Radar Remote Sensing	4
ATMS 411	Satellite Remote Sensing	4
ATMS 420	Atmospheric Chemistry	4
ATMS 421	Earth Systems Modeling	4
ATMS 425	Course ATMS 425 Not Found	
ATMS 447	Climate Change Assessment	3
ATMS 449	Biogeochemical Cycles	4
BIOC 406	Gene Expression & Regulation	3
BIOC 440	Physical Chemistry Principles	4
BIOC 446	Physical Biochemistry	3
BIOC 455	Technqs Biochem & Biotech	4
BIOE 201	Conservation Principles Bioeng	3
BIOE 202	Cell & Tissue Engineering Lab	2
BIOE 302	Modeling Human Physiology	3
BIOE 414	Biomedical Instrumentation	3
BIOE 415	Biomedical Instrumentation Lab	2
BIOE 461	Cellular Biomechanics	4
BIOE 467	Biophotonics	3
BIOE 476	Tissue Engineering	3

BIOE 480	Magnetic Resonance Imaging	3 or 4
BIOE 485	Computational Mathematics for Machine Learning and Imaging	4
Biophysics (BIOP): All 400 level courses except seminars and special topics courses, which may be reviewed in the Advising Office.		
CHBE 221	Principles of CHE	3
CHBE 321	Thermodynamics	4
CHBE 421	Momentum and Heat Transfer	4
CHBE 422	Mass Transfer Operations	4
CHBE 424	Chemical Reaction Engineering	3
CHBE 430	Unit Operations Laboratory	4
CHBE 431	Process Design	4
CHBE 440	Process Control and Dynamics	3
CHBE 451	Transport Phenomena	3
CHBE 452	Chemical Kinetics & Catalysis	3
CHBE 453	Electrochemical Engineering	2 or 3
CHBE 456	Polymer Science & Engineering	3
CHBE 457	Microelectronics Processing	3
CHBE 471	Biochemical Engineering	3 or 4
CHBE 472	Techniques in Biomolecular Eng	3 or 4
CHBE 473	Biomolecular Engineering	3 or 4
CHBE 474	Metabolic Engineering	3 or 4
CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab II	1
Chemistry (CHEM): All 200, 300 and 400 level except 397, 497, and 499. Exceptions also include seminars and special topics, which may be reviewed in the Advising Office.		
CEE 310	Transportation Engineering	3
CEE 330	Environmental Engineering	3
CEE 408	Railroad Transportation Engrg	3 or 4
CEE 410	Railway Signaling & Control	3 or 4
CEE 416	Traffic Capacity Analysis	3 or 4
CEE 430	Ecological Quality Engineering	2
CEE 447	Atmospheric Chemistry	4
CEE 491	Decision and Risk Analysis	3 or 4
CPSC 265	Genetic Engineering Lab	3
CS 101	Intro Computing: Engrg & Sci (By Approval)	3
CS 173	Discrete Structures	3
CS 225	Data Structures	4
CS 242	Programming Studio	3
CS 357	Numerical Methods I	3
CS 410	Text Information Systems	3 or 4
CS 411	Database Systems	3 or 4
CS 412	Introduction to Data Mining	3 or 4
CS 413	Intro to Combinatorics	3 or 4
CS 414	Multimedia Systems	3 or 4
CS 416	Data Visualization	3 or 4
CS 418	Interactive Computer Graphics	3 or 4
CS 419	Production Computer Graphics	3 or 4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 421	Programming Languages & Compilers	3 or 4
CS 422	Programming Language Design	3 or 4
CS 423	Operating Systems Design	3 or 4
CS 424	Real-Time Systems	3 or 4

CS 425	Distributed Systems	3 or 4
CS 426	Compiler Construction	3 or 4
CS 427	Software Engineering I	3 or 4
CS 428	Software Engineering II	3 or 4
CS 429	Software Engineering II, ACP	3
CS 431	Embedded Systems	3 or 4
CS 433	Computer System Organization	3 or 4
CS 435	Cloud Networking	3 or 4
CS 436	Computer Networking Laboratory	3 or 4
CS 438	Communication Networks	3 or 4
CS 439	Wireless Networks	3 or 4
CS 440	Artificial Intelligence	3 or 4
CS 441	Applied Machine Learning	3 or 4
CS 445	Computational Photography	3 or 4
CS 446	Machine Learning	3 or 4
CS 447	Natural Language Processing	3 or 4
CS 450	Numerical Analysis	3 or 4
CS 460	Security Laboratory	3 or 4
CS 461	Computer Security I	4
CS 463	Computer Security II	3 or 4
CS 465	User Interface Design	4
CS 466	Introduction to Bioinformatics	3 or 4
CS 467	Social Visualization	3 or 4
CS 473	Algorithms	4
CS 475	Formal Models of Computation	3 or 4
CS 476	Program Verification	3 or 4
CS 477	Formal Software Development Methods	3 or 4
CS 481	Advanced Topics in Stochastic Processes & Applications	3 or 4
CS 484	Parallel Programming	3 or 4
CS 398	Special Topics (As Approved)	1 to 4
CS 498	Special Topics (As Approved)	1 to 4
ECE 297	Individual Study	1
ECE 304	Photonic Devices	3
ECE 307	Techniques for Engrg Decisions	3
ECE 310	Digital Signal Processing	3
ECE 311	Digital Signal Processing Lab	1
ECE 314	Probability in Engineering Lab	1
ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3
ECE 333	Green Electric Energy	3
ECE 340	Semiconductor Electronics	3
ECE 342	Electronic Circuits	3
ECE 343	Electronic Circuits Laboratory	1
ECE 350	Fields and Waves II	3
ECE 365	Data Science and Engineering	3
ECE 374	Introduction to Algorithms & Models of Computation	4
ECE 380	Biomedical Imaging	3
ECE 391	Computer Systems Engineering	4
ECE 395	Advanced Digital Projects Lab	2 or 3
ECE 396	Honors Project	1 to 4
ECE 397	Individual Study in ECE	0 to 4
ECE 402	Electronic Music Synthesis	3

ECE 403	Audio Engineering	3
ECE 407	Cryptography	3 or 4
ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4
ECE 412	Microcomputer Laboratory	3
ECE 414	Biomedical Instrumentation	3
ECE 415	Biomedical Instrumentation Lab	2
ECE 416	Biosensors	3
ECE 417	Multimedia Signal Processing	4
ECE 418	Image & Video Processing	4
ECE 419	Security Laboratory	3 or 4
ECE 420	Embedded DSP Laboratory	2
ECE 422	Computer Security I	4
ECE 424	Computer Security II	3 or 4
ECE 425	Intro to VLSI System Design	3
ECE 428	Distributed Systems	3 or 4
ECE 431	Electric Machinery	4
ECE 432	Advanced Electric Machinery	3
ECE 435	Computer Networking Laboratory	3 or 4
ECE 437	Sensors and Instrumentation	3
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 441	Physcs & Modeling Semicond Dev	3
ECE 442	Silicon Photonics	3 or 4
ECE 443	LEDs and Solar Cells	4
ECE 444	IC Device Theory & Fabrication	4
ECE 445	Senior Design Project Lab	4
ECE 446	Principles of Experimental Research in Electrical Engineering	4
ECE 447	Active Microwave Ckt Design	3
ECE 448	Artificial Intelligence	3 or 4
ECE 451	Adv Microwave Measurements	3
ECE 452	Electromagnetic Fields	3
ECE 453	Wireless Communication Systems	4
ECE 454	Antennas	3
ECE 455	Optical Electronics	3 or 4
ECE 456	Global Nav Satellite Systems	4
ECE 457	Microwave Devices & Circuits	3
ECE 458	Applic of Radio Wave Propag	3
ECE 459	Communications Systems	3
ECE 460	Optical Imaging	4
ECE 461	Digital Communications	3
ECE 462	Logic Synthesis	3
ECE 463	Digital Communications Lab	2
ECE 464	Power Electronics	3
ECE 465	Optical Communications Systems	3
ECE 466	Optical Communications Lab	1
ECE 467	Biophotonics	3
ECE 468	Optical Remote Sensing	3
ECE 469	Power Electronics Laboratory	2
ECE 470	Introduction to Robotics	4
ECE 472	Biomedical Ultrasound Imaging	3
ECE 473	Fund of Engrg Acoustics	3 or 4

ECE 476	Power System Analysis	3
ECE 478	Formal Software Development Methods	3 or 4
ECE 480	Magnetic Resonance Imaging	3 or 4
ECE 481	Nanotechnology	4
ECE 482	Digital IC Design	3
ECE 483	Analog IC Design	3
ECE 485	MEMS Devices & Systems	3
ECE 486	Control Systems	4
ECE 487	Intro Quantum Electr for EEs	3
ECE 488	Compound Semicond & Devices	3
ECE 489	Robot Dynamics and Control	4
ECE 490	Introduction to Optimization	3 or 4
ECE 491	Numerical Analysis	3 or 4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4
ECE 493	Advanced Engineering Math	3 or 4
ECE 495	Photonic Device Laboratory	3
ECE 496	Senior Research Project	2
ECE 499	Senior Thesis	2
ECE 298	Special Topics (As approved)	1 to 4
ECE 398	Special Topics in ECE (As approved)	0 to 4
ECE 498	Special Topics in ECE (As approved)	0 to 4
ENG 491	Interdisciplinary Design Proj (CubeSat, Solar Decathlon, Formula SAE, Baja SAE, or by Approval.)	1 to 4
GEOL 107	Physical Geology	4
GEOL 208	History of the Earth System	4
GEOL 333	Earth Materials and the Env	4
GEOL 380	Environmental Geology	4
GEOL 411	Structural Geol and Tectonics	4
GEOL 417	Geol Field Methods, Western US	6
GEOL 432	Mineralogy and Mineral Optics	4
GEOL 436	Petrology and Petrography	4
GEOL 440	Sedimentology and Stratigraphy	4
GEOL 450	Probing the Earth's Interior	3
GEOL 452	Introduction to Geophysics	4
GEOL 460	Geochemistry	3
IE 310	Deterministic Models in Optimization	3
IE 330	Industrial Quality Control	3
IE 360	Facilities Planning and Design	3
IE 361	Production Planning & Control	3
IE 400	Design & Anlys of Experiments	3 or 4
IE 410	Advanced Topics in Stochastic Processes & Applications	3 or 4
IE 411	Optimization of Large Systems	3 or 4
IE 412	OR Models for Mfg Systems	3 or 4
IE 413	Simulation	3 or 4
IE 420	Financial Engineering	3 or 4
IE 430	Economic Found of Quality Syst	3 or 4
IE 431	Design for Six Sigma	3
IB 150	Organismal & Evolutionary Biol	4
IB 202	Physiology	3 or 4
IB 203	Ecology	4
IB 204	Genetics	3 or 4
IB 302	Evolution	4

IB 335	Plant Systematics	4
IB 348	Fish and Wildlife Ecology	3
IB 368	Vertebrate Natural History	4
IB 401	Introduction to Entomology	3 or 4
IB 405	Evolution of Traits and Genomes	3
IB 420	Plant Physiology	3
IB 421	Photosynthesis	3
IB 426	Env and Evol Physl of Animals	3
IB 427	Insect Physiology	4
IB 431	Behavioral Ecology	3
IB 432	Genes and Behavior	3
IB 440	Plants and Global Change	3
IB 443	Evolutionary Ecology	3
IB 444	Insect Ecology	3 or 4
IB 451	Conservation Biology	4
IB 452	Ecosystem Ecology	3
IB 453	Community Ecology	3
IB 461	Ornithology	4
IB 462	Mammalogy	4
IB 463	Ichthyology	4
IB 464	Herpetology	4
IB 467	Principles of Systematics	4
IB 468	Insect Classification and Evol	4
IB 471	General Mycology	4
IB 472	Plant Molecular Biology	1
IB 473	Plant Genomics	1
IB 481	Vector-borne Diseases	4
IB 482	Insect Pest Management	3
IB 483	Insect Pathology	3
IB 485	Environ Toxicology & Health	3
IB 486	Pesticide Toxicology	3 or 4
LING 300	Anat & Physiol Spch Mechanism	4
LING 406	Introduction to Computational Linguistics	3 or 4
LING 407	Logic and Linguistic Analysis	3 or 4
LING 427	Language and the Brain	3 or 4
MSE 280	Engineering Materials	3
Material Science and Eng. (MSE): All 300 and 400 level courses except 304, 460, and 461. Exceptions of seminar and special topics courses can be reviewed in the Advising Office.		
MATH 213	Basic Discrete Mathematics	3
MATH 347	Fundamental Mathematics	3
MATH 348	Fundamental Mathematics-ACP	4
MATH 357	Numerical Methods I	3
MATH 402	Non Euclidean Geometry	3 or 4
MATH 403	Euclidean Geometry	3 or 4
MATH 412	Graph Theory	3 or 4
MATH 413	Intro to Combinatorics	3 or 4
MATH 414	Mathematical Logic	3 or 4
MATH 416	Abstract Linear Algebra	3 or 4
MATH 417	Intro to Abstract Algebra	3 or 4
MATH 418	Intro to Abstract Algebra II	3 or 4
MATH 423	Differential Geometry	3 or 4
MATH 424	Honors Real Analysis	3

MATH 425	Honors Advanced Analysis	3
MATH 427	Honors Abstract Algebra	3
MATH 428	Honors Topics in Mathematics	3
MATH 432	Set Theory and Topology	3 or 4
MATH 442	Intro Partial Diff Equations	3 or 4
MATH 444	Elementary Real Analysis	3 or 4
MATH 446	Applied Complex Variables	3 or 4
MATH 447	Real Variables	3 or 4
MATH 448	Complex Variables	3 or 4
MATH 450	Numerical Analysis	3 or 4
MATH 453	Number Theory	3 or 4
MATH 473	Algorithms	4
MATH 475	Formal Models of Computation	3 or 4
MATH 481	Vector and Tensor Analysis	3 or 4
MATH 482	Linear Programming	3 or 4
MATH 484	Nonlinear Programming	3 or 4
MATH 487	Advanced Engineering Math	3 or 4
MATH 489	Dynamics & Differential Eqns	3 or 4
MCB 150	Molec & Cellular Basis of Life	4
MCB 250	Molecular Genetics	3
MCB 251	Exp Techniqs in Molecular Biol	2
MCB 252	Cells, Tissues & Development	3
MCB 253	Exp Techniqs in Cellular Biol	2
MCB 300	Microbiology	3
MCB 301	Experimental Microbiology	3
MCB 314	Introduction to Neurobiology	3
MCB 316	Genetics and Disease	4
MCB 354	Biochem & Phys Basis of Life	3
MCB 400	Cancer Cell Biology	3
MCB 401	Cellular Physiology	3
MCB 402	Sys & Integrative Physiology	3
MCB 403	Cell & Membrane Physiology Lab	1 or 2
MCB 404	Sys & Integrative Physiol Lab	1 to 2
MCB 406	Gene Expression & Regulation	3
MCB 408	Immunology	3
MCB 410	Developmental Biology, Stem Cells and Regenerative Medicine	3
MCB 413	Endocrinology	3
MCB 419	Brain, Behavior & Info Process	3
MCB 421	Microbial Genetics	3
MCB 424	Microbial Biochemistry	3
MCB 426	Bacterial Pathogenesis	3
MCB 430	Molecular Microbiology	3
MCB 431	Microbial Physiology	3
MCB 433	Virology & Viral Pathogenesis	3
MCB 435	Evolution of Infectious Disease	3
MCB 446	Physical Biochemistry	3
MCB 480	Eukaryotic Cell Signaling	3
ME 200	Thermodynamics	3
ME 310	Fundamentals of Fluid Dynamics	4
ME 320	Heat Transfer	4
ME 330	Engineering Materials	4
ME 340	Dynamics of Mechanical Systems	3.5

ME 370	Mechanical Design I	3
ME 371	Mechanical Design II	3
ME 400	Energy Conversion Systems	3 or 4
ME 401	Refrigeration and Cryogenics	3 or 4
ME 402	Design of Thermal Systems	3 or 4
ME 403	Internal Combustion Engines	3 or 4
ME 404	Intermediate Thermodynamics	4
ME 410	Intermediate Gas Dynamics	3 or 4
ME 411	Viscous Flow & Heat Transfer	4
ME 412	Numerical Thermo-Fluid Mechs	2 to 4
ME 420	Intermediate Heat Transfer	4
ME 430	Failure of Engrg Materials	3 or 4
ME 431	Mechanical Component Failure	3 or 4
ME 440	Kinem & Dynamics of Mech Syst	3 or 4
ME 445	Introduction to Robotics	4
ME 450	Course ME 450 Not Found	
ME 451	Computer-Aided Mfg Systems	3 or 4
ME 452	Num Control of Mfg Processes	3 or 4
ME 460	Industrial Control Systems	4
ME 461	Computer Cntrl of Mech Systems	3 or 4
ME 471	Finite Element Analysis	3 or 4
ME 472	Introduction to Tribology	3 or 4
ME 485	MEMS Devices & Systems	3
ME 487	MEMS-NEMS Theory & Fabrication	4
MUS 407	Elect Music Techniques I	3
MUS 409	Elec Music Techniques II	2
NEUR 453	Cog Neuroscience of Vision	3 or 4
NPRE 201	Energy Systems	2 or 3
NPRE 247	Modeling Nuclear Energy System	3
NPRE 402	Nuclear Power Engineering	3 or 4
NPRE 412	Nuclear Power Econ & Fuel Mgmt	3 or 4
NPRE 421	Plasma and Fusion Science	3
NPRE 423	Plasma Laboratory	2
NPRE 429	Plasma Engineering	3
NPRE 431	Materials in Nuclear Engrg	3
NPRE 432	Nuclear Engrg Materials Lab	2
NPRE 435	Radiological Imaging	3
NPRE 441	Radiation Protection	4
NPRE 442	Radioactive Waste Management	3
NPRE 444	Nuclear Analytical Methods Lab	2 or 3
NPRE 446	Radiation Interact w/Matter I	3
NPRE 447	Radiation Interact w/Matter II	3
NPRE 448	Nuclear Syst Engrg & Design	4
NPRE 451	NPRE Laboratory	3
NPRE 455	Neutron Diffusion & Transport	4
NPRE 457	Safety Anlys Nucl Reactor Syst	3 or 4
NPRE 458	Design in NPRE	4
NPRE 470	Fuel Cells & Hydrogen Sources	3
NPRE 475	Wind Power Systems	3 or 4
PHYS 225	Relativity & Math Applications	2
PHYS 325	Classical Mechanics I	3
PHYS 326	Classical Mechanics II	3

PHYS 401	Classical Physics Lab	3
PHYS 402	Light	3 or 4
PHYS 403	Modern Experimental Physics	4 or 5
PHYS 406	Acoustical Physics of Music	4
PHYS 419	Space, Time, and Matter-ACP	3 or 4
PHYS 420	Space, Time, and Matter	2
PHYS 427	Thermal & Statistical Physics	4
PHYS 460	Condensed Matter Physics	4
PHYS 466	Atomic Scale Simulations	3 or 4
PHYS 470	Subatomic Physics	4
PHYS 485	Atomic Phys & Quantum Theory	3
PHYS 486	Quantum Physics I	4
PHYS 487	Quantum Physics II	4
PSYC 204	Intro to Brain and Cognition	3
SHS 200	General Phonetics	3
SHS 240	Intro Sound & Hearing Science	3
SHS 300	Anat & Physiol Spch Mechanism	4
SHS 301	General Speech Science	4
SHS 320	Development of Spoken Language	3
SHS 450	Intro Audiol & Hear Disorders	4
SHS 470	Neural Bases Spch Lang	4
STAT 420	Methods of Applied Statistics	3 or 4
STAT 424	Analysis of Variance	3 or 4
STAT 425	Statistical Modeling I	3 or 4
STAT 428	Statistical Computing	3 or 4
STAT 429	Time Series Analysis	3 or 4
STAT 440	Statistical Data Management	3 or 4
SE 411	Reliability Engineering	3 or 4
SE 420	Digital Control Systems	4
SE 423	Mechatronics	3
SE 424	State Space Design for Control	3
TAM 211	Statics	3
TAM 212	Introductory Dynamics	3
TAM 251	Introductory Solid Mechanics	3
TAM 324	Behavior of Materials	4
TAM 335	Introductory Fluid Mechanics	4
TAM 412	Intermediate Dynamics	4
TAM 435	Intermediate Fluid Mechanics	4
TAM 445	Continuum Mechanics	4
TAM 451	Intermediate Solid Mechanics	4
ECE Courses to include:		
Select three from the following list of Advanced Core ECE electives:		
Select three courses from the following list of Advanced Core ECE electives		
ECE 391	Computer Systems Engineering	4
or CS 225	Data Structures	
ECE 310	Digital Signal Processing	3
ECE 330	Power Ckts & Electromechanics	3
ECE 342	Electronic Circuits	3
ECE 350	Fields and Waves II	3
Select three ECE labs identified below. At least one must be hardware labs		
Select three courses from the following list of ECE labs. At least one must be a Hardware Lab.		
Hardware Labs:		

ECE 343	Electronic Circuits Laboratory	1
ECE 391	Computer Systems Engineering	4
ECE 395	Advanced Digital Projects Lab	2 or 3
ECE 402	Electronic Music Synthesis	3
ECE 415	Biomedical Instrumentation Lab	2
ECE 420	Embedded DSP Laboratory	2
ECE 431	Electric Machinery	4
CS 436	Computer Networking Laboratory	3 or 4
ECE 437	Sensors and Instrumentation	3
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 443	LEDs and Solar Cells	4
ECE 444	IC Device Theory & Fabrication	4
ECE 446	Principles of Experimental Research in Electrical Engineering	4
ECE 447	Active Microwave Ckt Design	3
ECE 451	Adv Microwave Measurements	3
ECE 453	Wireless Communication Systems	4
ECE 456	Global Nav Satellite Systems	4
ECE 460	Optical Imaging	4
ECE 463	Digital Communications Lab	2
ECE 466	Optical Communications Lab	1
ECE 468	Optical Remote Sensing	3
ECE 469	Power Electronics Laboratory	2
ECE 470	Introduction to Robotics	4
ECE 481	Nanotechnology	4
ECE 486	Control Systems	4
ECE 489	Robot Dynamics and Control	4
ECE 495	Photonic Device Laboratory	3
Software Labs:		
ECE 311	Digital Signal Processing Lab	1
ECE 314	Probability in Engineering Lab	1
ECE 365	Data Science and Engineering	3
ECE 411	Computer Organization & Design	4
ECE 484	Principles of Safe Autonomy	4

Electives

Code	Title	Hours
The Grainger College of Engineering Liberal Education course list, or additional courses from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts[7]		6
Free electives. Additional unrestricted course work, subject to certain exceptions as noted by the College, so that there are at least 128 credit hours earned toward the degree.[8]		12
Total Hours of Curriculum to Graduate		**128**

1 *External transfer students take*ENG 300 *instead.*

2 MATH 220*may be substituted, with four of the five credit hours applying toward the degree.*MATH 220*is appropriate for students with no background in calculus.*

3 *Freshmen take*ECE 110*for 3 credit hours. Lab-only version taken by transfer students (with special permission) is 1 credit hour.*

4 STAT 410*may be substituted.*

5 ECE 496*AND*ECE 499*may be substituted.*

6 *Advanced Composition may be satisfied by completing*ECE 445*, or a course in either the general education or free elective categories which has the Advanced Composition designation.*

[7] *The Grainger College of Engineering*approved liberal education course list *(*https://go.grainger.illinois.edu/LiberalEducation/*). Note that these credit hours could carry the required cultural studies designation required for campus general education requirements.*

[8] *The Grainger College of Engineering*restrictions to free electives *(*https://go.grainger.illinois.edu/FreeElectives/*).*

Corresponding Degree

BS Bachelor of Science

Program Features

Academic Level

Undergraduate

Does this major have transcripted concentrations?

