Date Submitted: 12/20/21 10:51 am

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Engineering, BS

Last approved: 11/17/21 11:51 am

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Changes proposed by: Erhan Kudeki

Computer Engineering, BS

Catalog Pages Using this Program

Proposal Type:

In Workflow

- 1. U Program Review
- 2. 1933 Head
- 3. KP Committee Chair
- 4. KP Dean
- 5. University
 Librarian
- 6. Provost
- 7. Senate EPC
- 8. Senate
- 9. U Senate Conf
- 10. Board of Trustees
- 11. IBHE
- 12. HLC
- 13. DMI

Approval Path

- 01/05/22 2:30 pm Deb Forgacs (dforgacs): Approved for U Program Review
- 2. 01/05/22 4:55 pm Erhan Kudeki (erhan): Approved for 1933 Head
- 3. 02/03/22 11:39 am Brooke Newell

(bsnewell):
Approved for KP

Committee Chair

4. 02/03/22 11:47 am Candy Deaville (candyd):

Approved for KP

Dean

5. 02/03/22 11:54 am John Wilkin

(jpwilkin):
Approved for
University
Librarian

6. 02/03/22 4:15 pm 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)
- 8. Nov 17, 2021 by Erhan Kudeki (erhan)

Major (ex. Special Education)

This proposal is for a:

Revision

Administration Details

Official Program

Computer Engineering, BS

Name

Sponsor College Grainger College of Engineering

Sponsor Electrical and Computer Engineering

Department

Sponsor Name Erhan Kudeki

Sponsor Email erhan@illinois.edu

College Contact <u>Jonathan Makela</u> <u>Brooke Newell</u> College Contact

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Officer

Tessa Hile

College Budget

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Officer Email

List the role for rollbacks (which role will edit the proposal on questions from EPC, e.g., Dept Head or Initiator) and/or any additional stakeholders. *Purpose: List here who will do the editing work if proposal needs rolled back. And any other stakeholders.*

Brooke Newell, Erhan Kudeki

Does this program have inter-departmental administration?

No

Proposal Title

Effective Catalog Fall 2022

Term

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

Removed Liberal Education Electives (6 hours), updated number of free elective hours (from 12 to 16), moved footnotes (when possible) into the Program of Study Table (to improve accessibility), updated number of technical elective hours (from 29 to 30), and added 4 new courses to technical electives.

List here any related proposals/revisions and their keys. *Example: This BS proposal (key 567) is related to the Concentration A proposal (key 145) and the Concentration B proposal (key 203).*

Program Justification

Why are these changes necessary?

After careful analysis of programs of studies, various requirements, and course selection for students in The Grainger College of Engineering, we have decided to provide additional flexibility to all engineering undergraduate students by increasing the number of free elective hours in all engineering programs. While the actual number of credit hours for free electives varies by program, within the college - 8 programs currently provide only 6 credit hours for free electives while an additional 2 have less than 10 - only 4 programs have more than 10 free elective credits. This lack of free elective credit hours limits students' abilities to efficiently pursue minors, certificates, and other educational opportunities and potentially limits those opportunities only to students coming in with significant AP credit or similar.

The additional free elective credit hours added to the program of study are obtained through the removal of The Grainger College of Engineering's Liberal Education requirement, which required engineering students to take an additional 6 credit hours above-and-beyond the campus' General Education requirement from the Humanities & the Arts, Social & Behavioral Sciences, or a college-curated list of courses. Over time, the Liberal Education requirement has been revised within the college, successively relaxing restrictions and providing additional choice to students (i.e., removal of a sequencing requirement in 1999; addition of the college-curated course list in 2010). Simultaneously, the college-curated list of courses continued to expand to include courses from approximately 120 rubrics across campus (including within The Grainger College of Engineering), gradually removing constraints to allow greater flexibility of choice for students to take advantage of the many opportunities the campus has to offer. Still, in its current form, this additional college-level requirement constrains student choice and interferes with their ability to efficiently pursue minors, certificates, and other educational opportunities across campus unless those opportunities intersect with coursework in the Liberal Education requirement.