No

What is the typical time to completion of this program?

4 years

What are the minimum Total Credit Hours required for this program?

128 hours

CIP Code

141001 - Electrical and Electronics Engineering.

Is This a Teacher Certification Program?

No

Will specialized accreditation be sought for this program?

No

Delivery Method

This program is available:

On Campus - Students are required to be on campus, they may take some online courses.

Enrollment

Describe how this revision will impact enrollment and degrees awarded.

No impact

Estimated Annual Number of Degrees Awarded

What is the matriculation term for this program?

Fall

Budget

Are there budgetary implications for this revision?

No

Will the program or revision require staffing (faculty, advisors, etc.) beyond what is currently available?

No

Financial Resources

How does the unit intend to financially support this proposal?

No financial impact is expected.

Will the unit need to seek campus or other external resources?

No

Are you seeking a change in the tuition rate or differential for this program?

No

Resource Implications

Facilities

Will the program require new or additional facilities or significant improvements to already existing facilities?

No

Technology

Will the program need additional technology beyond what is currently available for the unit?

No

Non-Technical Resources

Will the program require additional supplies, services or equipment (non-technical)?

No

Resources

For each of these items, be sure to include in the response if the proposed new program or change will result in replacement of another program(s). If so, which program(s), what is the anticipated impact on faculty, students, and instructional resources? Please attach any letters of support/ acknowledgement from faculty, students, and/or other impacted units as appropriate.

Faculty Resources

Please address the impact on faculty resources including any changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc. Describe how the unit will support student advising, including job placement and/or admission to advanced studies.

No impact.

Library Resources

Describe your proposal's impact on the University Library's resources, collections, and services. If necessary please consult with the appropriate disciplinary specialist within the University Library.

No impact.

EP Documentation

EP Control Number

EP.22.030

This proposal requires HLC inquiry

No

DMI Documentation

Banner/Codebook Name

BS:Electrical Engineerng -UIUC

Program Code:

10KP0115BS

Degree Code

BS

Major Code

0115

Program Reviewer Comments

Deb Forgacs (dforgacs) (Wed, 15 Sep 2021 14:51:53 GMT): Rollback: requested.
Deb Forgacs (dforgacs) (Mon, 27 Sep 2021 13:57:35 GMT): Re-entered the proposal type, the corresponding program and the CIP code due to system bug 09/27/2021
Kathy Martensen (kmartens) (Wed, 06 Oct 2021 16:44:13 GMT): Administrative approval: Doesn't change total hours required, doesn't restrict students' options.

Key: 116

Addition
Removal
Revision

Current Program of Study

Orientation and Professional Development		
ENG 100	Engineering Orientation [1]	0
Total Hours		0

Foundational Mathematics and Science		
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
MATH 221	Calculus I [2]	4
MATH 231	Calculus II	3
MATH 257	Linear Algebra with Computational Applications (Linear Algebra)	3
or MATH 416	Abstract Linear Algebra	
MATH 241	Calculus III	4
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
PHYS 214	Univ Physics: Quantum Physics	2
Total Hours		33

Electrical Engineering Technical Core		
ECE 110	Introduction to Electronics [3]	3
ECE 120	Introduction to Computing	4
ECE 220	Computer Systems & Programming	4
ECE 210	Analog Signal Processing	4
ECE 313	Probability with Engrg Applic [4]	3
ECE 329	Fields and Waves I	3
ECE 340	Semiconductor Electronics	3
ECE 385	Digital Systems Laboratory	3
ECE 445	Senior Design Project Lab [5,6]	4
Total Hours		31

Technical Electives		
30 hours, to include:		
Non-ECE courses from list below:		6
AE 202	Aerospace Flight Mechanics	3
AE 302	Aerospace Flight Mechanics II	3
AE 311	Incompressible Flow	3
AE 312	Compressible Flow	3
AE 321	Mechs of Aerospace Structures	3
AE 352	Aerospace Dynamical Systems	3
AE 353	Aerospace Control Systems	3
AE 402	Orbital Mechanics	3 or 4
AE 403	Spacecraft Attitude Control	3 or 4
AE 410	Computational Aerodynamics	3 or 4
AE 412	Viscous Flow & Heat Transfer	4
AE 416	Applied Aerodynamics	3 or 4
AE 419	Aircraft Flight Mechanics	3 or 4
AE 420	Finite Element Analysis	3 or 4
AE 427	Course AE 427 Not Found	
AE 428	Mechanics of Composites	3
AE 433	Aerospace Propulsion	3 or 4
AE 434	Rocket Propulsion	3 or 4
AE 435	Electric Propulsion	3 or 4
AE 451	Aeroelasticity	3 or 4
AE 460	Aerodynamics & Propulsion Lab	2

New Program of Study

Orientation and Professional Development		
ENG 100	Engineering Orientation [1]	0
Total Hours		0

Foundational Mathematics and Science		
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
MATH 221	Calculus I [2]	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257	Linear Algebra with Computational Applications	3
or MATH 416	Abstract Linear Algebra	
MATH 285	Intro to Differential Eq	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
PHYS 214	Univ Physics: Quantum Physics	2
Total Hours		33

Electrical Engineering Technical Core		
ECE 110	Introduction to Electronics [3]	3
ECE 120	Introduction to Computing	4
ECE 220	Computer Systems & Programming	4
ECE 210	Analog Signal Processing	4
ECE 313	Probability with Engrg Applic [4]	3
ECE 329	Fields and Waves I	3
ECE 340	Semiconductor Electronics	3
ECE 385	Digital Systems Laboratory	3
ECE 445	Senior Design Project Lab [5,6]	4
Total Hours		31

Technical Electives		
From the Departmentally Approved List of Technical Electives, to include:		30
at least 6 hours of non-ECE electives		
at least 20 hours of ECE electives		
at least 3 Advanced Core Electives		
at least 3 ECE Labs, where at least one must be a Hardware Lab		
AE 202	Aerospace Flight Mechanics	3
AE 302	Aerospace Flight Mechanics II	3
AE 311	Incompressible Flow	3
AE 312	Compressible Flow	3
AE 321	Mechs of Aerospace Structures	3
AE 352	Aerospace Dynamical Systems	3
AE 353	Aerospace Control Systems	3
AE 402	Orbital Mechanics	3 or 4
AE 403	Spacecraft Attitude Control	3 or 4
AE 410	Computational Aerodynamics	3 or 4
AE 412	Viscous Flow & Heat Transfer	4
AE 416	Applied Aerodynamics	3 or 4
AE 419	Aircraft Flight Mechanics	3 or 4
AE 420	Finite Element Analysis	3 or 4
AE 428	Mechanics of Composites	3
AE 433	Aerospace Propulsion	3 or 4
AE 434	Rocket Propulsion	3 or 4
AE 435	Electric Propulsion	3 or 4
AE 451	Aeroelasticity	3 or 4
AE 460	Aerodynamics & Propulsion Lab	2

Ag and Bio Eng. - All 300 and 400 level courses except ABE 440. Exc		
ASTR 210	Introduction to Astrophysics	3
ASTR 310	Computing in Astronomy	3
ASTR 330	Extraterrestrial Life	3
ASTR 350	The Big Bang, Black Holes, and the End of the Universe	3
ASTR 404	Stellar Astrophysics	3
ASTR 405	Planetary Systems	3
ASTR 406	Galaxies and the Universe	3
ASTR 414	Astronomical Techniques	4
ASTR 450	Astrochemistry	4
ATMS 201	General Physical Meteorology	3
ATMS 301	Atmospheric Thermodynamics	3
ATMS 302	Atmospheric Dynamics I	3
ATMS 303	Synoptic-Dynamic Wea Analysis	4
ATMS 304	Radiative Transfer-Remote Sens	3
ATMS 305	Computing and Data Analysis	3
ATMS 404	Risk Analysis in Earth Science	3 or 4
ATMS 405	Boundary Layer Processes	4
ATMS 406	Tropical Meteorology	4
ATMS 410	Radar Remote Sensing	4
ATMS 411	Satellite Remote Sensing	4
ATMS 420	Atmospheric Chemistry	4
ATMS 421	Earth Systems Modeling	4
ATMS 425	Air Quality Modeling	4
ATMS 447	Climate Change Assessment	3
ATMS 449	Biogeochemical Cycles	4
BIOC 406	Gene Expression & Regulation	3
BIOC 440	Physical Chemistry Principles	4
BIOC 446	Physical Biochemistry	3
BIOC 455	Technqs Biochem & Biotech	4
BIOE 201	Conservation Principles Bioeng	3
BIOE 202	Cell & Tissue Engineering Lab	2
BIOE 302	Modeling Human Physiology	3
BIOE 414	Biomedical Instrumentation	3
BIOE 415	Biomedical Instrumentation Lab	2
BIOE 461	Cellular Biomechanics	4
BIOE 467	Biophotonics	3
BIOE 476	Tissue Engineering	3
BIOE 480	Magnetic Resonance Imaging	3 or 4
Biophysics (BIOP): All 400 level courses except seminars and special topics courses, which may be reviewed in the Advising Office.		
CHBE 221	Principles of CHE	3
CHBE 321	Thermodynamics	4
CHBE 421	Momentum and Heat Transfer	4
CHBE 422	Mass Transfer Operations	4
CHBE 424	Chemical Reaction Engineering	3
CHBE 430	Unit Operations Laboratory	4
CHBE 431	Process Design	4
CHBE 440	Process Control and Dynamics	3
CHBE 451	Transport Phenomena	3
CHBE 452	Chemical Kinetics & Catalysis	3
CHBE 453	Electrochemical Engineering	2 or 3
CHBE 456	Polymer Science & Engineering	3
CHBE 457	Microelectronics Processing	3
CHBE 471	Biochemical Engineering	3 or 4
CHBE 472	Techniques in Biomolecular Eng	3 or 4
CHBE 473	Biomolecular Engineering	3 or 4
CHBE 474	Metabolic Engineering	3 or 4
CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab II	1
Chemistry (CHEM): All 200, 300 and 400 level except 397, 497, and 499. Exceptions also include seminars and special topics, which may be reviewed in the Advising Office.		

Ag and Bio Eng. - All 300 and 400 level courses except ABE 440. Except seminars and special topics courses, which may be reviewed in the Advising Office		
ASTR 210	Introduction to Astrophysics	3
ASTR 310	Computing in Astronomy	3
ASTR 330	Extraterrestrial Life	3
ASTR 350	The Big Bang, Black Holes, and the End of the Universe	3
ASTR 404	Stellar Astrophysics	3
ASTR 405	Planetary Systems	3
ASTR 406	Galaxies and the Universe	3
ASTR 414	Astronomical Techniques	4
ASTR 450	Astrochemistry	4
ATMS 201	General Physical Meteorology	3
ATMS 301	Atmospheric Thermodynamics	3
ATMS 302	Atmospheric Dynamics I	3
ATMS 303	Synoptic-Dynamic Wea Analysis	4
ATMS 304	Radiative Transfer-Remote Sens	3
ATMS 305	Computing and Data Analysis	3
ATMS 404	Risk Analysis in Earth Science	3 or 4
ATMS 405	Boundary Layer Processes	4
ATMS 406	Tropical Meteorology	4
ATMS 410	Radar Remote Sensing	4
ATMS 411	Satellite Remote Sensing	4
ATMS 420	Atmospheric Chemistry	4
ATMS 421	Earth Systems Modeling	4
ATMS 447	Climate Change Assessment	3
ATMS 449	Biogeochemical Cycles	4
BIOC 406	Gene Expression & Regulation	3
BIOC 440	Physical Chemistry Principles	4
BIOC 446	Physical Biochemistry	3
BIOC 455	Technqs Biochem & Biotech	4
BIOE 201	Conservation Principles Bioeng	3
BIOE 202	Cell & Tissue Engineering Lab	2
BIOE 302	Modeling Human Physiology	3
BIOE 414	Biomedical Instrumentation	3
BIOE 415	Biomedical Instrumentation Lab	2
BIOE 461	Cellular Biomechanics	4
BIOE 467	Biophotonics	3
BIOE 476	Tissue Engineering	3
BIOE 480	Magnetic Resonance Imaging	3 or 4
BIOE 485	Computational Mathematics for Machine Learning and Imaging	4
Biophysics (BIOP): All 400 level courses except seminars and special topics courses, which may be reviewed in the Advising Office.		
CHBE 221	Principles of CHE	3
CHBE 321	Thermodynamics	4
CHBE 421	Momentum and Heat Transfer	4
CHBE 422	Mass Transfer Operations	4
CHBE 424	Chemical Reaction Engineering	3
CHBE 430	Unit Operations Laboratory	4
CHBE 431	Process Design	4
CHBE 440	Process Control and Dynamics	3
CHBE 451	Transport Phenomena	3
CHBE 452	Chemical Kinetics & Catalysis	3
CHBE 453	Electrochemical Engineering	2 or 3
CHBE 456	Polymer Science & Engineering	3
CHBE 457	Microelectronics Processing	3
CHBE 471	Biochemical Engineering	3 or 4
CHBE 472	Techniques in Biomolecular Eng	3 or 4
CHBE 473	Biomolecular Engineering	3 or 4
CHBE 474	Metabolic Engineering	3 or 4
CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab II	1
Chemistry (CHEM): All 200, 300 and 400 level except 397, 497, and 499. Exceptions also include seminars and special topics, which may be reviewed in the Advising Office.		

CEE 310	Transportation Engineering	3
CEE 330	Environmental Engineering	3
CEE 408	Railroad Transportation Engrg	3 or 4
CEE 410	Railway Signaling & Control	3 or 4
CEE 416	Traffic Capacity Analysis	3 or 4
CEE 430	Ecological Quality Engineering	2
CEE 447	Atmospheric Chemistry	4
CEE 491	Decision and Risk Analysis	3 or 4
CPSC 265	Genetic Engineering Lab	3
CS 101	Intro Computing: Engrg & Sci (By Approval)	3
CS 173	Discrete Structures	3
CS 225	Data Structures	4
CS 242	Programming Studio	3
CS 357	Numerical Methods I	3
CS 410	Text Information Systems	3 or 4
CS 411	Database Systems	3 or 4
CS 412	Introduction to Data Mining	3 or 4
CS 413	Intro to Combinatorics	3 or 4
CS 414	Multimedia Systems	3 or 4
CS 418	Interactive Computer Graphics	3 or 4
CS 419	Production Computer Graphics	3 or 4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 421	Programming Languages & Compilers	3 or 4
CS 422	Programming Language Design	3 or 4
CS 423	Operating Systems Design	3 or 4
CS 424	Real-Time Systems	3 or 4
CS 425	Distributed Systems	3 or 4
CS 426	Compiler Construction	3 or 4
CS 427	Software Engineering I	3 or 4
CS 428	Software Engineering II	3 or 4
CS 429	Software Engineering II, ACP	3
CS 431	Embedded Systems	3 or 4
CS 433	Computer System Organization	3 or 4
CS 436	Computer Networking Laboratory	3 or 4
CS 438	Communication Networks	3 or 4
CS 439	Wireless Networks	3 or 4
CS 440	Artificial Intelligence	3 or 4
CS 445	Computational Photography	3 or 4
CS 446	Machine Learning	3 or 4
CS 447	Natural Language Processing	3 or 4
CS 450	Numerical Analysis	3 or 4
CS 460	Security Laboratory	3 or 4
CS 461	Computer Security I	4
CS 463	Computer Security II	3 or 4
CS 465	User Interface Design	4
CS 466	Introduction to Bioinformatics	3 or 4
CS 467	Social Visualization	3 or 4
CS 473	Algorithms	4
CS 475	Formal Models of Computation	3 or 4
CS 476	Program Verification	3 or 4
CS 477	Formal Software Development Methods	3 or 4
CS 481	Advanced Topics in Stochastic Processes & Applications	3 or 4
CS 484	Parallel Programming	3 or 4
CS 398	Special Topics (As Approved)	1 to 4
CS 498	Special Topics (As Approved)	1 to 4
ECE 297	Individual Study	1
ECE 304	Photonic Devices	3
ECE 307	Techniques for Engrg Decisions	3
ECE 310	Digital Signal Processing	3
ECE 311	Digital Signal Processing Lab	1
ECE 314	Probability in Engineering Lab	1
ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3
ECE 333	Green Electric Energy	3
ECE 340	Semiconductor Electronics	3
ECE 342	Electronic Circuits	3
ECE 343	Electronic Circuits Laboratory	1
ECE 350	Fields and Waves II	3
ECE 365	Data Science and Engineering	3
ECE 374	Introduction to Algorithms & Models of Computation	4
ECE 380	Biomedical Imaging	3

CEE 310	Transportation Engineering	3
CEE 330	Environmental Engineering	3
CEE 408	Railroad Transportation Engrg	3 or 4
CEE 410	Railway Signaling & Control	3 or 4
CEE 416	Traffic Capacity Analysis	3 or 4
CEE 430	Ecological Quality Engineering	2
CEE 447	Atmospheric Chemistry	4
CEE 491	Decision and Risk Analysis	3 or 4
CPSC 265	Genetic Engineering Lab	3
CS 101	Intro Computing: Engrg & Sci (By Approval)	3
CS 173	Discrete Structures	3
CS 225	Data Structures	4
CS 242	Programming Studio	3
CS 357	Numerical Methods I	3
CS 410	Text Information Systems	3 or 4
CS 411	Database Systems	3 or 4
CS 412	Introduction to Data Mining	3 or 4
CS 413	Intro to Combinatorics	3 or 4
CS 414	Multimedia Systems	3 or 4
CS 416	Data Visualization	3 or 4
CS 418	Interactive Computer Graphics	3 or 4
CS 419	Production Computer Graphics	3 or 4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 421	Programming Languages & Compilers	3 or 4
CS 422	Programming Language Design	3 or 4
CS 423	Operating Systems Design	3 or 4
CS 424	Real-Time Systems	3 or 4
CS 425	Distributed Systems	3 or 4
CS 426	Compiler Construction	3 or 4
CS 427	Software Engineering I	3 or 4
CS 428	Software Engineering II	3 or 4
CS 429	Software Engineering II, ACP	3
CS 431	Embedded Systems	3 or 4
CS 433	Computer System Organization	3 or 4
CS 435	Cloud Networking	3 or 4
CS 436	Computer Networking Laboratory	3 or 4
CS 438	Communication Networks	3 or 4
CS 439	Wireless Networks	3 or 4
CS 440	Artificial Intelligence	3 or 4
CS 441	Applied Machine Learning	3 or 4
CS 445	Computational Photography	3 or 4
CS 446	Machine Learning	3 or 4
CS 447	Natural Language Processing	3 or 4
CS 450	Numerical Analysis	3 or 4
CS 460	Security Laboratory	3 or 4
CS 461	Computer Security I	4
CS 463	Computer Security II	3 or 4
CS 465	User Interface Design	3 or 4
CS 466	Introduction to Bioinformatics	3 or 4
CS 467	Social Visualization	3 or 4
CS 473	Algorithms	4
CS 475	Formal Models of Computation	3 or 4
CS 476	Program Verification	3 or 4
CS 477	Formal Software Development Methods	3 or 4
CS 481	Advanced Topics in Stochastic Processes & Applications	3 or 4
CS 484	Parallel Programming	3 or 4
CS 398	Special Topics (As Approved)	1 to 4
CS 498	Special Topics (As Approved)	1 to 4
ECE 297	Individual Study	1
ECE 304	Photonic Devices	3
ECE 307	Techniques for Engrg Decisions	3
ECE 310	Digital Signal Processing	3
ECE 311	Digital Signal Processing Lab	1
ECE 314	Probability in Engineering Lab	1
ECE 330	Power Ckts & Electromechanics	3
ECE 333	Green Electric Energy	3
ECE 342	Electronic Circuits	3
ECE 343	Electronic Circuits Laboratory	1
ECE 350	Fields and Waves II	3
ECE 365	Data Science and Engineering	3
ECE 374	Introduction to Algorithms & Models of Computation	4
ECE 380	Biomedical Imaging	3

ECE 391	Computer Systems Engineering	4
ECE 395	Advanced Digital Projects Lab	2 or 3
ECE 396	Honors Project	1 to 4
ECE 397	Individual Study in ECE	0 to 4
ECE 402	Electronic Music Synthesis	3
ECE 403	Audio Engineering	3
ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4
ECE 412	Microcomputer Laboratory	3
ECE 414	Biomedical Instrumentation	3
ECE 415	Biomedical Instrumentation Lab	2
ECE 416	Biosensors	3
ECE 417	Multimedia Signal Processing	4
ECE 418	Image & Video Processing	4
ECE 419	Security Laboratory	3 or 4
ECE 420	Embedded DSP Laboratory	2
ECE 422	Computer Security I	4
ECE 424	Computer Security II	3 or 4
ECE 425	Intro to VLSI System Design	3
ECE 428	Distributed Systems	3 or 4
ECE 431	Electric Machinery	4
ECE 432	Advanced Electric Machinery	3
ECE 435	Computer Networking Laboratory	3 or 4
ECE 437	Sensors and Instrumentation	3
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 441	Physcs & Modeling Semicond Dev	3
ECE 443	LEDs and Solar Cells	4
ECE 444	IC Device Theory & Fabrication	4
ECE 445	Senior Design Project Lab	4
ECE 446	Principles of Experimental Research in Electrical Engineering	4
ECE 447	Active Microwave Ckt Design	3
ECE 448	Artificial Intelligence	3 or 4
ECE 451	Adv Microwave Measurements	3
ECE 452	Electromagnetic Fields	3
ECE 453	Wireless Communication Systems	4
ECE 454	Antennas	3
ECE 455	Optical Electronics	3 or 4
ECE 456	Global Nav Satellite Systems	4
ECE 457	Microwave Devices & Circuits	3
ECE 458	Applic of Radio Wave Propag	3
ECE 459	Communications Systems	3
ECE 460	Optical Imaging	4
ECE 461	Digital Communications	3
ECE 462	Logic Synthesis	3
ECE 463	Digital Communications Lab	2
ECE 464	Power Electronics	3
ECE 465	Optical Communications Systems	3
ECE 466	Optical Communications Lab	1
ECE 467	Biophotonics	3
ECE 468	Optical Remote Sensing	3
ECE 469	Power Electronics Laboratory	2
ECE 470	Introduction to Robotics	4
ECE 472	Biomedical Ultrasound Imaging	3
ECE 473	Fund of Engrg Acoustics	3 or 4
ECE 476	Power System Analysis	3
ECE 478	Formal Software Development Methods	3 or 4
ECE 480	Magnetic Resonance Imaging	3 or 4
ECE 481	Nanotechnology	4
ECE 482	Digital IC Design	3
ECE 483	Analog IC Design	3
ECE 485	MEMS Devices & Systems	3
ECE 486	Control Systems	4
ECE 487	Intro Quantum Electr for EEs	3
ECE 488	Compound Semicond & Devices	3
ECE 489	Robot Dynamics and Control	4
ECE 490	Introduction to Optimization	3 or 4
ECE 491	Numerical Analysis	3 or 4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4
ECE 493	Advanced Engineering Math	3 or 4
ECE 495	Photonic Device Laboratory	3
ECE 496	Senior Research Project	2
ECE 499	Senior Thesis	2

ECE 391	Computer Systems Engineering	4
ECE 395	Advanced Digital Projects Lab	2 or 3
ECE 396	Honors Project	1 to 4
ECE 397	Individual Study in ECE	0 to 4
ECE 402	Electronic Music Synthesis	3
ECE 403	Audio Engineering	3
ECE 407	Cryptography	3 or 4
ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4
ECE 412	Microcomputer Laboratory	3
ECE 414	Biomedical Instrumentation	3
ECE 415	Biomedical Instrumentation Lab	2
ECE 416	Biosensors	3
ECE 417	Multimedia Signal Processing	4
ECE 418	Image & Video Processing	4
ECE 419	Security Laboratory	3 or 4
ECE 420	Embedded DSP Laboratory	2
ECE 422	Computer Security I	4
ECE 424	Computer Security II	3 or 4
ECE 425	Intro to VLSI System Design	3
ECE 428	Distributed Systems	3 or 4
ECE 431	Electric Machinery	4
ECE 432	Advanced Electric Machinery	3
ECE 435	Computer Networking Laboratory	3 or 4
ECE 437	Sensors and Instrumentation	3
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 441	Physcs & Modeling Semicond Dev	3
ECE 442	Silicon Photonics	3 or 4
ECE 443	LEDs and Solar Cells	4
ECE 444	IC Device Theory & Fabrication	4
ECE 446	Principles of Experimental Research in Electrical Engineering	4
ECE 447	Active Microwave Ckt Design	3
ECE 448	Artificial Intelligence	3 or 4
ECE 451	Adv Microwave Measurements	3
ECE 452	Electromagnetic Fields	3
ECE 453	Wireless Communication Systems	4
ECE 454	Antennas	3
ECE 455	Optical Electronics	3 or 4
ECE 456	Global Nav Satellite Systems	4
ECE 457	Microwave Devices & Circuits	3
ECE 458	Applic of Radio Wave Propag	3
ECE 459	Communications Systems	3
ECE 460	Optical Imaging	4
ECE 461	Digital Communications	3
ECE 462	Logic Synthesis	3
ECE 463	Digital Communications Lab	2
ECE 464	Power Electronics	3
ECE 465	Optical Communications Systems	3
ECE 466	Optical Communications Lab	1
ECE 467	Biophotonics	3
ECE 468	Optical Remote Sensing	3
ECE 469	Power Electronics Laboratory	2
ECE 470	Introduction to Robotics	4
ECE 472	Biomedical Ultrasound Imaging	3
ECE 473	Fund of Engrg Acoustics	3 or 4
ECE 476	Power System Analysis	3
ECE 478	Formal Software Development Methods	3 or 4
ECE 480	Magnetic Resonance Imaging	3 or 4
ECE 481	Nanotechnology	4
ECE 482	Digital IC Design	3
ECE 483	Analog IC Design	3
ECE 485	MEMS Devices & Systems	3
ECE 486	Control Systems	4
ECE 487	Intro Quantum Electr for EEs	3
ECE 488	Compound Semicond & Devices	3
ECE 489	Robot Dynamics and Control	4
ECE 490	Introduction to Optimization	3 or 4
ECE 491	Numerical Analysis	3 or 4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4
ECE 493	Advanced Engineering Math	3 or 4
ECE 495	Photonic Device Laboratory	3

ECE 398	Special Topics in ECE (As approved)	0 to 4
ECE 498	Special Topics in ECE (As approved)	0 to 4
ENG 491	Interdisciplinary Design Proj (CubeSat, Solar Decathlon, Formula SAE, Baja SAE, or by Approval.)	1 to 4
GEOL 107	Physical Geology	4
GEOL 208	History of the Earth System	4
GEOL 333	Earth Materials and the Env	4
GEOL 380	Environmental Geology	4
GEOL 411	Structural Geol and Tectonics	4
GEOL 417	Geol Field Methods, Western US	6
GEOL 432	Mineralogy and Mineral Optics	4
GEOL 436	Petrology and Petrography	4
GEOL 440	Sedimentology and Stratigraphy	4
GEOL 450	Probing the Earth's Interior	3
GEOL 452	Introduction to Geophysics	4
GEOL 460	Geochemistry	3
IE 310	Deterministic Models in Optimization	3
IE 330	Industrial Quality Control	3
IE 360	Facilities Planning and Design	3
IE 361	Production Planning & Control	3
IE 400	Design & Anlys of Experiments	3 or 4
IE 410	Advanced Topics in Stochastic Processes & Applications	3 or 4
IE 411	Optimization of Large Systems	3 or 4
IE 412	OR Models for Mfg Systems	3 or 4
IE 413	Simulation	3 or 4
IE 420	Financial Engineering	3 or 4
IE 430	Economic Found of Quality Syst	3 or 4
IE 431	Design for Six Sigma	3
IB 150	Organismal & Evolutionary Biol	4
IB 202	Physiology	3 or 4
IB 203	Ecology	4
IB 204	Genetics	3 or 4
IB 302	Evolution	4
IB 335	Plant Systematics	4
IB 348	Fish and Wildlife Ecology	3
IB 368	Vertebrate Natural History	4
IB 401	Introduction to Entomology	3 or 4
IB 405	Evolution of Traits and Genomes	3
IB 420	Plant Physiology	3
IB 421	Photosynthesis	3
IB 426	Env and Evol Physl of Animals	3
IB 427	Insect Physiology	4
IB 431	Behavioral Ecology	3
IB 432	Genes and Behavior	3
IB 440	Plants and Global Change	3
IB 443	Evolutionary Ecology	3
IB 444	Insect Ecology	3 or 4
IB 451	Conservation Biology	4
IB 452	Ecosystem Ecology	3
IB 453	Community Ecology	3
IB 461	Ornithology	4
IB 462	Mammalogy	4
IB 463	Ichthyology	4
IB 464	Herpetology	4
IB 467	Principles of Systematics	4
IB 468	Insect Classification and Evol	4
IB 471	General Mycology	4
IB 472	Plant Molecular Biology	1
IB 473	Plant Genomics	1
IB 481	Vector-borne Diseases	4
IB 482	Insect Pest Management	3
IB 483	Insect Pathology	3
IB 485	Environ Toxicology & Health	3
IB 486	Pesticide Toxicology	3 or 4
LING 300	Anat & Physiol Spch Mechanism	4
LING 406	Introduction to Computational Linguistics	3 or 4
LING 407	Logic and Linguistic Analysis	3 or 4
LING 427	Language and the Brain	3 or 4
MSE 280	Engineering Materials	3
Material Science and Eng. (MSE): All 300 and 400 level courses		
MATH 213	Basic Discrete Mathematics	3

ECE 298	Special Topics (As approved)	1 to 4
ECE 398	Special Topics in ECE (As approved)	0 to 4
ECE 498	Special Topics in ECE (As approved)	0 to 4
ENG 491	Interdisciplinary Design Proj (CubeSat, Solar Decathlon, Formula SAE, Baja SAE, or by Approval.)	1 to 4
GEOL 107	Physical Geology	4
GEOL 208	History of the Earth System	4
GEOL 333	Earth Materials and the Env	4
GEOL 380	Environmental Geology	4
GEOL 411	Structural Geol and Tectonics	4
GEOL 417	Geol Field Methods, Western US	6
GEOL 432	Mineralogy and Mineral Optics	4
GEOL 436	Petrology and Petrography	4
GEOL 440	Sedimentology and Stratigraphy	4
GEOL 450	Probing the Earth's Interior	3
GEOL 452	Introduction to Geophysics	4
GEOL 460	Geochemistry	3
IE 310	Deterministic Models in Optimization	3
IE 330	Industrial Quality Control	3
IE 360	Facilities Planning and Design	3
IE 361	Production Planning & Control	3
IE 400	Design & Anlys of Experiments	3 or 4
IE 410	Advanced Topics in Stochastic Processes & Applications	3 or 4
IE 411	Optimization of Large Systems	3 or 4
IE 412	OR Models for Mfg Systems	3 or 4
IE 413	Simulation	3 or 4
IE 420	Financial Engineering	3 or 4
IE 430	Economic Found of Quality Syst	3 or 4
IE 431	Design for Six Sigma	3
IB 150	Organismal & Evolutionary Biol	4
IB 202	Physiology	3 or 4
IB 203	Ecology	4
IB 204	Genetics	3 or 4
IB 302	Evolution	4
IB 335	Plant Systematics	4
IB 348	Fish and Wildlife Ecology	3
IB 368	Vertebrate Natural History	4
IB 401	Introduction to Entomology	3 or 4
IB 405	Evolution of Traits and Genomes	3
IB 420	Plant Physiology	3
IB 421	Photosynthesis	3
IB 426	Env and Evol Physl of Animals	3
IB 427	Insect Physiology	4
IB 431	Behavioral Ecology	3
IB 432	Genes and Behavior	3
IB 440	Plants and Global Change	3
IB 443	Evolutionary Ecology	3
IB 444	Insect Ecology	3 or 4
IB 451	Conservation Biology	4
IB 452	Ecosystem Ecology	3
IB 453	Community Ecology	3
IB 461	Ornithology	4
IB 462	Mammalogy	4
IB 463	Ichthyology	4
IB 464	Herpetology	4
IB 467	Principles of Systematics	4
IB 468	Insect Classification and Evol	4
IB 471	General Mycology	4
IB 472	Plant Molecular Biology	1
IB 473	Plant Genomics	1
IB 481	Vector-borne Diseases	4
IB 482	Insect Pest Management	3
IB 483	Insect Pathology	3
IB 485	Environ Toxicology & Health	3
IB 486	Pesticide Toxicology	3 or 4
LING 300	Anat & Physiol Spch Mechanism	4
LING 406	Introduction to Computational Linguistics	3 or 4
LING 407	Logic and Linguistic Analysis	3 or 4
LING 427	Language and the Brain	3 or 4
MSE 280	Engineering Materials	3
Material Science and Eng. (MSE): All 300 and 400 level courses		
MATH 213	Basic Discrete Mathematics	3

MATH 347	Fundamental Mathematics	3
MATH 348	Fundamental Mathematics-ACP	4
MATH 357	Numerical Methods I	3
MATH 402	Non Euclidean Geometry	3 or 4
MATH 403	Euclidean Geometry	3 or 4
MATH 412	Graph Theory	3 or 4
MATH 413	Intro to Combinatorics	3 or 4
MATH 414	Mathematical Logic	3 or 4
MATH 416	Abstract Linear Algebra	3 or 4
MATH 417	Intro to Abstract Algebra	3 or 4
MATH 418	Intro to Abstract Algebra II	3 or 4
MATH 423	Differential Geometry	3 or 4
MATH 424	Honors Real Analysis	3
MATH 425	Honors Advanced Analysis	3
MATH 427	Honors Abstract Algebra	3
MATH 428	Honors Topics in Mathematics	3
MATH 432	Set Theory and Topology	3 or 4
MATH 442	Intro Partial Diff Equations	3 or 4
MATH 444	Elementary Real Analysis	3 or 4
MATH 446	Applied Complex Variables	3 or 4
MATH 447	Real Variables	3 or 4
MATH 448	Complex Variables	3 or 4
MATH 450	Numerical Analysis	3 or 4
MATH 453	Number Theory	3 or 4
MATH 473	Algorithms	4
MATH 475	Formal Models of Computation	3 or 4
MATH 481	Vector and Tensor Analysis	3 or 4
MATH 482	Linear Programming	3 or 4
MATH 484	Nonlinear Programming	3 or 4
MATH 487	Advanced Engineering Math	3 or 4
MATH 489	Dynamics & Differential Eqns	3 or 4
MCB 150	Molec & Cellular Basis of Life	4
MCB 250	Molecular Genetics	3
MCB 251	Exp Techniqs in Molecular Biol	2
MCB 252	Cells, Tissues & Development	3
MCB 253	Exp Techniqs in Cellular Biol	2
MCB 300	Microbiology	3
MCB 301	Experimental Microbiology	3
MCB 314	Introduction to Neurobiology	3
MCB 316	Genetics and Disease	4
MCB 354	Biochem & Phys Basis of Life	3
MCB 400	Cancer Cell Biology	3
MCB 401	Cellular Physiology	3
MCB 402	Sys & Integrative Physiology	3
MCB 403	Cell & Membrane Physiology Lab	1 or 2
MCB 404	Sys & Integrative Physiol Lab	1 to 2
MCB 406	Gene Expression & Regulation	3
MCB 408	Immunology	3
MCB 410	Developmental Biology, Stem Cells and Regenerative Medicine	3
MCB 413	Endocrinology	3
MCB 419	Brain, Behavior & Info Process	3
MCB 421	Microbial Genetics	3
MCB 424	Microbial Biochemistry	3
MCB 426	Bacterial Pathogenesis	3
MCB 430	Molecular Microbiology	3
MCB 431	Microbial Physiology	3
MCB 433	Virology & Viral Pathogenesis	3
MCB 435	Evolution of Infectious Disease	3
MCB 446	Physical Biochemistry	3
MCB 480	Eukaryotic Cell Signaling	3
ME 200	Thermodynamics	3
ME 310	Fundamentals of Fluid Dynamics	4
ME 320	Heat Transfer	4
ME 330	Engineering Materials	4
ME 340	Dynamics of Mechanical Systems	3.5
ME 370	Mechanical Design I	3
ME 371	Mechanical Design II	3
ME 400	Energy Conversion Systems	3 or 4
ME 401	Refrigeration and Cryogenics	3 or 4
ME 402	Design of Thermal Systems	3 or 4
ME 403	Internal Combustion Engines	3 or 4
ME 404	Intermediate Thermodynamics	4
ME 410	Intermediate Gas Dynamics	3 or 4
ME 411	Viscous Flow & Heat Transfer	4
ME 412	Numerical Thermo-Fluid Mechs	2 to 4
ME 420	Intermediate Heat Transfer	4

MATH 347	Fundamental Mathematics	3
MATH 348	Fundamental Mathematics-ACP	4
MATH 357	Numerical Methods I	3
MATH 402	Non Euclidean Geometry	3 or 4
MATH 403	Euclidean Geometry	3 or 4
MATH 412	Graph Theory	3 or 4
MATH 413	Intro to Combinatorics	3 or 4
MATH 414	Mathematical Logic	3 or 4
MATH 417	Intro to Abstract Algebra	3 or 4
MATH 418	Intro to Abstract Algebra II	3 or 4
MATH 423	Differential Geometry	3 or 4
MATH 424	Honors Real Analysis	3
MATH 425	Honors Advanced Analysis	3
MATH 427	Honors Abstract Algebra	3
MATH 428	Honors Topics in Mathematics	3
MATH 432	Set Theory and Topology	3 or 4
MATH 442	Intro Partial Diff Equations	3 or 4
MATH 444	Elementary Real Analysis	3 or 4
MATH 446	Applied Complex Variables	3 or 4
MATH 447	Real Variables	3 or 4
MATH 448	Complex Variables	3 or 4
MATH 450	Numerical Analysis	3 or 4
MATH 453	Number Theory	3 or 4
MATH 473	Algorithms	4
MATH 475	Formal Models of Computation	3 or 4
MATH 481	Vector and Tensor Analysis	3 or 4
MATH 482	Linear Programming	3 or 4
MATH 484	Nonlinear Programming	3 or 4
MATH 487	Advanced Engineering Math	3 or 4
MATH 489	Dynamics & Differential Eqns	3 or 4
MCB 150	Molec & Cellular Basis of Life	4
MCB 250	Molecular Genetics	3
MCB 251	Exp Techniqs in Molecular Biol	2
MCB 252	Cells, Tissues & Development	3
MCB 253	Exp Techniqs in Cellular Biol	2
MCB 300	Microbiology	3
MCB 301	Experimental Microbiology	3
MCB 314	Introduction to Neurobiology	3
MCB 316	Genetics and Disease	4
MCB 354	Biochem & Phys Basis of Life	3
MCB 400	Cancer Cell Biology	3
MCB 401	Cellular Physiology	3
MCB 402	Sys & Integrative Physiology	3
MCB 403	Cell & Membrane Physiology Lab	1 or 2
MCB 404	Sys & Integrative Physiol Lab	1 to 2
MCB 406	Gene Expression & Regulation	3
MCB 408	Immunology	3
MCB 410	Developmental Biology, Stem Cells and Regenerative Medicine	3
MCB 413	Endocrinology	3
MCB 419	Brain, Behavior & Info Process	3
MCB 421	Microbial Genetics	3
MCB 424	Microbial Biochemistry	3
MCB 426	Bacterial Pathogenesis	3
MCB 430	Molecular Microbiology	3
MCB 431	Microbial Physiology	3
MCB 433	Virology & Viral Pathogenesis	3
MCB 435	Evolution of Infectious Disease	3
MCB 446	Physical Biochemistry	3
MCB 480	Eukaryotic Cell Signaling	3
ME 200	Thermodynamics	3
ME 310	Fundamentals of Fluid Dynamics	4
ME 320	Heat Transfer	4
ME 330	Engineering Materials	4
ME 340	Dynamics of Mechanical Systems	3.5
ME 370	Mechanical Design I	3
ME 371	Mechanical Design II	3
ME 400	Energy Conversion Systems	3 or 4
ME 401	Refrigeration and Cryogenics	3 or 4
ME 402	Design of Thermal Systems	3 or 4
ME 403	Internal Combustion Engines	3 or 4
ME 404	Intermediate Thermodynamics	4
ME 410	Intermediate Gas Dynamics	3 or 4
ME 411	Viscous Flow & Heat Transfer	4
ME 412	Numerical Thermo-Fluid Mechs	2 to 4
ME 420	Intermediate Heat Transfer	4