Simultaneously, the required engineering orientation course, ENG 100, will be granted 1-credit hour. Previously, this course was a 0-credit course. The allocation of 1-credit appropriately recognizes the time and commitment expected of all students who take this course. In the 1-credit version of ENG 100, content will be added to improve teamwork and interpersonal skills, including topics related to diversity, equity, and inclusion (DEI). The engineering accrediting agency, ABET, will soon be adding DEI requirements for accredited programs. This component of ENG 100 is therefore beneficial to all Grainger Engineering programs and students by providing a common framework on which additional DEI topics can build throughout a student's program of study.

After allocating the 6 hours made available by the removal of the Liberal Education requirement to 1 hour of ENG 100 and 4 additional hours of Free Electives within ECE curricula (EE and CE) the remaining one hour is being added to the Technical Electives category in both EE and CE. This change is justified as follows: Earlier in the year 1 hour of Technical Electives was removed from the EE curriculum (see Apr 19, 2021 proposal) to be used for MATH 257 which was being added to both of EE and CE programs as a required core course. This choice, reducing Technical Elective hours instead of Free Elective hours, was made to protect the breadth of the Free Elective option. With most recent addition of 4 new Free Elective hours being requested here, a

concern with reduced Free Elective hours is no longer relevant and thus restoring the count of Technical Electives in the EE program back to 31 is well justified. Also raising the number of Technical Elective hours from 29 to 30 in the CE program is desirable to retain the balance between EE and CE close in terms of the required Technical elective hours.

Finally 4 new technical elective courses were added in Graduation Requirements section --- these are new courses which were recently reviewed and added to the departmentally approved list of 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?

Yes

Required courses

Explain how the inclusion or removal of the courses/subjects listed above impacts the offering departments.

The current Liberal Education requirement is satisfied by a student completing 6 credit hours beyond those required by campus' General Education requirement from Humanities & the Arts, Social & Behavioral Sciences, or a college-curated list of courses (containing courses from over 120 rubrics across campus). An analysis of student course selection in the Liberal Education category indicates 25% of courses are taken in the College of Liberal Arts & Sciences, 20% from the College of Applied Health Sciences, 18% from Gies College of Business, 11% from the College of Agricultural, Consumer and Environmental Sciences, 11% from the College of Fine and Applied Arts, and 9% from The Grainger College of Engineering. Less than 2% of credits are taken in each of the remaining colleges and units across campus.

Although it might stand to reason that removal of the Liberal Education requirement would reduce the amount of credits Grainger Engineering students take outside of their home college, the data do not support that assertion. Specifically, despite the current Liberal Education requirement being set at 6 credit hours, the average number of credit hours completed from the Liberal Education course list upon graduation is 11.9. Through discussions with departmental and college advisors as well as students, students are making course selections not because the course satisfies the Liberal Education requirement, but because they are interested in the coursework offered

outside of their home college, are pursing minors and other educational opportunities, and are looking to balance course loads between technical and non- technical courses. Taken together, the data and evidence from advisors and students suggest that students will continue to take the types of courses represented on the Liberal Education course list, even if not specifically required to do so.

Attach letters of Letters of Acknowledgement - Liberal Education Electives.pdf support or acknowledgement from other departments.

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

"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 CompE BS bsn.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: 2.0

TGPA is required for ECE courses (except <u>ECE 316</u>). <u>ECE 316</u>). See <u>Technical GPA</u> to clarify requirements.

Minimum Overall GPA: 2.0

Minimum hours required for graduation: 128 hours

<u>General education:</u> Students must complete the Campus General Education requirements including the campus general education language requirement.

Specific Advanced Composition courses required for this degree are listedbelow. ECE 445 or combination of ECE 496 & ECE 499 satisfies a design elective Orientation and the Campus General Education Advanced Composition requirement.

<u>Orientation</u> <u>Professional DevelopmentFoundational Mathematics</u> and <u>Professional Development</u>

Course List

Code	Title	Hours
ENG 10	00 Grainger Engineering Orientation Seminar (External transfer students take ENG 300	1
	instead.)	
Total Ho	nurs	1

Foundational Mathematics and Science

Title

Code

Course List

Hours

0000	1100	
<u>MATH 221</u>	Calculus I (MATH 220 may be substituted. MATH 220 is appropriate for students with no	4
	background in calculus. 4 of 5 credit hours count towards degree.)	
MATH 231	Calculus II	3
MATH 241	Calculus III	4
<u>MATH 257</u>	Linear Algebra with Computational Applications	3
or <u>MATH 41</u>	<u>6</u> Abstract Linear Algebra	
<u>MATH 285</u>	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		29

Computer Engineering Technical Core

Course List

Code litte	Hours
ECE 110 Introduction to Electronics	3
ECE 120 Introduction to Computing	4
ECE 210 Analog Signal Processing	4
ECE 220 Computer Systems & Programming	4
CS 173 Discrete Structures (MATH 213 may be substituted.)	3
CS 225 Data Structures	4
ECE 313Probability with Engrg Applic (STAT 410 may be substitute	d.)3
ECE 374 Introduction to Algorithms & Models of Computation	4
ECE 385 Digital Systems Laboratory	3

Code	Title	Hours
ECE 39	1 Computer Systems Engineering	4
Total H	ours	36

Technical Electives

Course List

	Course List	
Code	Title	Hours
·	tmentally Approved List of Technical Electives to include: at least 1 Electrical	30
	ndations course, at least 3 Advanced Computing Electives, at least 1 Design Elective	
AE 202	Aerospace Flight Mechanics	3
AE 302	Aerospace Flight Mechanics II	3
<u>AE 311</u>	Incompressible Flow	3
<u>AE 312</u>	Compressible Flow	3
<u>AE 321</u>	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
	Fr	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
71L 133	Acrospace Propalation	4
AE 434	Rocket Propulsion	3 or
AL 454	Nocket Propulsion	4
AE 435	Electric Propulsion	3 or
AL 433	Electric Propulsion	4
ΛΕ <i>Δ</i> 5.1	Aeroelasticity	3 or
<u>AE 451</u>	Aeroelasticity	3 01 4
AE 460	Agradynamics & Dranulsian Lab	2
AE 460	Aerodynamics & Propulsion Lab	2
• ,	BE): all 300 and 400 level courses except 440. Exceptions for seminars and special	
•	riewed in Advising Office.	2
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

Code	Title	Hours
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
74110 101	rusk / utdrysts in Earth Science	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 (BIOF	P): All 400 level courses except seminars and special topics, which may be reviewed	
in the Advising C	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

Code	Title	Hours
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
	1): All 200, 300 and 400 level courses except 397, 497, 499, and seminars and	_
, ,	nich may be reviewed in the Advising Office	
<u>CEE 310</u>	Transportation Engineering	3
CEE 330	Environmental Engineering	3
CEE 408	Railroad Transportation Engrg	3 or
CLL 400	Kambad Hansportation Engry	4
CEE 410	Railway Signaling & Control	3 or
<u>CLL 410</u>	Railway Signaling & Control	3 01 4
CEE 416	Traffic Capacity Apalysis	4 3 or
CEE 416	Traffic Capacity Analysis	
CEE 420	Foological Ovality Engineering	4
CEE 430	Ecological Quality Engineering	2
CEE 447	Atmospheric Chemistry	4
CEE 491	Decision and Risk Analysis	3 or
0000 265		4
<u>CPSC 265</u>	Genetic Engineering Lab	3
<u>CS 101</u>	Intro Computing: Engrg & Sci (By Approval)	3
CS 242	Programming Studio	3
<u>CS 357</u>	Numerical Methods I	3
<u>CS 410</u>	Text Information Systems	3 or
		4
<u>CS 411</u>	Database Systems	3 or
		4
<u>CS 412</u>	Introduction to Data Mining	3 or
		4
<u>CS 413</u>	Intro to Combinatorics	3 or
		4
<u>CS 414</u>	Multimedia Systems	3 or
		4
<u>CS 416</u>	Data Visualization	3 or
		4
<u>CS 418</u>	Interactive Computer Graphics	3 or
		4
<u>CS 419</u>	Production Computer Graphics	3 or
		4