ME 430	Failure of Engrg Materials	3 or 4
ME 431	Mechanical Component Failure	3 or 4
ME 440	Kinem & Dynamics of Mech Syst	3 or 4
ME 445	Introduction to Robotics	4
ME 450	Course ME 450 Not Found	
ME 451	Computer-Aided Mfg Systems	3 or 4
ME 452	Num Control of Mfg Processes	3 or 4
ME 460	Industrial Control Systems	4
ME 461	Computer Cntrl of Mech Systems	3 or 4
ME 471	Finite Element Analysis	3 or 4
ME 472	Introduction to Tribology	3 or 4
ME 485	MEMS Devices & Systems	3
ME 487	MEMS-NEMS Theory & Fabrication	4
MUS 407	Elect Music Techniques I	3
MUS 409	Elec Music Techniques II	2
NEUR 453	Cog Neuroscience of Vision	3 or 4
NPRE 201	Energy Systems	2 or 3
NPRE 247	Modeling Nuclear Energy System	3
NPRE 402	Nuclear Power Engineering	3 or 4
NPRE 412	Nuclear Power Econ & Fuel Mgmt	3 or 4
NPRE 421	Plasma and Fusion Science	3
NPRE 423	Plasma Laboratory	2
NPRE 429	Plasma Engineering	3
NPRE 431	Materials in Nuclear Engrg	3
NPRE 432	Nuclear Engrg Materials Lab	2
NPRE 435	Radiological Imaging	3
NPRE 441	Radiation Protection	4
NPRE 442	Radioactive Waste Management	3
NPRE 444	Nuclear Analytical Methods Lab	2 or 3
NPRE 446	Radiation Interact w/Matter I	3
NPRE 447	Radiation Interact w/Matter II	3
NPRE 448	Nuclear Syst Engrg & Design	4
NPRE 451	NPRE Laboratory	3
NPRE 455	Neutron Diffusion & Transport	4
NPRE 457	Safety Anlys Nucl Reactor Syst	3 or 4
NPRE 458	Design in NPRE	4
NPRE 470	Fuel Cells & Hydrogen Sources	3
NPRE 475	Wind Power Systems	3 or 4
PHYS 225	Relativity & Math Applications	2
PHYS 325	Classical Mechanics I	3
PHYS 326	Classical Mechanics II	3
PHYS 401	Classical Physics Lab	3
PHYS 402	Light	3 or 4
PHYS 403	Modern Experimental Physics	4 or 5
PHYS 406	Acoustical Physics of Music	4
PHYS 419	Space, Time, and Matter-ACP	3 or 4
PHYS 420	Space, Time, and Matter	2
PHYS 427	Thermal & Statistical Physics	4
PHYS 460	Condensed Matter Physics	4
PHYS 466	Atomic Scale Simulations	3 or 4
PHYS 470	Subatomic Physics	4
PHYS 485	Atomic Phys & Quantum Theory	3
PHYS 486	Quantum Physics I	4
PHYS 487	Quantum Physics II	4
PSYC 204	Intro to Brain and Cognition	3
SHS 200	General Phonetics	3
SHS 240	Intro Sound & Hearing Science	3
SHS 300	Anat & Physiol Spch Mechanism	4
SHS 301	General Speech Science	4
SHS 320	Development of Spoken Language	3
SHS 450	Intro Audiol & Hear Disorders	4
SHS 470	Neural Bases Spch Lang	4
STAT 420	Methods of Applied Statistics	3 or 4
STAT 424	Analysis of Variance	3 or 4
STAT 428	Statistical Computing	3 or 4
STAT 429	Time Series Analysis	3 or 4
STAT 440	Statistical Data Management	3 or 4
SE 411	Reliability Engineering	3 or 4
SE 420	Digital Control Systems	4
SE 423	Mechatronics	3

ME 430	Failure of Engrg Materials	3 or 4
ME 431	Mechanical Component Failure	3 or 4
ME 440	Kinem & Dynamics of Mech Syst	3 or 4
ME 445	Introduction to Robotics	4
ME 451	Computer-Aided Mfg Systems	3 or 4
ME 452	Num Control of Mfg Processes	3 or 4
ME 460	Industrial Control Systems	4
ME 461	Computer Cntrl of Mech Systems	3 or 4
ME 471	Finite Element Analysis	3 or 4
ME 472	Introduction to Tribology	3 or 4
ME 485	MEMS Devices & Systems	3
ME 487	MEMS-NEMS Theory & Fabrication	4
MUS 407	Elect Music Techniques I	3
MUS 409	Elec Music Techniques II	2
NEUR 453	Cog Neuroscience of Vision	3 or 4
NPRE 201	Energy Systems	2 or 3
NPRE 247	Modeling Nuclear Energy System	3
NPRE 402	Nuclear Power Engineering	3 or 4
NPRE 412	Nuclear Power Econ & Fuel Mgmt	3 or 4
NPRE 421	Plasma and Fusion Science	3
NPRE 423	Plasma Laboratory	2
NPRE 429	Plasma Engineering	3
NPRE 431	Materials in Nuclear Engrg	3
NPRE 432	Nuclear Engrg Materials Lab	2
NPRE 435	Radiological Imaging	3
NPRE 441	Radiation Protection	4
NPRE 442	Radioactive Waste Management	3
NPRE 444	Nuclear Analytical Methods Lab	2 or 3
NPRE 446	Radiation Interact w/Matter I	3
NPRE 447	Radiation Interact w/Matter II	3
NPRE 448	Nuclear Syst Engrg & Design	4
NPRE 451	NPRE Laboratory	3
NPRE 455	Neutron Diffusion & Transport	4
NPRE 457	Safety Anlys Nucl Reactor Syst	3 or 4
NPRE 458	Design in NPRE	4
NPRE 470	Fuel Cells & Hydrogen Sources	3
NPRE 475	Wind Power Systems	3 or 4
PHYS 225	Relativity & Math Applications	2
PHYS 325	Classical Mechanics I	3
PHYS 326	Classical Mechanics II	3
PHYS 401	Classical Physics Lab	3
PHYS 402	Light	3 or 4
PHYS 403	Modern Experimental Physics	4 or 5
PHYS 406	Acoustical Physics of Music	4
PHYS 419	Space, Time, and Matter-ACP	3 or 4
PHYS 420	Space, Time, and Matter	2
PHYS 427	Thermal & Statistical Physics	4
PHYS 460	Condensed Matter Physics	4
PHYS 466	Atomic Scale Simulations	3 or 4
PHYS 470	Subatomic Physics	4
PHYS 485	Atomic Phys & Quantum Theory	3
PHYS 486	Quantum Physics I	4
PHYS 487	Quantum Physics II	4
PSYC 204	Intro to Brain and Cognition	3
SHS 200	General Phonetics	3
SHS 240	Intro Sound & Hearing Science	3
SHS 300	Anat & Physiol Spch Mechanism	4
SHS 301	General Speech Science	4
SHS 320	Development of Spoken Language	3
SHS 450	Intro Audiol & Hear Disorders	4
SHS 470	Neural Bases Spch Lang	4
STAT 420	Methods of Applied Statistics	3 or 4
STAT 424	Analysis of Variance	3 or 4
STAT 425	Statistical Modeling I	3 or 4
STAT 428	Statistical Computing	3 or 4
STAT 429	Time Series Analysis	3 or 4
STAT 440	Statistical Data Management	3 or 4
SE 411	Reliability Engineering	3 or 4
SE 420	Digital Control Systems	4
SE 423	Mechatronics	3

SE 424	State Space Design for Control	3
TAM 211	Statics	3
TAM 212	Introductory Dynamics	3
TAM 251	Introductory Solid Mechanics	3
TAM 324	Behavior of Materials	4
TAM 335	Introductory Fluid Mechanics	4
TAM 412	Intermediate Dynamics	4
TAM 435	Intermediate Fluid Mechanics	4
TAM 445	Continuum Mechanics	4
TAM 451	Intermediate Solid Mechanics	4
ECE Courses to include:		
Select three from the following list of Advanced Core ECE electives:		
ECE 391	Computer Systems Engineering	
or CS 225	Data Structures	
ECE 310	Digital Signal Processing	
ECE 330	Power Ckts & Electromechanics	
ECE 342	Electronic Circuits	
ECE 350	Fields and Waves II	
Select three ECE labs identified below. At least one must be hardware labs		
Hardware Labs:		
ECE 343	Electronic Circuits Laboratory	1
ECE 391	Computer Systems Engineering	4
ECE 395	Advanced Digital Projects Lab	2 or 3
ECE 402	Electronic Music Synthesis	3
ECE 415	Biomedical Instrumentation Lab	2
ECE 420	Embedded DSP Laboratory	2
ECE 431	Electric Machinery	4
CS 436	Computer Networking Laboratory	3 or 4
ECE 437	Sensors and Instrumentation	3
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 443	LEDs and Solar Cells	4
ECE 444	IC Device Theory & Fabrication	4
ECE 446	Principles of Experimental Research in Electrical Engineering	4
ECE 447	Active Microwave Ckt Design	3
ECE 451	Adv Microwave Measurements	3
ECE 453	Wireless Communication Systems	4
ECE 456	Global Nav Satellite Systems	4
ECE 460	Optical Imaging	4
ECE 463	Digital Communications Lab	2
ECE 466	Optical Communications Lab	1
ECE 468	Optical Remote Sensing	3
ECE 469	Power Electronics Laboratory	2
ECE 470	Introduction to Robotics	4
ECE 481	Nanotechnology	4
ECE 486	Control Systems	4
ECE 489	Robot Dynamics and Control	4
ECE 495	Photonic Device Laboratory	3
Software Labs:		
ECE 311	Digital Signal Processing Lab	1
ECE 314	Probability in Engineering Lab	1
ECE 365	Data Science and Engineering	3
ECE 411	Computer Organization & Design	4

SE 424	State Space Design for Control	3
TAM 211	Statics	3
TAM 212	Introductory Dynamics	3
TAM 251	Introductory Solid Mechanics	3
TAM 324	Behavior of Materials	4
TAM 335	Introductory Fluid Mechanics	4
TAM 412	Intermediate Dynamics	4
TAM 435	Intermediate Fluid Mechanics	4
TAM 445	Continuum Mechanics	4
TAM 451	Intermediate Solid Mechanics	4
Select three courses from the following list of Advanced Core ECE electives:		
ECE 391	Computer Systems Engineering	
or CS 225	Data Structures	
ECE 310	Digital Signal Processing	
ECE 330	Power Ckts & Electromechanics	
ECE 342	Electronic Circuits	
ECE 350	Fields and Waves II	
Select three courses from the following list of ECE Labs. At least one must be a Hardware Lab.		
Hardware Labs:		
ECE 343	Electronic Circuits Laboratory	1
ECE 391	Computer Systems Engineering	4
ECE 395	Advanced Digital Projects Lab	2 or 3
ECE 402	Electronic Music Synthesis	3
ECE 415	Biomedical Instrumentation Lab	2
ECE 420	Embedded DSP Laboratory	2
ECE 431	Electric Machinery	4
CS 436	Computer Networking Laboratory	3 or 4
ECE 437	Sensors and Instrumentation	3
ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4
ECE 443	LEDs and Solar Cells	4
ECE 444	IC Device Theory & Fabrication	4
ECE 446	Principles of Experimental Research in Electrical Engineering	4
ECE 447	Active Microwave Ckt Design	3
ECE 451	Adv Microwave Measurements	3
ECE 453	Wireless Communication Systems	4
ECE 456	Global Nav Satellite Systems	4
ECE 460	Optical Imaging	4
ECE 463	Digital Communications Lab	2
ECE 466	Optical Communications Lab	1
ECE 468	Optical Remote Sensing	3
ECE 469	Power Electronics Laboratory	2
ECE 470	Introduction to Robotics	4
ECE 481	Nanotechnology	4
ECE 486	Control Systems	4
ECE 489	Robot Dynamics and Control	4
ECE 495	Photonic Device Laboratory	3
Software Labs:		
ECE 311	Digital Signal Processing Lab	1
ECE 314	Probability in Engineering Lab	1
ECE 365	Data Science and Engineering	3
ECE 411	Computer Organization & Design	4
ECE 484	Principles of Safe Autonomy	4

Electives	
Gen Ed (SBS + HA + Comp I)	16
The Grainger College of Engineering Liberal Education course list, or additional courses from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts [7]	6
Free electives. Additional unrestricted course work, subject to certain exceptions as noted by the College, so that there are at least 128 credit hours earned toward the degree. [8]	12
Total Hours of Curriculum to Graduate	**128**

Electives	
Gen Ed (SBS + HA + Comp I)	16
The Grainger College of Engineering Liberal Education course list, or additional courses from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts [7]	6
Free electives. Additional unrestricted course work, subject to certain exceptions as noted by the College, so that there are at least 128 credit hours earned toward the degree. [8]	12
Total Hours of Curriculum to Graduate	**128**

[1] External transfer students take ENG 300 instead.

[2] MATH 220 *may be substituted, with four of the five credit hours applying toward the degree.* MATH 220 *is appropriate for students with no background in calculus.*

[3] Freshmen take ECE 110 for 3 credit hours. Lab-only version taken by transfer students (with special permission) is 1 credit hour.

[4] STAT 410 may be substituted.

[5] ECE 496 *AND* ECE 499 *may be substituted.*

[6] Advanced Composition may be satisfied by completing ECE 445, or a course in either the general education or free elective categories which has the Advanced Composition designation.

[7] The Grainger College of Engineering approved liberal education course list can be found here. Note that these credit hours could carry the required cultural studies designation required for campus general education requirements.

[8] The Grainger College of Engineering restrictions to free electives can be found here.

External transfer students
[1] take ENG 300 instead.

MATH 220 *may be substituted, with four of the five credit hours applying toward the degree.* MATH 220 *is appropriate for students with no background*
[2] *in calculus.*
Freshmen take ECE 110 for 3 credit hours. Lab-only version taken by transfer students (with special permission) is 1 credit
[3] hour.
[4] STAT 410 may be substituted.
ECE 496 *AND* ECE 499 *may be*
[5] *substituted.*

Advanced Composition may be satisfied by completing ECE 445, or a course in either the general education or free elective categories which has the Advanced Composition
[6] designation.

The Grainger College of Engineering approved liberal education course list can be found here. Note that these credit hours could carry the required cultural studies designation required for campus general
[7] education requirements.

The Grainger College of Engineering restrictions to free
[8] electives can be found here.

Addition
Removal
Revision

CURRENT PROGRAM			REVISED PROGRAM		
Orientation and Professional Development			**Orientation and Professional Development**		
Course List			Course List		
Code	**Title**	**Hours**	**Code**	**Title**	**Hours**
ENG 100	Engineering Orientation [1]	0	ENG 100	Engineering Orientation [1]	0
Total Hours		**0**	**Total Hours**		**0**
Foundational Mathematics and Science			**Foundational Mathematics and Science**		
Course List			Course List		
Code	**Title**	**Hours**	**Code**	**Title**	**Hours**
CHEM 102	General Chemistry I	3	CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1	CHEM 103	General Chemistry Lab I	1
MATH 221	Calculus I [2]	4	MATH 221	Calculus I [2]	4
MATH 231	Calculus II	3	MATH 231	Calculus II	3
MATH 241	Calculus III	4	MATH 241	Calculus III	4
			MATH 257	Linear Algebra with Computational Applications	3
			MATH 286	Intro to Differential Eq	4
MATH 286	Intro to Differential Eq Plus	4			
PHYS 211	University Physics: Mechanics	4	PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4	PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2	PHYS 213	Univ Physics: Thermal Physics	2
PHYS 214	Univ Physics: Quantum Physics	2	PHYS 214	Univ Physics: Quantum Physics	2
Total Hours		**31**	**Total Hours**		**33**
Electrical Engineering Technical Core			**Electrical Engineering Technical Core**		
Course List			Course List		
Code	**Title**	**Hours**	**Code**	**Title**	**Hours**
ECE 110	Introduction to Electronics [3]	3	ECE 110	Introduction to Electronics [3]	3
ECE 120	Introduction to Computing	4	ECE 120	Introduction to Computing	4
ECE 220	Computer Systems & Programming	4	ECE 220	Computer Systems & Programming	4
ECE 210	Analog Signal Processing	4	ECE 210	Analog Signal Processing	4
ECE 313	Probability with Engrg Applic [4]	3	ECE 313	Probability with Engrg Applic [4]	3
ECE 329	Fields and Waves I	3	ECE 329	Fields and Waves I	3
ECE 340	Semiconductor Electronics	3	ECE 340	Semiconductor Electronics	3
ECE 385	Digital Systems Laboratory	3	ECE 385	Digital Systems Laboratory	3
ECE 445	Senior Design Project Lab [5,6]	4	ECE 445	Senior Design Project Lab [5,6]	4
Total Hours		31	Total Hours		31
Technical Electives			**Technical Electives**		
Course List			Course List		
Code	**Title**	**Hours**	**Code**	**Title**	**Hours**
32 hours, to include:			**30 hours, to include:**		
Non-ECE courses from list below:		6	Non-ECE courses from list below:		6
AE 202	Aerospace Flight Mechanics	3	AE 202	Aerospace Flight Mechanics	3
AE 302	Aerospace Flight Mechanics II	3	AE 302	Aerospace Flight Mechanics II	3
AE 311	Incompressible Flow	3	AE 311	Incompressible Flow	3
AE 312	Compressible Flow	3	AE 312	Compressible Flow	3
AE 321	Mechs of Aerospace Structures	3	AE 321	Mechs of Aerospace Structures	3
AE 352	Aerospace Dynamical Systems	3	AE 352	Aerospace Dynamical Systems	3
AE 353	Aerospace Control Systems	3	AE 353	Aerospace Control Systems	3
AE 402	Orbital Mechanics	3 or 4	AE 402	Orbital Mechanics	3 or 4
AE 403	Spacecraft Attitude Control	3 or 4	AE 403	Spacecraft Attitude Control	3 or 4
AE 410	Computational Aerodynamics	3 or 4	AE 410	Computational Aerodynamics	3 or 4
AE 412	Viscous Flow & Heat Transfer	4	AE 412	Viscous Flow & Heat Transfer	4
AE 416	Applied Aerodynamics	3 or 4	AE 416	Applied Aerodynamics	3 or 4
AE 419	Aircraft Flight Mechanics	3 or 4	AE 419	Aircraft Flight Mechanics	3 or 4
AE 420	Finite Element Analysis	3 or 4	AE 420	Finite Element Analysis	3 or 4
AE 427	Mechanics of Polymers	3	AE 427	Mechanics of Polymers	3
AE 428	Mechanics of Composites	3	AE 428	Mechanics of Composites	3
AE 433	Aerospace Propulsion	3 or 4	AE 433	Aerospace Propulsion	3 or 4
AE 434	Rocket Propulsion	3 or 4	AE 434	Rocket Propulsion	3 or 4
AE 435	Electric Propulsion	3 or 4	AE 435	Electric Propulsion	3 or 4
AE 451	Aeroelasticity	3 or 4	AE 451	Aeroelasticity	3 or 4
AE 460	Aerodynamics & Propulsion Lab	2	AE 460	Aerodynamics & Propulsion Lab	2
Ag and Bio Eng. - All 300 and 400 level courses except ABE 440. Except s			Ag and Bio Eng. - All 300 and 400 level courses except ABE 440. Except seminars and special topics courses, which may be reviewed in the Advising Office		
ASTR 210	Introduction to Astrophysics	3	ASTR 210	Introduction to Astrophysics	3
ASTR 310	Computing in Astronomy	3	ASTR 310	Computing in Astronomy	3
ASTR 330	Extraterrestrial Life	3	ASTR 330	Extraterrestrial Life	3
ASTR 350	The Big Bang, Black Holes, and the End of the U	3	ASTR 350	The Big Bang, Black Holes, and the End of the U	3
ASTR 404	Stellar Astrophysics	3	ASTR 404	Stellar Astrophysics	3
ASTR 405	Planetary Systems	3	ASTR 405	Planetary Systems	3
ASTR 406	Galaxies and the Universe	3	ASTR 406	Galaxies and the Universe	3
ASTR 414	Astronomical Techniques	4	ASTR 414	Astronomical Techniques	4
ASTR 450	Astrochemistry	4	ASTR 450	Astrochemistry	4
			ATMS 201	Introduc Physical Meteorology	3
ATMS 301	Atmospheric Thermodynamics	3	ATMS 301	Atmospheric Thermodynamics	3
ATMS 302	Atmospheric Dynamics I	3	ATMS 302	Atmospheric Dynamics I	3
ATMS 303	Synoptic-Dynamic Wea Analysis	4	ATMS 303	Synoptic-Dynamic Wea Analysis	4
ATMS 304	Radiative Transfer-Remote Sens	3	ATMS 304	Radiative Transfer-Remote Sens	3
ATMS 305	Computing and Data Analysis	3	ATMS 305	Computing and Data Analysis	3
ATMS 404	Risk Analysis in Earth Science	3 or 4	ATMS 404	Risk Analysis in Earth Science	3 or 4
ATMS 405	Boundary Layer Processes	4	ATMS 405	Boundary Layer Processes	4
ATMS 406	Tropical Meteorology	4	ATMS 406	Tropical Meteorology	4
ATMS 410	Radar Remote Sensing	4	ATMS 410	Radar Remote Sensing	4
ATMS 411	Satellite Remote Sensing	4	ATMS 411	Satellite Remote Sensing	4
ATMS 420	Atmospheric Chemistry	4	ATMS 420	Atmospheric Chemistry	4
ATMS 421	Earth Systems Modeling	4	ATMS 421	Earth Systems Modeling	4
ATMS 425	Air Quality Modeling	4	ATMS 425	Air Quality Modeling	4
ATMS 447	Climate Change Assessment	3	ATMS 447	Climate Change Assessment	3
ATMS 449	Biogeochemical Cycles	4	ATMS 449	Biogeochemical Cycles	4
BIOC 406	Gene Expression & Regulation	3	BIOC 406	Gene Expression & Regulation	3
BIOC 440	Physical Chemistry Principles	4	BIOC 440	Physical Chemistry Principles	4
BIOC 446	Physical Biochemistry	3	BIOC 446	Physical Biochemistry	3
BIOC 455	Techngs Biochem & Biotech	4	BIOC 455	Techngs Biochem & Biotech	4
BIOE 201	Conservation Principles Bioeng	3	BIOE 201	Conservation Principles Bioeng	3
BIOE 202	Cell & Tissue Engineering Lab	2	BIOE 202	Cell & Tissue Engineering Lab	2
BIOE 302	Modeling Human Physiology	3	BIOE 302	Modeling Human Physiology	3
BIOE 414	Biomedical Instrumentation	3	BIOE 414	Biomedical Instrumentation	3
BIOE 415	Biomedical Instrumentation Lab	2	BIOE 415	Biomedical Instrumentation Lab	2
BIOE 461	Cellular Biomechanics	4	BIOE 461	Cellular Biomechanics	4
BIOE 467	Biophotonics	3	BIOE 467	Biophotonics	3
BIOE 476	Tissue Engineering	3	BIOE 476	Tissue Engineering	3
BIOE 480	Magnetic Resonance Imaging	3 or 4	BIOE 480	Magnetic Resonance Imaging	3 or 4
Biophysics (BIOP): All 400 level courses except seminars and special topics cou			Biophysics (BIOP): All 400 level courses except seminars and special topics courses, which may be reviewed in the Advising Office.		
CHBE 221	Principles of CHE	3	CHBE 221	Principles of CHE	3
CHBE 321	Thermodynamics	4	CHBE 321	Thermodynamics	4
CHBE 421	Momentum and Heat Transfer	4	CHBE 421	Momentum and Heat Transfer	4
CHBE 422	Mass Transfer Operations	4	CHBE 422	Mass Transfer Operations	4
CHBE 424	Chemical Reaction Engineering	3	CHBE 424	Chemical Reaction Engineering	3
CHBE 430	Unit Operations Laboratory	4	CHBE 430	Unit Operations Laboratory	4
CHBE 431	Process Design	4	CHBE 431	Process Design	4
CHBE 440	Process Control and Dynamics	3	CHBE 440	Process Control and Dynamics	3
CHBE 451	Transport Phenomena	3	CHBE 451	Transport Phenomena	3
CHBE 452	Chemical Kinetics & Catalysis	3	CHBE 452	Chemical Kinetics & Catalysis	3
CHBE 453	Electrochemical Engineering	2 or 3	CHBE 453	Electrochemical Engineering	2 or 3
CHBE 456	Polymer Science & Engineering	3	CHBE 456	Polymer Science & Engineering	3
CHBE 457	Microelectronics Processing	3	CHBE 457	Microelectronics Processing	3
CHBE 471	Biochemical Engineering	3 or 4	CHBE 471	Biochemical Engineering	3 or 4
CHBE 472	Techniques in Biomolecular Eng	3 or 4	CHBE 472	Techniques in Biomolecular Eng	3 or 4
CHBE 473	Biomolecular Engineering	3 or 4	CHBE 473	Biomolecular Engineering	3 or 4
CHBE 474	Metabolic Engineering	3 or 4	CHBE 474	Metabolic Engineering	3 or 4
CHEM 104	General Chemistry II	3	CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab II	1	CHEM 105	General Chemistry Lab II	1
Chemistry (CHEM): All 200, 300 and 400 level except 397, 497, and 499. Excepti			Chemistry (CHEM): All 200, 300 and 400 level except 397, 497, and 499. Exceptions also include seminars and special topics, which may be reviewed in the Advising Office.		
CEE 310	Transportation Engineering	3	CEE 310	Transportation Engineering	3
CEE 330	Environmental Engineering	3	CEE 330	Environmental Engineering	3
CEE 408	Railroad Transportation Engrg	3 or 4	CEE 408	Railroad Transportation Engrg	3 or 4
CEE 410	Railway Signaling & Control	3 or 4	CEE 410	Railway Signaling & Control	3 or 4
CEE 416	Traffic Capacity Analysis	3 or 4	CEE 416	Traffic Capacity Analysis	3 or 4
CEE 430	Ecological Quality Engineering	2	CEE 430	Ecological Quality Engineering	2
CEE 447	Atmospheric Chemistry	4	CEE 447	Atmospheric Chemistry	4
CEE 491	Decision and Risk Analysis	3 or 4	CEE 491	Decision and Risk Analysis	3 or 4
			CEE 499	Special Topics in CEE	3
CS 101	Intro Computing: Engrg & Sci (By Approval)	3	CS 101	Intro Computing: Engrg & Sci (By Approval)	3
CS 173	Discrete Structures	3	CS 173	Discrete Structures	3
CS 225	Data Structures	4	CS 225	Data Structures	4
CS 242	Programming Studio	3	CS 242	Programming Studio	3
CS 357	Numerical Methods I	3	CS 357	Numerical Methods I	3