Code CS 420	Title Parallel Progrmg: Sci & Engrg	Hours 3 or
<u>CS 421</u>	Programming Languages & Compilers	4 3 or
<u>CS 422</u>	Programming Language Design	4 3 or 4
<u>CS 423</u>	Operating Systems Design	3 or 4
<u>CS 424</u>	Real-Time Systems	3 or 4
<u>CS 425</u>	Distributed Systems	3 or 4
<u>CS 426</u>	Compiler Construction	3 or 4
<u>CS 427</u>	Software Engineering I	3 or 4
<u>CS 428</u>	Software Engineering II ACD	3 or 4 3
<u>CS 429</u> <u>CS 431</u>	Software Engineering II, ACP Embedded Systems	3 or 4
<u>CS 433</u>	Computer System Organization	3 or 4
<u>CS 435</u>	Cloud Networking	3 or 4
<u>CS 436</u>	Computer Networking Laboratory	3 or 4
<u>CS 438</u>	Communication Networks	3 or 4
<u>CS 439</u>	Wireless Networks	3 or 4 3 or
<u>CS 440</u> <u>CS 445</u>	Artificial Intelligence Computational Photography	3 or
<u>CS 446</u>	Machine Learning	4 3 or
<u>CS 447</u>	Natural Language Processing	4 3 or
<u>CS 450</u>	Numerical Analysis	4 3 or
<u>CS 460</u>	Security Laboratory	4 3 or
CS 461 CS 463	Computer Security I Computer Security II	4 4 3 or
<u>CS 465</u>	User Interface Design	4 4

Codo	Tible	Harria
Code CS 466	Title Introduction to Bioinformatics	Hours 3 or
<u>C3 400</u>	The oddection to bioinformatics	3 01 4
<u>CS 467</u>	Social Visualization	3 or
<u>C5 407</u>	Social Visualization	4
<u>CS 473</u>	Algorithms	4
<u>CS 475</u>	Formal Models of Computation	3 or
<u>CS 475</u>	Tormal Floucis of Computation	4
<u>CS 476</u>	Program Verification	3 or
<u>CS 470</u>	Trogram vermeation	4
<u>CS 477</u>	Formal Software Development Methods	3 or
<u>CS 177</u>	Tormal Software Development Fledhous	4
<u>CS 481</u>	Advanced Topics in Stochastic Processes & Applications	3 or
<u> </u>	Advanced Topics in Stochastic Processes & Applications	4
CS 484	Parallel Programming	3 or
<u> </u>		4
CS 398	Special Topics (As approved)	1 to
		4
<u>CS 498</u>	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

Codo	Title	Цолис
Code	Title Biomedical Instrumentation	Hours 3
ECE 414 ECE 415	Biomedical Instrumentation Lab	2
ECE 416	Biosensors	3
		3 4
ECE 417	Multimedia Signal Processing	
ECE 418	Image & Video Processing	4 3 or
ECE 419	Security Laboratory	
ECE 420	Embedded DSP Laboratory	4 2
ECE 422	Computer Security I	4
ECE 424	Computer Security I	4 3 or
<u>LCL 424</u>	Computer Security II	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
<u> </u>	compater rectioning Laboratory	4
ECE 437	Sensors and Instrumentation	3
ECE 438	Communication Networks	3 or
<u> </u>		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

Code	Title	Hours
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
LCL 450	Introduction to Optimization	4
ECE 491	Numerical Analysis	3 or
LCL 451	Numerical Analysis	4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or
LCL 492	rafaller Frogring. Sci & Eligig	4
ECE 493	Advanced Engineering Math	3 or
LCL 493	Advanced Engineering Matri	
ECE 40E	Photonia Davica Laboratory	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 o	or 1 to
	by approval)	4
<u>GEOL 107</u>	Physical Geology	4
GEOL 208	History of the Earth System	4
GEOL 333	Earth Materials and the Env	4
GEOL 380	Environmental Geology	4
<u>GEOL 411</u>	Structural Geol and Tectonics	4