CS 410	Text Information Systems	3 or 4	CS 410	Text Information Systems	3 or 4
CS 411	Database Systems	3 or 4	CS 411	Database Systems	3 or 4
CS 412	Introduction to Data Mining	3 or 4	CS 412	Introduction to Data Mining	3 or 4
CS 413	Intro to Combinatorics	3 or 4	CS 413	Intro to Combinatorics	3 or 4
CS 414	Multimedia Systems	3 or 4	CS 414	Multimedia Systems	3 or 4
CS 418	Interactive Computer Graphics	3 or 4	CS 418	Interactive Computer Graphics	3 or 4
CS 419	Production Computer Graphics	3 or 4	CS 419	Production Computer Graphics	3 or 4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4	CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 421	Programming Languages & Compilers	3 or 4	CS 421	Programming Languages & Compilers	3 or 4
CS 422	Programming Language Design	3 or 4	CS 422	Programming Language Design	3 or 4
CS 423	Operating Systems Design	3 or 4	CS 423	Operating Systems Design	3 or 4
CS 424	Real-Time Systems	3 or 4	CS 424	Real-Time Systems	3 or 4
CS 425	Distributed Systems	3 or 4	CS 425	Distributed Systems	3 or 4
CS 426	Compiler Construction	3 or 4	CS 426	Compiler Construction	3 or 4
CS 427	Software Engineering I	3 or 4	CS 427	Software Engineering I	3 or 4
CS 428	Software Engineering II	3 or 4	CS 428	Software Engineering II	3 or 4
CS 429	Software Engineering II, ACP	3	CS 429	Software Engineering II, ACP	3
CS 431	Embedded Systems	3 or 4	CS 431	Embedded Systems	3 or 4
CS 433	Computer System Organization	3 or 4	CS 433	Computer System Organization	3 or 4
CS 436	Computer Networking Laboratory	3 or 4	CS 436	Computer Networking Laboratory	3 or 4
CS 438	Communication Networks	3 or 4	CS 438	Communication Networks	3 or 4
CS 439	Wireless Networks	3 or 4	CS 439	Wireless Networks	3 or 4
CS 440	Artificial Intelligence	3 or 4	CS 440	Artificial Intelligence	3 or 4
CS 445	Computational Photography	3 or 4	CS 445	Computational Photography	3 or 4
CS 446	Machine Learning	3 or 4	CS 446	Machine Learning	3 or 4
CS 447	Natural Language Processing	3 or 4	CS 447	Natural Language Processing	3 or 4
CS 450	Numerical Analysis	3 or 4	CS 450	Numerical Analysis	3 or 4
CS 460	Security Laboratory	3 or 4	CS 460	Security Laboratory	3 or 4
CS 461	Computer Security I	4	CS 461	Computer Security I	4
CS 463	Computer Security II	3 or 4	CS 463	Computer Security II	3 or 4
CS 465	User Interface Design	3 or 4	CS 465	User Interface Design	3 or 4
CS 466	Introduction to Bioinformatics	3 or 4	CS 466	Introduction to Bioinformatics	3 or 4
CS 467	Social Visualization	3 or 4	CS 467	Social Visualization	3 or 4
CS 473	Algorithms	4	CS 473	Algorithms	4
CS 475	Formal Models of Computation	3 or 4	CS 475	Formal Models of Computation	3 or 4
CS 476	Program Verification	3 or 4	CS 476	Program Verification	3 or 4
CS 477	Formal Software Development Methods	3 or 4	CS 477	Formal Software Development Methods	3 or 4
CS 481	Advanced Topics in Stochastic Processes & App	3 or 4	CS 481	Advanced Topics in Stochastic Processes & App	3 or 4
CS 484	Parallel Programming	3 or 4	CS 484	Parallel Programming	3 or 4
CS 398	Special Topics (As Approved)	1 to 4	CS 398	Special Topics (As Approved)	1 to 4
CS 498	Special Topics (As Approved)	1 to 4	CS 498	Special Topics (As Approved)	1 to 4
ECE 297	Individual Study	1	ECE 297	Individual Study	1
ECE 304	Photonic Devices	3	ECE 304	Photonic Devices	3
ECE 307	Techniques for Engrg Decisions	3	ECE 307	Techniques for Engrg Decisions	3
ECE 310	Digital Signal Processing	3	ECE 310	Digital Signal Processing	3
ECE 311	Digital Signal Processing Lab	1	ECE 311	Digital Signal Processing Lab	1
ECE 314	Probability in Engineering Lab	1	ECE 314	Probability in Engineering Lab	1
ECE 329	Fields and Waves I	3	ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3	ECE 330	Power Ckts & Electromechanics	3
ECE 333	Green Electric Energy	3	ECE 333	Green Electric Energy	3
ECE 340	Semiconductor Electronics	3	ECE 340	Semiconductor Electronics	3
ECE 342	Electronic Circuits	3	ECE 342	Electronic Circuits	3
ECE 343	Electronic Circuits Laboratory	1	ECE 343	Electronic Circuits Laboratory	1
ECE 350	Fields and Waves II	3	ECE 350	Fields and Waves II	3
ECE 365	Data Science and Engineering	3	ECE 365	Data Science and Engineering	3
ECE 374	Introduction to Algorithms & Models of Computati	4	ECE 374	Introduction to Algorithms & Models of Computat	4
ECE 380	Biomedical Imaging	3	ECE 380	Biomedical Imaging	3
ECE 391	Computer Systems Engineering	4	ECE 391	Computer Systems Engineering	4
ECE 395	Advanced Digital Projects Lab	2 or 3	ECE 395	Advanced Digital Projects Lab	2 or 3
ECE 396	Honors Project	1 to 4	ECE 396	Honors Project	1 to 4
ECE 397	Individual Study in ECE	0 to 4	ECE 397	Individual Study in ECE	0 to 4
ECE 402	Electronic Music Synthesis	3	ECE 402	Electronic Music Synthesis	3
ECE 403	Audio Engineering	3	ECE 403	Audio Engineering	3
ECE 408	Applied Parallel Programming	4	ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4	ECE 411	Computer Organization & Design	4
ECE 412	Microcomputer Laboratory	3	ECE 412	Microcomputer Laboratory	3
ECE 414	Biomedical Instrumentation	3	ECE 414	Biomedical Instrumentation	3
ECE 415	Biomedical Instrumentation Lab	2	ECE 415	Biomedical Instrumentation Lab	2
ECE 416	Biosensors	3	ECE 416	Biosensors	3
ECE 417	Multimedia Signal Processing	4	ECE 417	Multimedia Signal Processing	4
ECE 418	Image & Video Processing	4	ECE 418	Image & Video Processing	4
ECE 419	Security Laboratory	3 or 4	ECE 419	Security Laboratory	3 or 4
ECE 420	Embedded DSP Laboratory	2	ECE 420	Embedded DSP Laboratory	2
ECE 422	Computer Security I	4	ECE 422	Computer Security I	4
ECE 424	Computer Security II	3 or 4	ECE 424	Computer Security II	3 or 4
ECE 425	Intro to VLSI System Design	3	ECE 425	Intro to VLSI System Design	3
ECE 428	Distributed Systems	3 or 4	ECE 428	Distributed Systems	3 or 4
ECE 431	Electric Machinery	4	ECE 431	Electric Machinery	4
ECE 432	Advanced Electric Machinery	3	ECE 432	Advanced Electric Machinery	3
ECE 435	Computer Networking Laboratory	3 or 4	ECE 435	Computer Networking Laboratory	3 or 4
ECE 437	Sensors and Instrumentation	3	ECE 437	Sensors and Instrumentation	3
ECE 438	Communication Networks	3 or 4	ECE 438	Communication Networks	3 or 4
ECE 439	Wireless Networks	3 or 4	ECE 439	Wireless Networks	3 or 4
ECE 441	Physcs & Modeling Semicond Dev	3	ECE 441	Physcs & Modeling Semicond Dev	3
ECE 443	LEDs and Solar Cells	4	ECE 443	LEDs and Solar Cells	4
ECE 444	IC Device Theory & Fabrication	4	ECE 444	IC Device Theory & Fabrication	4
ECE 445	Senior Design Project Lab	4	ECE 445	Senior Design Project Lab	4
ECE 446	Principles of Experimental Research in Electrical	4	ECE 446	Principles of Experimental Research in Electrical	4
ECE 447	Active Microwave Ckt Design	3	ECE 447	Active Microwave Ckt Design	3
ECE 448	Artificial Intelligence	3 or 4	ECE 448	Artificial Intelligence	3 or 4
ECE 451	Adv Microwave Measurements	3	ECE 451	Adv Microwave Measurements	3
ECE 452	Electromagnetic Fields	3	ECE 452	Electromagnetic Fields	3
ECE 453	Wireless Communication Systems	4	ECE 453	Wireless Communication Systems	4
ECE 454	Antennas	3	ECE 454	Antennas	3
ECE 455	Optical Electronics	3 or 4	ECE 455	Optical Electronics	3 or 4
ECE 456	Global Nav Satellite Systems	4	ECE 456	Global Nav Satellite Systems	4
ECE 457	Microwave Devices & Circuits	3	ECE 457	Microwave Devices & Circuits	3
ECE 458	Applic of Radio Wave Propag	3	ECE 458	Applic of Radio Wave Propag	3
ECE 459	Communications Systems	3	ECE 459	Communications Systems	3
ECE 460	Optical Imaging	4	ECE 460	Optical Imaging	4
ECE 461	Digital Communications	3	ECE 461	Digital Communications	3
ECE 462	Logic Synthesis	3	ECE 462	Logic Synthesis	3
ECE 463	Digital Communications Lab	2	ECE 463	Digital Communications Lab	2
ECE 464	Power Electronics	3	ECE 464	Power Electronics	3
ECE 465	Optical Communications Systems	3	ECE 465	Optical Communications Systems	3
ECE 466	Optical Communications Lab	1	ECE 466	Optical Communications Lab	1
ECE 467	Biophotonics	3	ECE 467	Biophotonics	3
ECE 468	Optical Remote Sensing	3	ECE 468	Optical Remote Sensing	3
ECE 469	Power Electronics Laboratory	2	ECE 469	Power Electronics Laboratory	2
ECE 470	Introduction to Robotics	4	ECE 470	Introduction to Robotics	4
ECE 472	Biomedical Ultrasound Imaging	3	ECE 472	Biomedical Ultrasound Imaging	3
ECE 473	Fund of Engrg Acoustics	3 or 4	ECE 473	Fund of Engrg Acoustics	3 or 4
ECE 476	Power System Analysis	3	ECE 476	Power System Analysis	3
ECE 478	Formal Software Development Methods	3 or 4	ECE 478	Formal Software Development Methods	3 or 4
ECE 480	Magnetic Resonance Imaging	3 or 4	ECE 480	Magnetic Resonance Imaging	3 or 4
ECE 481	Nanotechnology	4	ECE 481	Nanotechnology	4
ECE 482	Digital IC Design	3	ECE 482	Digital IC Design	3
ECE 483	Analog IC Design	3	ECE 483	Analog IC Design	3
ECE 485	MEMS Devices & Systems	3	ECE 485	MEMS Devices & Systems	3
ECE 486	Control Systems	4	ECE 486	Control Systems	4
ECE 487	Intro Quantum Electr for EEs	3	ECE 487	Intro Quantum Electr for EEs	3
ECE 488	Compound Semicond & Devices	3	ECE 488	Compound Semicond & Devices	3
ECE 489	Robot Dynamics and Control	4	ECE 489	Robot Dynamics and Control	4
ECE 490	Introduction to Optimization	3 or 4	ECE 490	Introduction to Optimization	3 or 4
ECE 491	Numerical Analysis	3 or 4	ECE 491	Numerical Analysis	3 or 4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4	ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4
ECE 493	Advanced Engineering Math	3 or 4	ECE 493	Advanced Engineering Math	3 or 4
ECE 495	Photonic Device Laboratory	3	ECE 495	Photonic Device Laboratory	3
ECE 496	Senior Research Project	2	ECE 496	Senior Research Project	2
ECE 499	Senior Thesis	2	ECE 499	Senior Thesis	2
ECE 398	Special Topics in ECE (As approved)	0 to 4	ECE 398	Special Topics in ECE (As approved)	0 to 4
ECE 498	Special Topics in ECE (As approved)	0 to 4	ECE 498	Special Topics in ECE (As approved)	0 to 4
ENG 491	Interdisciplinary Design Proj (CubeSat, Solar Dec	1 to 4	ENG 491	Interdisciplinary Design Proj (CubeSat, Solar Dec	1 to 4
GEOL 107	Physical Geology	4	GEOL 107	Physical Geology	4
GEOL 208	History of the Earth System	4	GEOL 208	History of the Earth System	4
GEOL 333	Earth Materials and the Env	4	GEOL 333	Earth Materials and the Env	4
GEOL 380	Environmental Geology	4	GEOL 380	Environmental Geology	4
GEOL 411	Structural Geol and Tectonics	4	GEOL 411	Structural Geol and Tectonics	4
GEOL 417	Geol Field Methods, Western US	6	GEOL 417	Geol Field Methods, Western US	6
GEOL 432	Mineralogy and Mineral Optics	4	GEOL 432	Mineralogy and Mineral Optics	4
GEOL 436	Petrology and Petrography	4	GEOL 436	Petrology and Petrography	4
GEOL 440	Sedimentology and Stratigraphy	4	GEOL 440	Sedimentology and Stratigraphy	4