Cada	T:41-	Harris
Code	Title	Hours
GEOL 417	Geol Field Methods, Western US	6
GEOL 432 GEOL 436	Mineralogy and Mineral Optics	4
	Petrology and Petrography	4
GEOL 440	Sedimentology and Stratigraphy	4
GEOL 450	Investigating the Earth's Interior	3
GEOL 452	Introduction to Geophysics	4
GEOL 460	Geochemistry	3
<u>IE 310</u>	Deterministic Models in Optimization	3
<u>IE 330</u>	Industrial Quality Control	3
<u>IE 360</u>	Facilities Planning and Design	3
<u>IE 361</u>	Production Planning & Control	3
<u>IE 400</u>	Design & Anlys of Experiments	3 or
IE 410	Advanced Taxies in Charlestia Duscosco C. Applications	4
<u>IE 410</u>	Advanced Topics in Stochastic Processes & Applications	3 or
TE 411	Orbinsi-ships of Laura Costana	4
<u>IE 411</u>	Optimization of Large Systems	3 or
IE 410	OD Madala for Mfg Cystoma	4
<u>IE 412</u>	OR Models for Mfg Systems	3 or
TE 412	Cinculation	4
<u>IE 413</u>	Simulation	3 or
TE 420	Financial Engineering	4
<u>IE 420</u>	Financial Engineering	3 or
TE 420	Face are in Face of at Occality Coat	4
<u>IE 430</u>	Economic Found of Quality Syst	3 or
TE 424	Desire for Civ. Circus	4
<u>IE 431</u>	Design for Six Sigma	3
<u>IB 150</u>	Organismal & Evolutionary Biol	4
<u>IB 202</u>	Physiology	3 or
ID 202	Factoria	4
IB 203	Ecology	4
<u>IB 204</u>	Genetics	3 or
TD 202		4
IB 302	Evolution	4
<u>IB 335</u>	Plant Systematics	4
<u>IB 348</u>	Fish and Wildlife Ecology	3
<u>IB 368</u>	Vertebrate Natural History	4
<u>IB 401</u>	Introduction to Entomology	3 or
ID 405	Fuglistian of Traits and Conomics	4
IB 405	Evolution of Traits and Genomes	3
IB 420	Plant Physiology	3
IB 421	Photosynthesis	3
<u>IB 426</u>	Env and Evol Physl of Animals	3
<u>IB 427</u>	Insect Physiology	4
<u>IB 431</u>	Behavioral Ecology	3
IB 432	Genes and Clabal Change	3
<u>IB 440</u>	Plants and Global Change	3
<u>IB 443</u>	Evolutionary Ecology	3

Code	Title	Hours
<u>IB 444</u>	Insect Ecology	3 or
		4
<u>IB 451</u>	Conservation Biology	4
IB 452	Ecosystem Ecology	3
IB 453	Community Ecology	3
<u>IB 461</u>	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
<u>IB 483</u>	Insect Pathology	3
<u>IB 485</u>	Environ Toxicology & Health	3
		3 or
<u>IB 486</u>	Pesticide Toxicology	
LINC 200	Anat & Physial Cash Mashaniam	4
LING 300	Anat & Physiol Spch Mechanism	4
LING 406	Introduction to Computational Linguistics	3 or
LING 407	Louis and Linguistic Analysis	4
LING 407	Logic and Linguistic Analysis	3 or
1 TNO 427		4
LING 427	Language and the Brain	3 or
		4
MSE 280	Engineering Materials	3
	and Engineering (MSE): All 300 and 400 level courses except 304, 460, 461, and	
1	topics, which may be reviewed by the Advising Office	_
MATH 347	Fundamental Mathematics	3
<u>MATH 348</u>	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

Code	Title	Hours
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
10011112	India Fardar Bili Equations	4
MATH 444	Elementary Real Analysis	3 or
MAIII 444	Liementary Real Analysis	
MATU 446		4
MATH 446	Applied Complex Variables	3 or
		4
<u>MATH 447</u>	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
	, and the second	4
MATH 473	Algorithms	4
MATH 475	Formal Models of Computation	3 or
HAIH 475	Tormal Plodels of Computation	4
MATH 481	Vector and Tensor Analysis	3 or
<u>MAIII 401</u>	vector and rensor Analysis	
MATU 400	Lineau December 1	4
MATH 482	Linear Programming	3 or
		4
<u>MATH 484</u>	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

Code	Title	Hours
MCB 402	Sys & Integrative Physiology	3
MCB 403	Cell & Membrane Physiology Lab	1 or
	, 3,	2
MCB 404	Sys & Integrative Physiol Lab	1 to
1105 101	Sys at Integrative viryolor Las	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
	- 3 7-3	4
ME 402	Design of Thermal Systems	3 or
	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	4
ME 403	Internal Combustion Engines	3 or
	, and the second se	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

Code	Title	Hours
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
	٠,	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 330	Materials in Nuclear Engineering	<u>3</u>
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	Course NPRE 431 Not Found	
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

Code	Title	Hours
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
11113 402	Light	4
DUIVC 402	Madaya Farantas Blancia	
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
11115 400	Atomic Scale Simulations	4
PHYS 470	Cubatamia Dhysica	
	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
31A1 420	Methods of Applied Statistics	
CTAT 42.4		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
<u>31711 110</u>	Statistical Pata Flanagement	4
CE //11	Poliability Engineering	3 or
<u>SE 411</u>	Reliability Engineering	
0- 100		4
SE 420	Digital Control Systems	4
<u>SE 423</u>	Mechatronics	3
<u>SE 424</u>	State Space Design for Control	3
<u>TAM 211</u>	Statics	3
<u>TAM 212</u>	Introductory Dynamics	3

Code	Title	Hours
TAM 251	Introductory Solid Mechanics	3
TAM 324	Behavior of Materials	4
TAM 335	Introductory Fluid Mechanics	4
TAM 412	Intermediate Dynamics	4
<u>TAM 435</u>	Intermediate Fluid Mechanics	4
<u>TAM 445</u>	Continuum Mechanics	4
TAM 451	Intermediate Solid Mechanics	4
•	se 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
•	rses from the following list of Advanced Computing Electives:	2
<u>CS 357</u>	Numerical Methods I	3
<u>CS 411</u>	Database Systems	3 or
CC 412	Tubus dustrian to Data Mining	4
<u>CS 412</u>	Introduction to Data Mining	3 or
CC 414	Multimodia Cuatama	4 3 or
<u>CS 414</u>	Multimedia Systems	3 Of 4
<u>CS 418</u>	Interactive Computer Graphics	4 3 or
<u>C5 410</u>	Interactive computer Grapmes	4
CS 419	Production Computer Graphics	3 or
<u>65 115</u>	Troduction compater Grapmes	4
CS 420	Parallel Progrmg: Sci & Engrg	3 or
		4
<u>CS 421</u>	Programming Languages & Compilers	3 or
		4
CS 423	Operating Systems Design	3 or
		4
<u>CS 424</u>	Real-Time Systems	3 or
		4
<u>CS 425</u>	Distributed Systems	3 or
		4
<u>CS 426</u>	Compiler Construction	3 or
		4
<u>CS 431</u>	Embedded Systems	3 or
		4
<u>CS 434</u>	Mobile Computing & Application	<u>3 or</u>
66.436	Canada Nahara Nahara Lahara kara	4
<u>CS 436</u>	Computer Networking Laboratory	3 or
CC 427	Tonics in Internet of Things	4 2 or
<u>CS 437</u>	<u>Topics in Internet of Things</u>	<u>3 or</u>
		<u>4</u>

Code <u>CS 438</u>	Title Communication Networks	Hours 3 or
<u>CS 440</u>	Artificial Intelligence	4 3 or
<u>CS 441</u>	Applied Machine Learning	4 3 or 4
<u>CS 444</u>	Deep Learning for Computer Vision	3 or 4
<u>CS 446</u>	Machine Learning	≟ 3 or 4
<u>CS 450</u>	Numerical Analysis	3 or 4
<u>CS 461</u>	Computer Security I	4
<u>CS 475</u>	Formal Models of Computation	3 or 4
<u>CS 476</u>	Program Verification	3 or 4
<u>CS 477</u>	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 479	IoT and Cognitive Computing	<u>4</u>
ECE 484	Principles of Safe Autonomy	4
ECE 491	Numerical Analysis	3 or
		4

Code	Title	Hours
ECE 492	Parallel Progrmg: Sci & Engrg	3 or
		4
Select one cour	rse from departmentally approved Design Elective list below:	
ECE 411	Computer Organization & Design	4
ECE 445	Senior Design Project Lab	4
ECE 496	Senior Research Project	4
& <u>ECE 499</u>	and Senior Thesis	
Eros Electivos		

Free Electives

Course List

Code	Title	Hours
The Grainger College of Engineering Liberal Education	course list, or additional courses from the	6
campus General Education lists for Social and Behavior	al Sciences or Humanities and the Arts 7	
Free electives. Additional unrestricted course work, sub-	pject to certain exceptions as noted by the	12
College, so that there are at least 128 credit hours ear	ned toward the degree. 8	
Additional unrestricted course work, subject to certain	exceptions as noted by the College, so that	<u>16</u>
there are at least 128 credit hours earned toward the o	<u>legree.</u>	
Total Hours of Curriculum to Graduate		128

Footnotes

12

MATH 220%7C may be substituted, with four of the five credit hours applying toward the degree. MATH 220%7C is appropriate for students with no background in calculus.

3

Freshmen take ECE 110%7C for 3 credit hours. Lab-only version taken by transfer students (with special permission) is 1 credit hour.