GEOL 450	Probing the Earth's Interior		3	GEOL 450	Probing the Earth's Interior	3
GEOL 452	Introduction to Geophysics		4	GEOL 452	Introduction to Geophysics	4
GEOL 460	Geochemistry		3	GEOL 460	Geochemistry	3
IE 310	Deterministic Models in Optimization		3	IE 310	Deterministic Models in Optimization	3
IE 330	Industrial Quality Control		3	IE 330	Industrial Quality Control	3
IE 360	Facilities Planning and Design		3	IE 360	Facilities Planning and Design	3
IE 361	Production Planning & Control		3	IE 361	Production Planning & Control	3
IE 400	Design & Anlys of Experiments	3 or 4		IE 400	Design & Anlys of Experiments	3 or 4
IE 410	Advanced Topics in Stochastic Processes & App	3 or 4		IE 410	Advanced Topics in Stochastic Processes & App	3 or 4
IE 411	Optimization of Large Systems	3 or 4		IE 411	Optimization of Large Systems	3 or 4
IE 412	OR Models for Mfg Systems	3 or 4		IE 412	OR Models for Mfg Systems	3 or 4
IE 413	Simulation	3 or 4		IE 413	Simulation	3 or 4
IE 420	Financial Engineering	3 or 4		IE 420	Financial Engineering	3 or 4
IE 430	Economic Found of Quality Syst	3 or 4		IE 430	Economic Found of Quality Syst	3 or 4
IE 431	Design for Six Sigma		3	IE 431	Design for Six Sigma	3
IB 150	Organismal & Evolutionary Biol		4	IB 150	Organismal & Evolutionary Biol	4
IB 202	Physiology	3 or 4		IB 202	Physiology	3 or 4
IB 203	Ecology		4	IB 203	Ecology	4
IB 204	Genetics	3 or 4		IB 204	Genetics	3 or 4
IB 302	Evolution		4	IB 302	Evolution	4
IB 335	Plant Systematics		4	IB 335	Plant Systematics	4
IB 348	Fish and Wildlife Ecology		3	IB 348	Fish and Wildlife Ecology	3
IB 368	Vertebrate Natural History		4	IB 368	Vertebrate Natural History	4
IB 401	Introduction to Entomology	3 or 4		IB 401	Introduction to Entomology	3 or 4
IB 405	Evolution of Traits and Genomes		3	IB 405	Evolution of Traits and Genomes	3
IB 420	Plant Physiology		3	IB 420	Plant Physiology	3
IB 421	Photosynthesis		3	IB 421	Photosynthesis	3
IB 426	Env and Evol Physl of Animals		3	IB 426	Env and Evol Physl of Animals	3
IB 427	Insect Physiology		4	IB 427	Insect Physiology	4
IB 431	Behavioral Ecology		3	IB 431	Behavioral Ecology	3
IB 432	Genes and Behavior		3	IB 432	Genes and Behavior	3
IB 440	Plants and Global Change		3	IB 440	Plants and Global Change	3
IB 443	Evolutionary Ecology		3	IB 443	Evolutionary Ecology	3
IB 444	Insect Ecology	3 or 4		IB 444	Insect Ecology	3 or 4
IB 451	Conservation Biology		4	IB 451	Conservation Biology	4
IB 452	Ecosystem Ecology		3	IB 452	Ecosystem Ecology	3
IB 453	Community Ecology		3	IB 453	Community Ecology	3
IB 461	Ornithology		4	IB 461	Ornithology	4
IB 462	Mammalogy		4	IB 462	Mammalogy	4
IB 463	Ichthyology		4	IB 463	Ichthyology	4
IB 464	Herpetology		4	IB 464	Herpetology	4
IB 467	Principles of Systematics		4	IB 467	Principles of Systematics	4
IB 468	Insect Classification and Evol		4	IB 468	Insect Classification and Evol	4
IB 471	General Mycology		4	IB 471	General Mycology	4
IB 472	Plant Molecular Biology		1	IB 472	Plant Molecular Biology	1
IB 473	Plant Genomics		1	IB 473	Plant Genomics	1
IB 481	Vector-borne Diseases		4	IB 481	Vector-borne Diseases	4
IB 482	Insect Pest Management		3	IB 482	Insect Pest Management	3
IB 483	Insect Pathology		3	IB 483	Insect Pathology	3
IB 485	Environ Toxicology & Health		3	IB 485	Environ Toxicology & Health	3
IB 486	Pesticide Toxicology	3 or 4		IB 486	Pesticide Toxicology	3 or 4
LING 300	Anat & Physiol Spch Mechanism		4	LING 300	Anat & Physiol Spch Mechanism	4
LING 406	Introduction to Computational Linguistics	3 or 4		LING 406	Introduction to Computational Linguistics	3 or 4
LING 407	Logic and Linguistic Analysis	3 or 4		LING 407	Logic and Linguistic Analysis	3 or 4
LING 427	Language and the Brain	3 or 4		LING 427	Language and the Brain	3 or 4
MSE 280	Engineering Materials		3	MSE 280	Engineering Materials	3
Material Science and Eng. (MSE): All 300 and 400 level courses except 304, 460, and 461. Exceptions of seminar and special topics courses can be reviewed in the Advising Office.				Material Science and Eng. (MSE): All 300 and 400 level courses except 304, 460, and 461. Exceptions of seminar and special topics courses can be reviewed in the Advising Office.		
MATH 213	Basic Discrete Mathematics		3	MATH 213	Basic Discrete Mathematics	3
MATH 347	Fundamental Mathematics		3	MATH 347	Fundamental Mathematics	3
MATH 348	Fundamental Mathematics-ACP		4	MATH 348	Fundamental Mathematics-ACP	4
MATH 357	Numerical Methods I		3	MATH 357	Numerical Methods I	3
MATH 402	Non Euclidean Geometry	3 or 4		MATH 402	Non Euclidean Geometry	3 or 4
MATH 403	Euclidean Geometry	3 or 4		MATH 403	Euclidean Geometry	3 or 4
MATH 412	Graph Theory	3 or 4		MATH 412	Graph Theory	3 or 4
MATH 413	Intro to Combinatorics	3 or 4		MATH 413	Intro to Combinatorics	3 or 4
MATH 414	Mathematical Logic	3 or 4		MATH 414	Mathematical Logic	3 or 4
MATH 415	Applied Linear Algebra	3 or 4				
MATH 416	Abstract Linear Algebra	3 or 4		MATH 416	Abstract Linear Algebra	3 or 4
MATH 417	Intro to Abstract Algebra	3 or 4		MATH 417	Intro to Abstract Algebra	3 or 4
MATH 418	Intro to Abstract Algebra II	3 or 4		MATH 418	Intro to Abstract Algebra II	3 or 4
MATH 423	Differential Geometry	3 or 4		MATH 423	Differential Geometry	3 or 4
MATH 424	Honors Real Analysis		3	MATH 424	Honors Real Analysis	3
MATH 425	Honors Advanced Analysis		3	MATH 425	Honors Advanced Analysis	3
MATH 427	Honors Abstract Algebra		3	MATH 427	Honors Abstract Algebra	3
MATH 428	Honors Topics in Mathematics		3	MATH 428	Honors Topics in Mathematics	3
MATH 432	Set Theory and Topology	3 or 4		MATH 432	Set Theory and Topology	3 or 4
MATH 442	Intro Partial Diff Equations	3 or 4		MATH 442	Intro Partial Diff Equations	3 or 4
MATH 444	Elementary Real Analysis	3 or 4		MATH 444	Elementary Real Analysis	3 or 4
MATH 446	Applied Complex Variables	3 or 4		MATH 446	Applied Complex Variables	3 or 4
MATH 447	Real Variables	3 or 4		MATH 447	Real Variables	3 or 4
MATH 448	Complex Variables	3 or 4		MATH 448	Complex Variables	3 or 4
MATH 450	Numerical Analysis	3 or 4		MATH 450	Numerical Analysis	3 or 4
MATH 453	Elementary Theory of Numbers	3 or 4		MATH 453	Elementary Theory of Numbers	3 or 4
MATH 473	Algorithms		4	MATH 473	Algorithms	4
MATH 475	Formal Models of Computation	3 or 4		MATH 475	Formal Models of Computation	3 or 4
MATH 481	Vector and Tensor Analysis	3 or 4		MATH 481	Vector and Tensor Analysis	3 or 4
MATH 482	Linear Programming	3 or 4		MATH 482	Linear Programming	3 or 4
MATH 484	Nonlinear Programming	3 or 4		MATH 484	Nonlinear Programming	3 or 4
MATH 487	Advanced Engineering Math	3 or 4		MATH 487	Advanced Engineering Math	3 or 4
MATH 489	Dynamics & Differential Eqns	3 or 4		MATH 489	Dynamics & Differential Eqns	3 or 4
MCB 150	Molec & Cellular Basis of Life		4	MCB 150	Molec & Cellular Basis of Life	4
MCB 250	Molecular Genetics		3	MCB 250	Molecular Genetics	3
MCB 251	Exp Techniqs in Molecular Biol		2	MCB 251	Exp Techniqs in Molecular Biol	2
MCB 252	Cells, Tissues & Development		3	MCB 252	Cells, Tissues & Development	3
MCB 253	Exp Techniqs in Cellular Biol		2	MCB 253	Exp Techniqs in Cellular Biol	2
MCB 300	Microbiology		3	MCB 300	Microbiology	3
MCB 301	Experimental Microbiology		3	MCB 301	Experimental Microbiology	3
MCB 314	Introduction to Neurobiology		3	MCB 314	Introduction to Neurobiology	3
MCB 316	Genetics and Disease		4	MCB 316	Genetics and Disease	4
MCB 354	Biochem & Phys Basis of Life		3	MCB 354	Biochem & Phys Basis of Life	3
MCB 400	Cancer Cell Biology		3	MCB 400	Cancer Cell Biology	3
MCB 401	Cell & Membrane Physiology		3	MCB 401	Cell & Membrane Physiology	3
MCB 402	Sys & Integrative Physiology		3	MCB 402	Sys & Integrative Physiology	3
MCB 403	Cell & Membrane Physiology Lab	1 or 2		MCB 403	Cell & Membrane Physiology Lab	1 or 2
MCB 404	Sys & Integrative Physiol Lab	1 to 2		MCB 404	Sys & Integrative Physiol Lab	1 to 2
MCB 406	Gene Expression & Regulation		3	MCB 406	Gene Expression & Regulation	3
MCB 408	Immunology		3	MCB 408	Immunology	3
MCB 410	Developmental Biology, Stem Cells and Regener		3	MCB 410	Developmental Biology, Stem Cells and Regener	3
MCB 413	Endocrinology		3	MCB 413	Endocrinology	3
MCB 419	Brain, Behavior & Info Process		3	MCB 419	Brain, Behavior & Info Process	3
MCB 421	Microbial Genetics		3	MCB 421	Microbial Genetics	3
MCB 424	Microbial Biochemistry		3	MCB 424	Microbial Biochemistry	3
MCB 426	Bacterial Pathogenesis		3	MCB 426	Bacterial Pathogenesis	3
MCB 430	Molecular Microbiology		3	MCB 430	Molecular Microbiology	3
MCB 431	Microbial Physiology		3	MCB 431	Microbial Physiology	3
MCB 433	Virology & Viral Pathogenesis		3	MCB 433	Virology & Viral Pathogenesis	3
MCB 435	Evolution of Infectious Disease		3	MCB 435	Evolution of Infectious Disease	3
MCB 446	Physical Biochemistry		3	MCB 446	Physical Biochemistry	3
MCB 480	Eukaryotic Cell Signaling		3	MCB 480	Eukaryotic Cell Signaling	3
ME 200	Thermodynamics		3	ME 200	Thermodynamics	3
ME 310	Fundamentals of Fluid Dynamics		4	ME 310	Fundamentals of Fluid Dynamics	4
ME 320	Heat Transfer		4	ME 320	Heat Transfer	4
ME 330	Engineering Materials		4	ME 330	Engineering Materials	4
ME 340	Dynamics of Mechanical Systems		3.5	ME 340	Dynamics of Mechanical Systems	3.5
ME 370	Mechanical Design I		3	ME 370	Mechanical Design I	3
ME 371	Mechanical Design II		3	ME 371	Mechanical Design II	3
ME 400	Energy Conversion Systems	3 or 4		ME 400	Energy Conversion Systems	3 or 4
ME 401	Refrigeration and Cryogenics	3 or 4		ME 401	Refrigeration and Cryogenics	3 or 4
ME 402	Design of Thermal Systems	3 or 4		ME 402	Design of Thermal Systems	3 or 4
ME 403	Internal Combustion Engines	3 or 4		ME 403	Internal Combustion Engines	3 or 4
ME 404	Intermediate Thermodynamics		4	ME 404	Intermediate Thermodynamics	4
ME 410	Intermediate Gas Dynamics	3 or 4		ME 410	Intermediate Gas Dynamics	3 or 4
ME 411	Viscous Flow & Heat Transfer		4	ME 411	Viscous Flow & Heat Transfer	4
ME 412	Numerical Thermo-Fluid Mechs	2 to 4		ME 412	Numerical Thermo-Fluid Mechs	2 to 4
ME 420	Intermediate Heat Transfer		4	ME 420	Intermediate Heat Transfer	4
ME 430	Failure of Engrg Materials	3 or 4		ME 430	Failure of Engrg Materials	3 or 4
ME 431	Mechanical Component Failure	3 or 4		ME 431	Mechanical Component Failure	3 or 4
ME 440	Kinem & Dynamics of Mech Syst	3 or 4		ME 440	Kinem & Dynamics of Mech Syst	3 or 4
ME 445	Introduction to Robotics		4	ME 445	Introduction to Robotics	4
ME 450	Modeling Materials Processing		3	ME 450	Modeling Materials Processing	3
ME 451	Computer-Aided Mfg Systems	3 or 4		ME 451	Computer-Aided Mfg Systems	3 or 4
ME 452	Num Control of Mfg Processes	3 or 4		ME 452	Num Control of Mfg Processes	3 or 4

ME 460	Industrial Control Systems		4	ME 460	Industrial Control Systems		4
ME 461	Computer Cntrl of Mech Systems	3 or 4		ME 461	Computer Cntrl of Mech Systems	3 or 4	
ME 471	Finite Element Analysis	3 or 4		ME 471	Finite Element Analysis	3 or 4	
ME 472	Introduction to Tribology	3 or 4		ME 472	Introduction to Tribology	3 or 4	
ME 485	MEMS Devices & Systems		3	ME 485	MEMS Devices & Systems		3
ME 487	MEMS-NEMS Theory & Fabrication		4	ME 487	MEMS-NEMS Theory & Fabrication		4
MUS 407	Elect Music Techniques I		3	MUS 407	Elect Music Techniques I		3
MUS 409	Elec Music Techniques II		2	MUS 409	Elec Music Techniques II		2
NEUR 453	Cog Neuroscience of Vision	3 or 4		NEUR 453	Cog Neuroscience of Vision	3 or 4	
NPRE 201	Energy Systems	2 or 3		NPRE 201	Energy Systems	2 or 3	
NPRE 247	Modeling Nuclear Energy System		3	NPRE 247	Modeling Nuclear Energy System		3
NPRE 402	Nuclear Power Engineering	3 or 4		NPRE 402	Nuclear Power Engineering	3 or 4	
NPRE 412	Nuclear Power Econ & Fuel Mgmt	3 or 4		NPRE 412	Nuclear Power Econ & Fuel Mgmt	3 or 4	
NPRE 421	Plasma and Fusion Science		3	NPRE 421	Plasma and Fusion Science		3
NPRE 423	Plasma Laboratory		2	NPRE 423	Plasma Laboratory		2
NPRE 429	Plasma Engineering		3	NPRE 429	Plasma Engineering		3
NPRE 431	Materials in Nuclear Engrg		3	NPRE 431	Materials in Nuclear Engrg		3
NPRE 432	Nuclear Engrg Materials Lab		2	NPRE 432	Nuclear Engrg Materials Lab		2
NPRE 435	Radiological Imaging		3	NPRE 435	Radiological Imaging		3
NPRE 441	Radiation Protection		4	NPRE 441	Radiation Protection		4
NPRE 442	Radioactive Waste Management		3	NPRE 442	Radioactive Waste Management		3
NPRE 444	Nuclear Analytical Methods Lab	2 or 3		NPRE 444	Nuclear Analytical Methods Lab	2 or 3	
NPRE 446	Radiation Interact w/Matter I		3	NPRE 446	Radiation Interact w/Matter I		3
NPRE 447	Radiation Interact w/Matter II		3	NPRE 447	Radiation Interact w/Matter II		3
NPRE 448	Nuclear Syst Engrg & Design		4	NPRE 448	Nuclear Syst Engrg & Design		4
NPRE 451	NPRE Laboratory		3	NPRE 451	NPRE Laboratory		3
NPRE 455	Neutron Diffusion & Transport		4	NPRE 455	Neutron Diffusion & Transport		4
NPRE 457	Safety Anlys Nucl Reactor Syst	3 or 4		NPRE 457	Safety Anlys Nucl Reactor Syst	3 or 4	
NPRE 458	Design in NPRE		4	NPRE 458	Design in NPRE		4
NPRE 470	Fuel Cells & Hydrogen Sources		3	NPRE 470	Fuel Cells & Hydrogen Sources		3
NPRE 475	Wind Power Systems	3 or 4		NPRE 475	Wind Power Systems	3 or 4	
PHYS 225	Relativity & Math Applications		2	PHYS 225	Relativity & Math Applications		2
PHYS 325	Classical Mechanics I		3	PHYS 325	Classical Mechanics I		3
PHYS 326	Classical Mechanics II		3	PHYS 326	Classical Mechanics II		3
PHYS 401	Classical Physics Lab		3	PHYS 401	Classical Physics Lab		3
PHYS 402	Light	3 or 4		PHYS 402	Light	3 or 4	
PHYS 403	Modern Experimental Physics	4 or 5		PHYS 403	Modern Experimental Physics	4 or 5	
PHYS 406	Acoustical Physics of Music		4	PHYS 406	Acoustical Physics of Music		4
PHYS 419	Space, Time, and Matter-ACP	3 or 4		PHYS 419	Space, Time, and Matter-ACP	3 or 4	
PHYS 420	Space, Time, and Matter		2	PHYS 420	Space, Time, and Matter		2
PHYS 427	Thermal & Statistical Physics		4	PHYS 427	Thermal & Statistical Physics		4
PHYS 460	Condensed Matter Physics		4	PHYS 460	Condensed Matter Physics		4
PHYS 466	Atomic Scale Simulations	3 or 4		PHYS 466	Atomic Scale Simulations	3 or 4	
PHYS 470	Subatomic Physics		4	PHYS 470	Subatomic Physics		4
PHYS 485	Atomic Phys & Quantum Theory		3	PHYS 485	Atomic Phys & Quantum Theory		3
PHYS 486	Quantum Physics I		4	PHYS 486	Quantum Physics I		4
PHYS 487	Quantum Physics II		4	PHYS 487	Quantum Physics II		4
				PSYC 204	Intro to Brain and Cognition		3
SHS 200	General Phonetics		3	SHS 200	General Phonetics		3
SHS 240	Intro Sound & Hearing Science		3	SHS 240	Intro Sound & Hearing Science		3
SHS 300	Anat & Physiol Spch Mechanism		4	SHS 300	Anat & Physiol Spch Mechanism		4
SHS 301	General Speech Science		4	SHS 301	General Speech Science		4
SHS 320	Development of Spoken Language		3	SHS 320	Development of Spoken Language		3
SHS 450	Intro Audiol & Hear Disorders		4	SHS 450	Intro Audiol & Hear Disorders		4
SHS 470	Neural Bases Spch Lang		4	SHS 470	Neural Bases Spch Lang		4
STAT 420	Methods of Applied Statistics	3 or 4		STAT 420	Methods of Applied Statistics	3 or 4	
STAT 424	Analysis of Variance	3 or 4		STAT 424	Analysis of Variance	3 or 4	
STAT 428	Statistical Computing	3 or 4		STAT 428	Statistical Computing	3 or 4	
STAT 429	Time Series Analysis	3 or 4		STAT 429	Time Series Analysis	3 or 4	
STAT 440	Statistical Data Management	3 or 4		STAT 440	Statistical Data Management	3 or 4	
SE 411	Reliability Engineering	3 or 4		SE 411	Reliability Engineering	3 or 4	
SE 420	Digital Control Systems		4	SE 420	Digital Control Systems		4
SE 423	Mechatronics		3	SE 423	Mechatronics		3
SE 424	State Space Design for Control		3	SE 424	State Space Design for Control		3
TAM 211	Statics		3	TAM 211	Statics		3
TAM 212	Introductory Dynamics		3	TAM 212	Introductory Dynamics		3
TAM 251	Introductory Solid Mechanics		3	TAM 251	Introductory Solid Mechanics		3
TAM 324	Behavior of Materials		4	TAM 324	Behavior of Materials		4
TAM 335	Introductory Fluid Mechanics		4	TAM 335	Introductory Fluid Mechanics		4
TAM 412	Intermediate Dynamics		4	TAM 412	Intermediate Dynamics		4
TAM 435	Intermediate Fluid Mechanics		4	TAM 435	Intermediate Fluid Mechanics		4
TAM 445	Continuum Mechanics		4	TAM 445	Continuum Mechanics		4
TAM 451	Intermediate Solid Mechanics		4	TAM 451	Intermediate Solid Mechanics		4
ECE Courses to include:				ECE Courses to include:			
Select three from the following list of Advanced Core ECE electives:				Select three from the following list of Advanced Core ECE electives:			
ECE 391	Computer Systems Engineering			ECE 391	Computer Systems Engineering		
or CS 225	Data Structures			or CS 225	Data Structures		
ECE 310	Digital Signal Processing			ECE 310	Digital Signal Processing		
ECE 330	Power Ckts & Electromechanics			ECE 330	Power Ckts & Electromechanics		
ECE 342	Electronic Circuits			ECE 342	Electronic Circuits		
ECE 350	Fields and Waves II			ECE 350	Fields and Waves II		
Select three ECE labs identified below. At least one must be hardware labs				Select three ECE labs identified below. At least one must be hardware labs			
Hardware Labs:				Hardware Labs:			
ECE 343	Electronic Circuits Laboratory		1	ECE 343	Electronic Circuits Laboratory		1
ECE 391	Computer Systems Engineering		4	ECE 391	Computer Systems Engineering		4
ECE 395	Advanced Digital Projects Lab	2 or 3		ECE 395	Advanced Digital Projects Lab	2 or 3	
ECE 402	Electronic Music Synthesis		3	ECE 402	Electronic Music Synthesis		3
ECE 415	Biomedical Instrumentation Lab		2	ECE 415	Biomedical Instrumentation Lab		2
ECE 420	Embedded DSP Laboratory		2	ECE 420	Embedded DSP Laboratory		2
ECE 431	Electric Machinery		4	ECE 431	Electric Machinery		4
CS 436	Computer Networking Laboratory	3 or 4		CS 436	Computer Networking Laboratory	3 or 4	
ECE 437	Sensors and Instrumentation		3	ECE 437	Sensors and Instrumentation		3
ECE 438	Communication Networks	3 or 4		ECE 438	Communication Networks	3 or 4	
ECE 439	Wireless Networks	3 or 4		ECE 439	Wireless Networks	3 or 4	
ECE 443	LEDs and Solar Cells		4	ECE 443	LEDs and Solar Cells		4
ECE 444	IC Device Theory & Fabrication		4	ECE 444	IC Device Theory & Fabrication		4
ECE 446	Principles of Experimental Research in Electrical		4	ECE 446	Principles of Experimental Research in Electrical		4
ECE 447	Active Microwave Ckt Design		3	ECE 447	Active Microwave Ckt Design		3
ECE 451	Adv Microwave Measurements		3	ECE 451	Adv Microwave Measurements		3
ECE 453	Wireless Communication Systems		4	ECE 453	Wireless Communication Systems		4
ECE 456	Global Nav Satellite Systems		4	ECE 456	Global Nav Satellite Systems		4
ECE 460	Optical Imaging		4	ECE 460	Optical Imaging		4
ECE 463	Digital Communications Lab		2	ECE 463	Digital Communications Lab		2
ECE 466	Optical Communications Lab		1	ECE 466	Optical Communications Lab		1
ECE 468	Optical Remote Sensing		3	ECE 468	Optical Remote Sensing		3
ECE 469	Power Electronics Laboratory		2	ECE 469	Power Electronics Laboratory		2
ECE 470	Introduction to Robotics		4	ECE 470	Introduction to Robotics		4
ECE 481	Nanotechnology		4	ECE 481	Nanotechnology		4
ECE 486	Control Systems		4	ECE 486	Control Systems		4
ECE 489	Robot Dynamics and Control		4	ECE 489	Robot Dynamics and Control		4
ECE 495	Photonic Device Laboratory		3	ECE 495	Photonic Device Laboratory		3
Software Labs:				Software Labs:			
ECE 311	Digital Signal Processing Lab		1	ECE 311	Digital Signal Processing Lab		1
ECE 314	Probability in Engineering Lab		1	ECE 314	Probability in Engineering Lab		1
ECE 365	Data Science and Engineering		3	ECE 365	Data Science and Engineering		3
ECE 411	Computer Organization & Design		4	ECE 411	Computer Organization & Design		4

Electives | **Electives**

Course List | Course List

Code	Title	Hours		Code	Title	Hours	
The Grainger College of Engineering Liberal Education course lis			6	The Grainger College of Engineering Liberal Education course lis			6
Free electives. Additional unrestricted course work, subject to ce			12	Free electives. Additional unrestricted course work, subject to ce			12
Total Hours of Curriculum to Graduate			128	**Total Hours of Curriculum to Graduate**			**128**

[1] External transfer students take ENG 300 instead.
[2] MATH 220 *may be substituted, with four of the five c*
[3] Freshmen take ECE 110 for 3 credit hours. Lab-only versio
[4] STAT 410 may be substituted.
[5] ECE 496 *AND* ECE 499 *may be substituted.*
[6] Advanced Composition may be satisfied by completing EC
[7] The Grainger College of Engineering approved liberal educ
[8] The Grainger College of Engineering restrictions to free ele

[1] External transfer students take ENG 300 instead.
[2] MATH 220 *may be substituted, with four of the five credit hours applying toward the degree.* MATH 220 *is appropriate for students with no background in calculus.*
[3] Freshmen take ECE 110 for 3 credit hours. Lab-only version taken by transfer students (with special permission) is 1 credit hour.
[4] STAT 410 may be substituted.
[5] ECE 496 *AND* ECE 499 *may be substituted.*
[6] Advanced Composition may be satisfied by completing ECE 445, or a course in either the general education or free elective categories which has the Advanced Composition designation.
[7] The Grainger College of Engineering approved liberal education course list can be found here. Note that these credit hours could carry the required cultural studies designation required for campus general education requirements.
[8] The Grainger College of Engineering restrictions to free electives can be found here.