4MATH 213%7C may be substituted. 5STAT 410%7C may be substituted. 6

Advanced Composition may be satisfied by completing ECE 445%7C or ECE 496%7C and ECE 499%7C 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. 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.

Corresponding

BS Bachelor of Science

Degree

Program Features

Academic Level Undergraduate

Does this major No

have transcripted concentrations?

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.

Admission Requirements

Desired Effective

Admissions Term

Provide a brief narrative description of the admission requirements for this program. Where relevant, include information about licensure requirements, student background checks, GRE and TOEFL scores, and admission requirements for transfer students.

Describe how critical academic functions such as admissions and student advising are managed.

Enrollment

Describe how this revision will impact enrollment and degrees awarded.

These changes will not impact enrollment.

Estimated Annual Number of Degrees Awarded

Year One Estimate 5th Year Estimate (or when

fully implemented)

What is the matriculation term for this program?

Fall

Budget

Are there No

budgetary

implications for this revision?

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

No

Additional Budget Information

Attach File(s)

Financial Resources

How does the unit intend to financially support this proposal?

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

No

Attach letters of support

What tuition rate do you expect to charge for this program? e.g, Undergraduate Base Tuition, or Engineering Differential, or Social Work Online (no dollar amounts necessary)

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

Nο

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.

Attach File(s)

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.

These changes will not impact our faculty resources.

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.

There is no impact to the use of the Library collections, resources, and services.

EP Documentation

EP Control EP.22.087

Number

Attach <u>ep22087_response from sponsor_20220214.pdf</u>

Rollback/Approval

Notices

This proposal No

requires HLC

inquiry

DMI Documentation

Attach Final

Approval Notices

Banner/Codebook BS:Computer Engineering -UIUC

Name

Program Code: 10KP0109BS

Minor Conc Degree BS Major Code Code Code Code

0109

Senate Approval

Date

Senate Conference

Approval Date

BOT Approval Date

IBHE Approval

Date

HLC Approval

Date

Effective Date:

Attached Document Justification for this request

Program Reviewer Comments

Key: 248



Current Program of Study

General education: Students must complete the Campus General Education requirements including the campus general education language requirement. Specific Advanced Composition courses required for this degree are listed below.

Orientation and Professional Dev	velopment	
	Engineering	
ENG 100	Orientation ¹	0
Total Hours		0

Form detional Backhouseties and Colons		
Foundational Mathematics and Science		
MATH 221	Calculus I ²	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
	Linear Algebra with	
	Computational	
MATH 257	Applications	3
or MATH 416	Abstract Linear Algebra	
MATH 285	Intro to Differential Eq	3
	University Physics:	
PHYS 211	Mechanics	4
	University Physics: Elec	
PHYS 212	& Mag	4
	Univ Physics: Thermal	
PHYS 213	Physics	2
	Univ Physics: Quantum	
PHYS 214	·	2
Total Hours	,	29
	Physics	

Computer Engineering Technical Core		
	Introduction to	
ECE 110	Electronics ³	3
	Introduction to	
ECE 120	Computing	4
	Analog Signal	
ECE 210	Processing	4
	Computer Systems &	
ECE 220	Programming	4
	4	
CS 173	Discrete Structures ⁴	3
CS 225	Data Structures	4
	Drobobility with Engra	
505.242	Probability with Engrg	_
ECE 313	Applic ⁵	3
	Introduction to	
	Algorithms & Models of	
ECE 374		4
ECE 3/4	Computation	4

New Program of Study

General education: Students must complete the Campus
General Education requirements including the campus
general education language requirement. ECE 445 or
combination of ECE 496 & ECE 499 satisfies a design
elective and the Campus General Education Advanced
Composition requirement.

Development		
	Orientation (External	
ENG 100	transfer students take	1
Total Hours		1

Foundational Mathematics and Science		
	Calculus I (MATH 220	
	may be substituted.	
	MATH 220 is	
	appropriate for	
	students with no	
	background in calculus.	
	4 of 5 credit hours	
MATH 221	count towards degree.)	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
	Linear Algebra with	
	Computational	
MATH 257	Applications	3
or MATH 416	Abstract Linear Algebra	
MATH 285	Intro to Differential Eq	3
	University Physics:	
PHYS 211	Mechanics	4
	University Physics: Elec	
PHYS 212	& Mag	4
	Univ Physics: Thermal	
PHYS 213	Physics	2
	Univ Physics: Quantum	
PHYS 214	Physics	2
Total Hours		29