ILLINOIS

MATHEMATICS

College of Liberal Arts & Sciences
273 Altgeld Hall, MC-382
1409 W. Green Street
Urbana, IL 61801 USA

February 22, 2021

Erhan Kudeki
Professor and Associate Head for Undergraduate Affairs
Department of Electrical and Computer Engineering
University of Illinois at Urbana-Champaign

Dear Professor Kudeki,

Our department acknowledges and supports the proposed revision of the Electrical Engineering (EE) and Computer Engineering (CE) BS programs, to adopt MATH 257 as a required course for EE and CE majors to be taken after MATH 220/221 and before MATH 285, and to replace MATH 286 with MATH 285. The Department of Mathematics is prepared to accommodate the enrollment shifts among courses which will result from these changes.

In the event that this curricular revision is approved, the Mathematics Department will remove the phrase "Computer Engineering or Electrical Engineering" from the following statement in Course Explorer regarding MATH 285 (which can be found at https://courses.illinois.edu/schedule/2021/spring/MATH/285):

> "not intended for Computer Engineering or Electrical Engineering or Math & CS major(s)."

Sincerely,

Jeremy Tyson
Professor and Chair
Department of Mathematics
University of Illinois at Urbana-Champaign

ILLINOIS

COLLEGE OF LIBERAL ARTS & SCIENCES
Department of Atmospheric Sciences
3070 Natural History Building, MC-104
1301 W. Green St.
Urbana, IL 61801-3070

March 15, 2021

Dear Professor Kudeki,

The Department of Atmospheric Sciences approves listing the class ATMS 201 (General Physical Meteorology) as Technical Elective for Electrical Engineering and Computer Engineering majors.

Sincerely,

Nicole Riemer

Nicole Riemer
Professor and Associate Head
Department of Atmospheric Sciences

On Mar 18, 2021, at 11:14 AM, Aber, Mark S <maber@illinois.edu> wrote:

Dear Erhan,

We are happy to support ECE by welcoming your students into PSYC 204. Best of luck with your curriculum revision.

best,
Mark

From: Kudeki, Erhan <erhan@illinois.edu>
Sent: Thursday, March 11, 2021 4:45 PM
To: Aber, Mark S <maber@illinois.edu>
Cc: Kudeki, Erhan <erhan@illinois.edu>; Newell, Brooke <bsnewell@illinois.edu>
Subject: Support letter request

Dear Mark,

I am writing to let you know that ECE has decided to add PSYC 204, Intro to Brain and Cognition, to its list of Technical Electives applicable to Electrical Engineering and Computer Engineering majors in our undergraduate program.

We have been asked by the College of Engineering to seek a letter of support from Psychology for this change as our curriculum revision proposal, approved by the College Executive Committee, goes up to the University Senate. Please provide us with such a letter of support. I'll be happy to answer any questions you may have about our request.

Thanks and best regards,

Erhan

Erhan Kudeki 2172650128 | erhan@illinois.edu
Professor and Associate Head for Undergraduate Affairs
Electrical and Computer Engineering, The Grainger College of Engineering
2080 ECE Building, 306 North Wright Street, Urbana, IL 61801

On Mar 18, 2021, at 2:52 PM, Rayburn, A Lane <arayburn@illinois.edu> wrote:

Hi Erhan

Crop Sciences supports adding CPSC 265 to the list of technical electives in ECE.

Just let me know if you need anything else.

Sincerely,

Lane

Dr. A. Lane Rayburn
Professor of Cytogenetics
Director of Undergraduate Studies
Department of Crop Sciences
University of Illinois
AE-120 Turner Hall
1102 S. Goodwin Ave
Urbana, IL 61801
Telephone - 217 333-4374.
http:// https://cropsciences.illinois.edu/people/profile/arayburn

From: Kudeki, Erhan <erhan@illinois.edu>
Sent: Thursday, March 18, 2021 10:47 AM
To: Tranel, Patrick J <tranel@illinois.edu>; Rayburn, A Lane <arayburn@illinois.edu>
Cc: Kudeki, Erhan <erhan@illinois.edu>
Subject: Re: Support letter request

Thanks Pat, I'm ashamed of my cut and paste error :-)

Lane, we will be needing the crop sciences support letter. We will be adding CPSC 265 to our very broad list of Technical Electives in ECE. Let me know if you have any questions.

Regards,

Erhan

Erhan Kudeki 2172650128 | erhan@illinois.edu
Professor and Associate Head for Undergraduate Affairs
Electrical and Computer Engineering, The Grainger College of Engineering
2080 ECE Building, 306 North Wright Street, Urbana, IL 61801

<image001.png>

On Mar 18, 2021, at 9:23 AM, Tranel, Patrick J <tranel@illinois.edu> wrote:

Erhan,

Sorry. I scanned your email before and deleted it because this is out of my jurisdiction, and because your email stated you needed a letter from atmospheric sciences, not crop sciences. After a closer read, I've passed your email on to our teaching coordinator, Lane Rayburn, who handles these.

Pat

PATRICK J TRANEL
Ainsworth Professor and Associate Head

University of Illinois at Urbana-Champaign
College of Agricultural, Consumer and Environmental Sciences
Department of Crop Sciences
320 ERML
1201 W Gregory Dr | M/C 051
Urbana, IL 61801
217.333.1531 | tranel@illinois.edu
cropsciences.illinois.edu

<image001.png>

From: "Kudeki, Erhan" <erhan@illinois.edu>
Date: Thursday, March 18, 2021 at 9:03 AM
To: Patrick Tranel <tranel@illinois.edu>
Cc: "Kudeki, Erhan" <erhan@illinois.edu>, "Newell, Brooke" <bsnewell@illinois.edu>
Subject: Re: Support letter request

Hi Patrick, a gentle reminder, thx,

Erhan

Erhan Kudeki 2172650128 | erhan@illinois.edu
Professor and Associate Head for Undergraduate Affairs
Electrical and Computer Engineering, The Grainger College of Engineering
2080 ECE Building, 306 North Wright Street, Urbana, IL 61801

On Mar 11, 2021, at 4:45 PM, Kudeki, Erhan <erhan@illinois.edu> wrote:

Dear Patrick,

I am writing to let you know that ECE has decided to add CPSC 265, Genetic Engineering Lab, to its list of Technical Electives applicable to Electrical Engineering and Computer Engineering majors in our undergraduate program.

We have been asked by the College of Engineering to seek a letter of support from Atmospheric Sciences for this change as our curriculum revision proposal, approved by the College Executive Committee, goes up to the University Senate. Please provide us with such a letter of support. I'll be happy to answer any questions you may have about our request.

Thanks and best regards,

Erhan

Erhan Kudeki 2172650128 | erhan@illinois.edu
Professor and Associate Head for Undergraduate Affairs
Electrical and Computer Engineering, The Grainger College of Engineering
2080 ECE Building, 306 North Wright Street, Urbana, IL 61801

UNIVERSITY OF ILLINOIS
Urbana-Champaign ● Chicago ● Springfield

University Senates Conference
378 Henry Administration Building
506 South Wright Street
Urbana, IL 61801

February 26, 2020

Kathy Martensen
Assistant Provost for Educational Programs
206 Swanlund, MC-304

Dear Kathy:

At its meeting on February 20, the University Senates Conference approved the proposed classification of minutes of the Urbana-Champaign Senate meeting of February 10. The Class I items are listed below.

EP.19.69	Establish a Major in Translational Medical Sciences in the Carle Illinois College of Medicine for the Degree of Master of Science
EP.20.34	Establish a Minor in Disability Studies in the Department of Kinesiology and Community Health, College of Applied Health Sciences
EP.20.44	Eliminate the BS MS in Industrial Engineering
EP.20.45	Eliminate the BS MS in Mechanical Engineering
EP.20.46	Revision of Curriculum Requirements for the Ph.D. in Civil Engineering to Add a 96-Credit Hour Option
EP.20.47	Revision of Curriculum Requirements for the Ph.D. in Environmental Engineering to Add a 96-Credit Hour Option
EP.20.48	Revision to the Master of Accounting Science (MAS) Degree Course Requirements
EP.20.49	Revision to Taxation Concentration. Revision to the Master of Accounting Science (MAS) Degree Course Requirements
EP.20.50	Revision to the Data Analytics Concentration. Revision to the Master of Accounting Science (MAS) Degree Course Requirements
EP.20.51	Financial Reporting & Assurance Concentration. Revision to the Master of Accounting Science (MAS) Degree Course Requirements

Telephone (217) 333-3077 ● Fax (217) 244-5763

EP.20.52 Establish Joint Program in the Department of Animal Sciences for the BS/MANSC

EP.20.53 Establish a Joint BS (CS+ANSC)/MANSC Program in the Department of Animal Sciences

EP.20.54 Revise the BALAS in Classics, College of Liberal Arts and Sciences, to Eliminate the Five Ways Students Can Choose a Classics Major (Major in Classics (Without a Concentration) and the Four Concentrations in Greek, Latin, Classics, Classical Civilization, and Classical Archeology. Add Concentrations in Classical Languages and Classical Civilizations as the Only Two Options Students May Pursue a Classics Major

EP.20.55 Revise the BALAS in Classics, College of Liberal Arts and Sciences, Classical Archeology

EP.20.56 Revise the BALAS in Classics, College of Liberal Arts and Sciences, Classical Civilization

EP.20.57 Elimination of the Undergraduate Minor: Classical Archaeology. In Conjunction with the Elimination of Three Other Undergraduate Minors in the Department of Classics: Classical Civilization, Greek, Latin; and the Creation of Two Minors: Classical Civilizations and Classical Languages

EP.20.58 Elimination of the Undergraduate Minor: Greek Minor

EP.20.59 Elimination of the Undergraduate Minor: Classical Civilization

EP.20.60 Elimination of the Undergraduate Minor: Latin Minor

EP.20.61 Creation of a new Undergraduate Minor: Classical Civilizations

EP.20.62 Creation of a new Undergraduate Minor: Classical Languages

EP.20.63 Revise the BALAS in Classics, Classical Civilizations

EP.20.64 Revise the BALAS in Classics, Classical Languages

EP.20.65 Revising EdD Degree Program Course and Exam Requirement

EP.20.66 Revise the Minor in German, Department of Germanic Languages and Literatures

EP.20.67 Revise the BALAS in Classics

EP.20.68 Revise the BALAS in Classics: Latin

EP.20.69 Establish a New Master of Science (M.S.) in Mental Health Counseling in the Department of Educational Psychology, College of Education

EP.20.70 Proposal to Establish a New Bachelor of Science Degree with a Major in Plant Biotechnology (B.S. in Plant Biotech) in the Department of Crop Sciences, College of Agricultural, Consumer and Environmental Sciences

EP.20.71 Revision to the Chemistry Minor

EP.20.72 Urban Studies & Planning: Social Justice

EP.20.75 Remove Art History PhD, Art Education PhD, and Education Policy, Organization, and Leadership MA, EdM, and CAS from a List of Programs Participating in the Writing Studies Floating Concentration

EP.20.76 Create a new Minor in German Business and Commercial Studies

EP.20.77 Computer Science & Philosophy, BSLAS (Revisions to the BSLAS in Computer Science & Philosophy, Department of Philosophy)

EP.20.78 Computer Science Minor

EP.20.79 New Proposal for BFA in Theatre: Arts & Entertainment Technology

EP.20.80 Revising Requirements for BFA in Theatre: Scenic Design

EP.20.81 Revising Requirements for BFA in Theatre: Sound Design & Technology

EP.20.82 Revising Requirements for BFA in Theatre: Lighting Design & Technology

EP.20.83 Revising Requirements for BFA in Theatre: Scenic Technology

EP.20.84 Revising Requirements for BFA in Theatre: Costume Design & Technology

EP.20.85 Revising Requirements for BFA in Theatre: Acting

EP.20.86 Revising Requirements for BFA in Theatre

EP.20.87 Revising Requirements for BFA in Theatre: Theatre Studies

EP.20.88 Revising Requirements for BFA in Theatre: Stage Management

EP.20.89 Revising Requirements in Theatre Minor, UG

EP.20.90 Computer Science & Astronomy, BSLAS (Revise the BSLAS in Computer Science & Astronomy, College of Liberal Arts and Sciences)

EP.20.91 Revising Requirements for BS in Civil Engineering

EP.20.92 Revising Requirements for BS in Computer Engineering

EP.20.93 Revising Requirements for BSAG in Agricultural and Biological Engineering

EP.20.94 Revising Requirements for BS in Agricultural and Biological Engineering

EP.20.95 Revising Requirements for BS in Agricultural & Biological Engineering: Agricultural Engineering

EP.20.96 Revising Requirements for BS in Agricultural & Biological Engineering: Biological Engineering

EP.20.97 Revising Requirements for BS in Computer Science

EP.20.98 Revising Requirements for BS in Electrical Engineering

EP.20.99 Revising Requirements for BS in Engineering Mechanics

EP.20.100 Revising Requirements for BS in Engineering Physics

EP.20.101 Revising Requirements for BS in Systems Engineering & Design

EP.20.102 Revising Requirements for BS in Nuclear, Plasma, and Radiological Engineering

EP.20.103 Revising Requirements for BS in Mechanical Engineering

EP.20.104 Revising Requirements for BS in Materials Science & Engineering

SP.20.09 Proposed Revision to the *Constitution*, Article II, Section 1.b; Article III, Section 1; and Article IV, Section 1

Sincerely,

Connie

Connie Sailor
Administrative Aide

c: Ellen Foran,
Renee Nagy
Julian Parrott
Jenny Roether
Nathan Wilds

1200: ELECTRICAL & COMPUTER ENGINEERING MINOR, UG

Completed Workflow

1. U Program Review (dforgacs@illinois.edu; eastuby@illinois.edu; aledward@illinois.edu)

Approval Path

1. Fri, 13 Sep 2019 13:48:18 GMT
   Deb Forgacs (dforgacs): Approved for U Program Review

History

1. Sep 13, 2019 by Brooke Newell (bsnewell)

Date Submitted:Tue, 21 Sep 2021 16:12:28 GMT

Viewing:1200 : Electrical & Computer Engineering Minor, UG

Changes proposed by: Brooke Newell

Proposal Type:

Minor (ex. European Union Studies)

This proposal is for a:

Revision

Administration Details

Official Program Name

Electrical & Computer Engineering Minor, UG

Sponsor College

Grainger College of Engineering

Sponsor Department

Electrical and Computer Engineering

Sponsor Name

Erhan Kudeki

Sponsor Email

erhan@illinois.edu

College Contact

Brooke Newell

College Contact Email

bsnewell@illinois.edu

Does this program have inter-departmental administration?

No

Proposal Title

Effective Catalog Term

Fall 2021

Provide a brief, concise description (not justification) of your proposal.

Administrative approval: Replacing CS 125 with CS 124, and providing clarity in the EE and CompE Options regarding credit hour totals.

Program Justification

Why are these changes necessary?

CS 125 is being discontinued and the EE and CompE Option credit hour totals weren't clear for each option.

Instructional Resources

Will there be any reduction in other course offerings, programs or concentrations by your department as a result of this new program/proposed change?

No

Does the program include other courses/subjects impacted by the creation/revision of this program?

No

Program Regulation and Assessment

Briefly describe the plan to assess and improve student learning, including the program's learning objectives; when, how, and where these learning objectives will be assessed; what metrics will be used to signify student's achievement of the stated learning objectives; and the process to ensure assessment results are used to improve student learning. (Describe how the program is aligned with or meets licensure, certification, and/or entitlement requirements, if applicable).

This is tied to ECE ABET process.

Is the career/profession for graduates of this program regulated by the State of Illinois?

No

Program of Study

“Baccalaureate degree requires at least 120 semester credit hours or 180 quarter credit hours and at least 40 semester credit hours (60 quarter credit hours) in upper division courses” (source: https://www.ibhe.org/assets/files/PrivateAdminRules2017.pdf). For proposals for new bachelor’s degrees, if this minimum is not explicitly met by specifically-required 300- and/or 400-level courses, please provide information on how the upper-division hours requirement will be satisfied.

An undergraduate minor should consist of at least 16 - and no more than 21 hours - of course work, with at least 6 hours of 300- or 400- level courses. Except clearly remedial offerings, prerequisite courses within the sponsoring unit count towards the total; prerequisite courses outside the sponoring unit do not count toward this total. The unit sponsoring the minor and that unit's college may set educationally necessary prerequisites for eligibility for the minor within these constraints. Does this proposal meet these criteria?

Yes

All proposals must attach the new or revised version of the Academic Catalog program of study entry. Contact your college office if you have questions.

Revised programs

ECE Minor UG_Minor Revision_Side by Side Table.xlsx

Attach a side-by-side comparison with the existing program AND, if the revision references or adds “chose-from” lists of courses students can select from to fulfill requirements, a listing of these courses, including the course rubric, number, title, and number of credit hours.

Catalog Page Text - Overview Tab

Statement for Programs of Study Catalog

Code	Title	Hours
Circuits Requirement:		**3**
Select one of the following:		
ECE 110	Introduction to Electronics	3
ECE 205	Electrical and Electronic Circuits	3
Programming Requirement:[1]		**0-3**
Select one of the following (with no particular preference):		3-4
Select one of the following (with no particular preference) unlessECE 220is taken:		
CS 101	Intro Computing: Engrg & Sci	3
CS 125	Introduction to Computer Science	
CS 124	Introduction to Computer Science I	3
A probability or statistics course chosen from an approved list below:		**3-4**
ECE 313	Probability with Engrg Applic	3
IE 300	Analysis of Data	3
BIOE 310	Comp Tools Bio Data	3
MATH 461	Probability Theory	3 or 4
MATH 463	Statistics and Probability I	4
CEE 202	Engineering Risk & Uncertainty	3
CS 361	Probability & Statistics for Computer Science	3
Select one of the following options below. Both the Core and Advanced Core courses from Option A or B must be completed		
A. Electrical Engineering Option		
A. Electrical Engineering Option		**10-11**

Core requirement:		
ECE 210	Analog Signal Processing	4
Advanced Core Electives:		
Two ECE courses chosen from an approved list below:		
ECE 310	Digital Signal Processing	3
ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3
ECE 340	Semiconductor Electronics	3
ECE 342 & ECE 343	Electronic Circuits and Electronic Circuits Laboratory	4
B. Computing Engineering Option		
B. Computing Engineering Option		**15-16**
Core Requirement:		
ECE 120	Introduction to Computing	4
ECE 220	Computer Systems & Programming	4
Advanced Core Electives:		
Two ECE courses chosen from an approved list below:		
ECE 385	Digital Systems Laboratory	3
ECE 391	Computer Systems Engineering	4
ECE 411	Computer Organization & Design	4
Elective ECE Courses to achieve a minimum of 18 hours of ECE course work.[2]		**0-5**

1 *If the student will be taking*ECE 220*following*ECE 120*, this requirement will be waived.*

2 *Completion of the minor requires a minimum of 18 hours ECE course work. No additional hours are needed in this category if all courses taken to satisfy the previous requirements are ECE courses. Otherwise choose from any 300 and 400 level classes except*ECE 316,ECE 317,ECE 396,ECE 397,ECE 496,ECE 499*.*

Program Features

Academic Level

Undergraduate

Is this minor?

A Comprehensive study in a single discipline

Is This a Teacher Certification Program?

No

Will specialized accreditation be sought for this program?

No

Other than certification via the students' degree audits, is there any additional planned mechanism to award/honor successful completion of the minor?

No

Delivery Method

This program is available:

On Campus - Students are required to be on campus, they may take some online courses.

Enrollment

Will the department limit enrollment to the minor?

No

Are there any prerequisites for the proposed minor?

No

Describe how this revision will impact enrollment and degrees awarded.

No impact

Budget

Are there budgetary implications for this revision?

No

Will the program or revision require staffing (faculty, advisors, etc.) beyond what is currently available?

No

Financial Resources

Will the unit need to seek campus or other external resources?

No

Resource Implications

Facilities

Will the program require new or additional facilities or significant improvements to already existing facilities?

No

Technology

Will the program need additional technology beyond what is currently available for the unit?

No

Non-Technical Resources

Will the program require additional supplies, services or equipment (non-technical)?

No

Resources

For each of these items, be sure to include in the response if the proposed new program or change will result in replacement of another program(s). If so, which program(s), what is the anticipated impact on faculty, students, and instructional resources? Please attach any letters of support/ acknowledgement from faculty, students, and/or other impacted units as appropriate.

Library Resources

Describe your proposal's impact on the University Library's resources, collections, and services. If necessary please consult with the appropriate disciplinary specialist within the University Library.

No impact

EP Documentation

EP Control Number

EP.22.030

This proposal requires HLC inquiry

No

DMI Documentation

Banner/Codebook Name

Electrical & Computer Engineering

Program Code:

1200

Minor Code

1200

Program Reviewer Comments

Deb Forgacs (dforgacs) (Fri, 17 Sep 2021 14:27:45 GMT): Rollback: minimum total credit hours.
Brooke Newell (bsnewell) (Mon, 20 Sep 2021 16:22:14 GMT): Rollback: Per email.
Deb Forgacs (dforgacs) (Mon, 27 Sep 2021 14:22:37 GMT): Re-entered the proposal type, minor type "is this minor", program feature 09/27/2021
Kathy Martensen (kmartens) (Wed, 06 Oct 2021 16:52:36 GMT): Administrative approval: Doesn't change total required hours; doesn't restrict students' options.

Key: 124

Addition
Removal
Revision

Current Program of Study

Circuits Requirement:		4
Select one of the following:		3
ECE 110	Introduction to Electronics	3
ECE 205	Electrical and Electronic Circuits	3
Programming Requirement: [1]		3-4
Select one of the following (with no particular preference):		3-4
CS 101	Intro Computing: Engrg & Sci	3
CS 125	Introduction to Computer Science	4
A probability or statistics course chosen from an approved list below:		3-4
ECE 313	Probability with Engrg Applic	3
IE 300	Analysis of Data	3
BIOE 310	Comp Tools Bio Data	3
MATH 461	Probability Theory	3 or 4
MATH 463	Statistics and Probability I	4
CEE 202	Engineering Risk & Uncertainty	3
CS 361	Probability & Statistics for Computer Science	3
Select one of the following options below. Both the Core and Advanced Core courses from Option A or B must be completed		9-11
A. Electrical Engineering Option		
Core requirement:		
ECE 210	Analog Signal Processing	4
Advanced Core Electives:		
Two ECE courses chosen from an approved list below:		
ECE 310	Digital Signal Processing	3
ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3
ECE 340	Semiconductor Electronics	3
ECE 342 & ECE 343	Electronic Circuits and Electronic Circuits Laboratory	3
B. Computing Engineering Option		
Core Requirement:		
ECE 120	Introduction to Computing	4
ECE 220	Computer Systems & Programming	4
Advanced Core Electives:		
Two ECE courses chosen from an approved list below:		
ECE 385	Digital Systems Laboratory	3
ECE 391	Computer Systems Engineering	4
ECE 411	Computer Organization & Design	4
Elective ECE Courses to achieve a minimum of 18 hours of ECE course work. [2]		0-5
[1]	*If the student will be taking ECE 220 following ECE 120, this requirement will be waived.*	
[2]	*Completion of the minor requires a minimum of 18 hours ECE course work. No additional hours are needed in this category if all courses taken to satisfy the previous requirements are ECE courses. Otherwise choose from any 300 and 400 level classes except ECE 316, ECE 317, ECE 396, ECE 397, ECE 496, ECE 499.*	

New Program of Study

Circuits Requirement:		3
Select one of the following:		
ECE 110	Introduction to Electronics	3
ECE 205	Electrical and Electronic Circuits	3
Programming Requirement: [1]		0-3
Select one of the following (with no particular preference) unless ECE 220 is taken:		
CS 101	Intro Computing: Engrg & Sci	3
CS 124	Introduction to Computer Science I	3
A probability or statistics course chosen from an approved list below:		3-4
ECE 313	Probability with Engrg Applic	3
IE 300	Analysis of Data	3
BIOE 310	Comp Tools Bio Data	3
MATH 461	Probability Theory	3 or 4
MATH 463	Statistics and Probability I	4
CEE 202	Engineering Risk & Uncertainty	3
CS 361	Probability & Statistics for Computer Science	3
Select one of the following options below. Both the Core and Advanced Core courses from Option A or B must be completed		
A. Electrical Engineering Option		10-11
Core requirement:		
ECE 210	Analog Signal Processing	4
Advanced Core Electives:		
Two ECE courses chosen from an approved list below:		
ECE 310	Digital Signal Processing	3
ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3
ECE 340	Semiconductor Electronics	3
ECE 342 & ECE 343	Electronic Circuits and Electronic Circuits Laboratory	4
B. Computing Engineering Option		15-16
Core Requirement:		
ECE 120	Introduction to Computing	4
ECE 220	Computer Systems & Programming	4
Advanced Core Electives:		
Two ECE courses chosen from an approved list below:		
ECE 385	Digital Systems Laboratory	3
ECE 391	Computer Systems Engineering	4
ECE 411	Computer Organization & Design	4
Elective ECE Courses to achieve a minimum of 18 hours of ECE course work. [2]		0-5
[1]	*If the student will be taking ECE 220 following ECE 120, this requirement will be waived.*	
[2]	*Completion of the minor requires a minimum of 18 hours ECE course work. No additional hours are needed in this category if all courses taken to satisfy the previous requirements are ECE courses. Otherwise choose from any 300 and 400 level classes except ECE 316, ECE 317, ECE 396, ECE 397, ECE 496, ECE 499.*	

Note: Please check DARS code to make sure this is only by approval (right now the new DARS automatically count it as tech elec

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

EP.12.08

APPROVED BY SENATE
9/12/2011

Office of the Provost and Vice Chancellor
for Academic Affairs

Swanlund Administration Building
601 East John Street
Champaign, IL 61820

August 23, 2011

Gay Miller, Chair
Senate Committee on Educational Policy
Office of the Senate
228 English Building, MC-461

Dear Professor Miller:

Enclosed is a copy of a proposal from the College of Engineering to establish the undergraduate minor in Electrical and Computer Engineering.

This proposal has been approved by the College of Engineering's Executive Committee. It now requires Senate review.

Sincerely,

Kristi A. Kuntz
Assistant Provost

KAK/njh

Enclosures

c: A. Cangellaris
J. Erickson
B. Heuser
S. Kamin
E. Kudeki
E. Stovall
J. Hanks

telephone (217) 333-6677 • *fax* (217) 244-5639

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

College of Engineering

Executive Committee
306 Engineering Hall, MC-266
1308 West Green Street
Urbana, IL 61801

May 19, 2011

Kristi Kuntz
Assistant Provost
217 Swanlund Administration Building
MC-304

Via: Ilesanmi Adesida, Engineering College

Dear Ms. Kuntz:

The College of Engineering Executive Committee has reviewed and approved the following:

New Program: "Undergraduate Minor in Electrical and Computer Engineering"

Attached is a copy of the request.

Sincerely yours,

Brent J. Heuser, Secretary
Executive Committee

Approval Recommended:

Ilesanmi Adesida, Dean
College of Engineering

5/17/11
Date

BJH/jmh

Enclosure

c: Andreas Cangellaris
Jeff Erickson
Sam Kamin
Erhan Kudeki
Michael Pleck
Elizabeth Stovall
Jean Hanks

telephone 217-333-2151 • *fax* 217-244-7705

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA CHAMPAIGN

Senate Educational Policy Committee
Proposal Check Sheet

PROPOSAL TITLE (Same as on proposal): Establishment of a New Undergraduate Minor in Electrical and Computer Engineering in the Department of Electrical and Computer Engineering, College of Engineering

PROPOSAL TYPE (Please select all that apply below):

A. ☒ Program and degree proposals

1. This proposal is for a graduate program or degree

   ☐ Yes ☒ No

2. **Degree** proposal (e.g. B.S.A.E., M.S.C.E.)

   ☐ New degree — please name the new degree: _____

   ☐ Revision of an existing degree — please name the existing degree to be revised: _____

3. **Major** proposal (disciplinary focus, e.g., Mathematics)

   ☐ New major — please name the new major: _____

   ☐ Revision of an existing major — please name the existing major to be revised: _____

4. **Concentration** proposal (e.g. Financial Planning)

   ☐ New concentration — please name the new concentration: _____

   ☐ Revision of an existing concentration — please name the existing concentration to be revised: _____

5. **Minor** proposal (e.g. Cinema Studies)

   ☒ New minor — please name the new minor: Electrical and Computer Engineering

   ☐ Revision of an existing minor — please name the existing minor to be revised: _____

6. ☐ Proposal for renaming an existing degree, major, concentration, or minor

   ☐ degree ☐ major ☐ concentration ☐ minor

   Please provide the current name: _____

   Please provide the proposed new name: _____

7. ☐ Proposal for terminating an existing degree, major, concentration, or minor

   Please name the existing degree, major, concentration, or minor: _____

8. ☐ Proposal for a multi-institutional degree between Illinois (UIUC) and a foreign institution

   Please name the existing Illinois degree or program: _____

   Please name the partnering institution: _____

B. ☐ **Proposal for renaming existing academic units** (college, school, department, or program)

Please provide the unit's current name: _____

Please provide the unit's proposed new name: _____

C. ☐ **Proposal for reorganizing existing units** (colleges, schools, departments, or programs)

☐ Change in status of an existing and approved unit (e.g. change from a program to department) — please indicate current unit name including status: _____

☐ Transfer an existing unit

Please provide the current unit's name and home: _____

Please provide the new home for the unit: _____

☐ Merge two or more existing units (e.g., merge department A with department B)

Please provide the name and college of unit one to be merged: _____

Please provide the name and college of unit two to be merged: _____

☐ Terminate an existing unit — please provide the current unit's name and status: _____

D. ☐ **Other educational policy proposals** (e.g., academic calendar, grading policies, etc.)

Please indicate the nature of the proposal: _____

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Proposal to the Senate Educational Policy Committee

PROPOSAL TITLE: Establishment of a New Undergraduate Minor in Electrical and Computer Engineering in the Department of Electrical and Computer Engineering, College of Engineering

SPONSOR: Erhan Kudeki, Professor of Electrical and Computer Engineering and Associate Head for Undergraduate Affairs, 265-0128, erhan@illinois.edu.

COLLEGE CONTACT: Charles Tucker, III, Associate Dean for Undergraduate Programs, 333-2280, ctucker@illinois.edu

BRIEF DESCRIPTION: The Electrical and Computer Engineering (ECE) Minor will provide a choice between exposure to the electrical engineering (EE) and computer engineering (CE) disciplines. Students in the ECE Minor will take a common set of required courses in Circuits, Programming, and Probability or Statistics. Depth in the ECE Minor will be established via an advanced core requirement and an advanced elective requirement in EE or CE.

JUSTIFICATION: The ECE Minor will be open to all UIUC undergraduates outside the ECE Department with the exception that Computer Science majors cannot elect the Computer Engineering Option within the Minor. The aim of the ECE Minor is to expose engineering students outside of ECE, as well as undergraduates in sciences and or mathematics, to methodologies and applications of focus in electrical and computer engineering disciplines. Engineering students outside of ECE would benefit from a knowledge and understanding of electrical and computer engineering principles that can be applied to interdisciplinary work in the areas of computation, system and product design, signal processing, and optimization. Students outside of engineering would benefit from instruction in engineering as a framework for analytical problem solving. For example, it has been said for many years that students in the life sciences would benefit from a minor in engineering to prepare them for careers in bioengineering which is engineering applied to biological applications and processes. Students in engineering disciplines such as chemical and biomolecular engineering would benefit from this minor as many of the applications in this discipline are computationally oriented.

REQUIREMENTS AND RELATED INFORMATION:

Course Requirements

1. Circuits (4 hours): ECE 110—Intro Elec & Computer Engrg; or ECE 205—Elec & Electronic Circuits and ECE 206—Elec & Electronic Circuits Lab
2. Programming (3-4 hours): one of (with no particular preference) CS 101—Intro Computing: Engrg & Sci, CS 125—Intro to Computer Science, or ECE 190—Intro to Computing Systems
3. Probability or Statistics (3-4 hours): one course from an approved list (see Appendix A.1)
4. Option:
    a. EE Option (10-11 hours):
        1) EE Core Requirement: ECE 210—Analog Signal Processing (4 hours)
        2) EE Advanced Electives: two courses (300 level or above) from an approved list (6-7 hours, see Appendix A.2)

        – Or –

    b. CE Option (9-11 hours):
        1) CE Core Requirement: ECE 290—Computer Engineering I (3 hours) or CS 231—Computer Architecture I (3 hours). ECE 290 should be taken unless CS 231 credit exists
        2) CE Advanced Electives: two courses (300 level or above) from an approved list (6-8 hours, see Appendix A.3)
5. Additional ECE Course Work (0-5 hours): Elective ECE-rubric courses to attain 18 total hours of ECE-rubric credit. No additional hours are needed in this category if all courses taken to satisfy Requirements 1-4 are ECE-rubric ones.

Accordingly, the number of credit hours required to complete the ECE Minor ranges from 19-23 hours if no additional ECE-rubric course work (Requirement 5) is needed, and up to 28 if it is.

Prerequisites for the Minor: None, other than credit in basic science and mathematics courses required as standard prerequisites for the courses to be taken under the program.

Admission to the Minor: Students with B- or better grades in ECE 110 or ECE 205 will be formally accepted to the program upon application.

Minor Advisor: ECE Advisors in the ECE Undergraduate Advising Office in 156 Everitt will be responsible for advising the students enrolled in the program.

Certification of Successful Completion: The requirements will be coded into and verified via DARS, and then verified by the CoE as the other minors are.

BUDGETARY AND STAFF IMPLICATIONS:

a. *Additional staff and dollars needed:* None.

b. *Internal reallocations (e.g. change in class size, teaching loads, student-faculty ratio, etc.):* Minimal. Enrollment in the minor is projected to be about 20 students per year.

That's a negligible fraction of the approximately 800 and 550 students enrolled in ECE 110 and ECE 205/206 annually. Furthermore, ECE 110 and ECE 205/206 are already handling many non-ECE students, the pool that we will draw from for the new ECE minor. Similarly, the core EE and CE Option courses, ECE 210 and ECE 290, with enrollments averaging almost 500 and 400, can easily absorb the 20 or so students annually split between the two courses. Hence, additional costs and impacts will be negligible and can be easily handled by the department.

c. *Effect on course enrollment in other departments and explanations of discussions with representatives of those departments:* Minimal. Students taking the programming requirement courses CS 101 or CS 125 will likely do so to satisfy requirements of their major. The core CE Option course CS 231 is one of two alternates and only a few students are expected to enroll annually, a negligible fraction of the average annual enrollment of about 400.

d. *Impact on library, computer use, laboratory use, equipment, etc.:* None.

Proposed Effective Date: Spring 2012

Statement for the Programs of Study Catalog: See Appendix B.

CLEARANCES:

Signatures:

Unit Representative:	Date: Feb 21, 2011
College Representative:	Date: 5/17/11
Graduate College Representative:	Date:
Provost Representative:	Date:
Educational Policy Committee Representative:	Date:

Appendix A. Distribution Requirement Elective Courses

Credit hours are shown in parentheses

A.1 Approved list of courses on probability/statistics:

ECE 313 – Probability with Engrg Applic (3)
STAT 400 – Statistics and Probability I (4)
MATH 463 – Statistics and Probability I (4)
GE 331 – Analyt Methods for Uncertainty (3)
CEE 202 – Engineering Risk & Uncertainty (3)
EPSY 480 – Educational Statistics (4)

A.2 Advanced Core Electives in EE:

ECE 310 – Digital Signal Processing, I (3)
ECE 329 – Fields and Waves I (3)
ECE 330 – Power Circuits & Electromechanics (3)
ECE 340 – Semiconductor Devices (3)
ECE 342/343 – Electronic Circuits/Laboratory (4)

A.3 Advanced Core Electives in CE:

ECE 385 – Digital Systems Laboratory (2)
ECE 391 – Computer Systems Engineering (4)
ECE 411 – Computer Organization and Design (4)

APPENDIX B. STATEMENT FOR THE PROGRAMS OF STUDY

Electrical and Computer Engineering Minor

Electrical and computer engineering transforms our day-to-day lives through a multitude of innovative technologies and products. The ECE minor is intended to expose students from other disciplines to the unlimited opportunities for innovation in this exciting field, and to the methodologies and tools used by electrical and computer engineers for the exploration and design of new technologies and products. This minor is open to all UIUC undergraduates outside the ECE Department with the exception that Computer Science majors cannot elect the Computer Engineering Option within the Minor.

Hours	Required Courses
4	*Circuits Requirement:* ECE 110—Intro Elec & Computer Engrg **or** ECE 205—Elec & Electronic Circuits + ECE 206—Elec & Electronic Circuits Lab
3-4	*Programming Requirement:* one of (with no particular preference) CS 101—Intro Computing: Engrg & Sci CS 125— Intro to Computer Science ECE 190—Intro to Computing Systems
3-4	A probability or statistics course chosen from an approved list
10-11	A. Electrical Engineering Option[1] • *Core Requirement:* ECE 210—Analog Signal Processing • *Advanced Core Electives:* Two ECE courses chosen from an approved list
- or -	**- - - - - - or - - - - - -**
9-11	B. Computer Engineering Option[1] • *Core Requirement*[2]*:* ECE 290—Computer Engineering I **or** CS 231—Computer Architecture I • *Advanced Core Electives:* Two ECE courses chosen from an approved list
0-5	Elective ECE courses to achieve a minimum of 18 hours of ECE course work[3].
19-28	Total

1. To complete the minor, both the Core and Advanced Core courses from Option "A" or "B," must be completed.

2. ECE 290 should be taken unless CS 231 credit already exists.

3. No additional hours are needed in this category if all courses taken to satisfy the previous requirements are ECE ones.

For more information regarding the Electrical and Computer Engineering minor, visit the Electrical and Computer Engineering minor Web site, contact the Electrical and Computer

Engineering Undergraduate Programs Office (156 Everitt Laboratory, 217-333-0716, ece-advisor@illinois.edu), or visit the Office of the Associate Dean for Undergraduate Programs, 206 Engineering Hall.

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Department of Computer Science
201 North Goodwin Avenue
Urbana, IL 61801-2302 USA

April 25, 2011

To whom it may concern,

The Computer Science Department has considered the proposed ECE minor, and gives its full endorsement. The minor will provide an opportunity for interested students on campus to explore this field. Any additional load on CS courses will be minimal, and we do not anticipate any need for additional resources due to the inclusion of several CS courses as options in the minor.

We will note that "option B – Computer Engineering Option", would not be appropriate for Computer Science majors, due to the overlap with their existing curriculum. Consequently, we shall request that this option not be made available to CS majors.

Sincerely,

Leonard Pitt
Professor and Director of Undergraduate Programs
Department of Computer Science
University of Illinois
pitt@illinois.edu

Draft Minutes
College of Engineering Executive Committee (EC) Meeting
Tuesday, 1:00 p.m., May 3, 2011
301 Engineering Hall

Present:

D. Abrams (CEE)
M. Bragg (Admin)**
D. Ceperley (Phys)
J. Freund (MechSE)
J. Hart (CS)**
B. Heuser (NPRE)
D. Jones (ECE)
P. Kalita (ABE)
S. Kamin (CS)
D. Pack (ChBE)
H. Reis (ISE)
C. Tucker (Admin)
J. Weaver (MatSE)

Absent

I. Adesida (Admin)
S.-L. Chuang (MNTL)
B. Conway (AE)
V. Coverstone (Admin)
B. Cunningham (BioE)
M. Wong (CSL)

* = alternate, ** = guest

The meeting was called to order at 1:00 pm.

1. Welcome to New EC Members by Executive Associate Dean Bragg.

2. Importance of the EC Activities by Executive Associate Dean Bragg.

3. Annual Budget Overview by Executive Associate Dean Bragg.

4. Approval of the draft minutes, April 19, 2011

   The minutes were approved unanimously.

5. Old Business

—Review of the policy concerning internship courses. This policy was discussed extensively, with a new issue related to the approval of the work product (written report) identified in the previous policy statement (April 19, 2011 minutes). Specifically, the question was raised as to whether a member of the graduate college should be the only person allowed to sign these reports. This issue will have an impact on the MSE 585 and ENG 572 courses as they are currently described in the respective course proposals.

A motion to add the requirement of graduate college member approval to the written work product(s) to the internship course to the COE EC policy was approved.

—Review of MSE 585 proposal.

6. Course and Program Proposals/Reports

   a. New/Revised Course Outlines and Program Proposals

—B.S in Agricultural and Biological Engineering
New Courses

—ABE 223 "ABE Principles: Machine Syst"

—ABE 224 "ABE Principles: Soil & Water"
—ABE 225 "ABE Principles: Bioenviron"
—ABE 226 "ABE Principles: Bioprocessing"

The COE EC unanimously approved the revision to the B.S curriculum and the associated new courses without forwarding for review to an ad hoc committee.

—CEE 445 "Air Quality Modeling"

The CEE department is requested to provide clarification of the 1 additional course credit hour based on one contact hour per week of laboratory. COE policy is 2 to 3 contact hours per course credit hour. Alternatively, other work products such as laboratory reports outside of lab/lecture meeting time is required to meet the COE policy. The current CEE 445 appears to be deficient with regard to this policy and further information is required before the COE EC will consider the proposal.

—CEE 553 "River Morphodynamics"

The review of this course has been assigned to the following ad hoc committee: P. Kumar (CEE), R. Cooke (ABE), M. Matalon (MechSE), chair.

—ENG 572 "Energy Systems Practicum"
—ENG 573 "Energy Systems Project"

b. Subcommittee Reports

— CEE 411 "RR Project Design & Constr"
— CS 528 "Obj-Oriented Progrmg & Design"
— Undergraduate Minor in Electrical and Computer Engineering
— ECE 526 "Distributed Algorithms"

The above subcommittee reports were all unanimously approved.

7. A resolution recognizing Dean Pleck's contribution to the COE was read aloud and is hereby entered into the EC minutes.

8. Adjournment: The meeting adjourned at 2:30 pm.

The minutes have not yet been approved.
Respectfully submitted,

Brent J. Heuser, Secretary

cc: Samuel Kamin
Jean Hanks
Michael Pleck