Computer Engineering Technical Core		
	Introduction to	
ECE 110	Electronics	3
	Introduction to	
ECE 120	Computing	4
	Analog Signal	
ECE 210	Processing	4
	Computer Systems &	
ECE 220	Programming	4
	Discrete Structures	
	(MATH 213 may be	
CS 173	substituted.)	3
CS 225	Data Structures	4
	Probability with Engrg	
	Applic (STAT 410 may	
ECE 313	be substituted.)	3
	Introduction to	
	Algorithms & Models of	
ECE 374	Computation	4

ECE 385	Digital Systems Laboratory Computer Systems	3	
ECE 391	Engineering	4	
Total Hours		36	

ECE 385	Digital Systems Laboratory	3
ECE 391	Computer Systems Engineering	4
Total Hours		36

Technical Electives			Technical Electives
From the Departmentally Approved List of	Technical Electives, to	29	From the Department
at least 1 Electrical Engineering Foundation	ns course		at least 1 Electrical Eng
at least 3 Advanced Computing electives			at least 3 Advanced Co
at least 1 Design Elective			at least 1 Design Electi
	Aerospace Flight	3	
AE 202	Mechanics	3	AE 202
	Aerospace Flight	3	
AE 302	Mechanics II	3	AE 302
AE 311	Incompressible Flow	3	AE 311
AE 312	Compressible Flow	3	AE 312
	Mechs of Aerospace	2	
AE 321	Structures	3	AE 321
	Aerospace Dynamical	2	
AE 352	Systems	3	AE 352
	Aerospace Control		
AE 353	Systems	3	AE 353
AE 402	Orbital Mechanics	3 or 4	AE 402
	Spacecraft Attitude		
AE 403	Control	3 or 4	AE 403
	Computational		
AE 410	Aerodynamics	3 or 4	AE 410
	Viscous Flow & Heat		7.2 .25
AE 412	Transfer	4	AE 412
AL 412	riansiei		AL 412
AE 416	Applied Aerodynamics	3 or 4	AE 416
VF 410	Aircraft Flight		AL 410
AE 419	Mechanics	3 or 4	AE 419
AE 419	Mechanics		AE 419
AE 430	Finite Element Analysis	3 or 4	AE 420
AE 420	Na alagaiga of		AE 420
A.F. 43.0	Mechanics of	3	A.F. 420
AE 428	Composites		AE 428
A.F. 422	Aerospace Propulsion	3 or 4	A.F. 422
AE 433	Dealest Describer	2 4	AE 433
AE 434	Rocket Propulsion	3 or 4	AE 434
AE 435	Electric Propulsion	3 or 4	AE 435
AE 451	Aeroelasticity	3 or 4	AE 451
	Aerodynamics &	2	45.460
AE 460	Propulsion Lab		AE 460
Agri. Bio Eng. (ABE): all 300 and 400 level c	•		Agri. Bio Eng. (ABE): al
	Introduction to	3	
ASTR 210	Astrophysics		ASTR 210
	Computing in	3	
ASTR 310	Astronomy	3	ASTR 310
ASTR 330	Extraterrestrial Life	3	ASTR 330
	The Big Bang, Black		
	Holes, and the End of	3	
ASTR 350	the Universe		ASTR 350
ASTR 404	Stellar Astrophysics	3	ASTR 404
ASTR 405	Planetary Systems	3	ASTR 405
	Galaxies and the		
ASTR 406	Universe	3	ASTR 406
	Astronomical		
ASTR 414	Techniques	4	ASTR 414
ASTR 450	Astrochemistry	4	ASTR 450
A311(430	General Physical	7	A311(430
ATMS 201	Meteorology	3	ATMS 201
ATIVIS 201	•		A11013 201
	Atmospheric	3	ATNAS 201
ATN 4C 204	Thermodynamics		ATMS 301
ATMS 301			
	Atmospheric Dynamics	3	
	Atmospheric Dynamics	3	ATMS 302
ATMS 302	Atmospheric Dynamics I Synoptic-Dynamic Wea	3	
ATMS 301 ATMS 302 ATMS 303	Atmospheric Dynamics I Synoptic-Dynamic Wea Analysis		ATMS 302 ATMS 303
ATMS 302	Atmospheric Dynamics I Synoptic-Dynamic Wea		

at least 1 Electrical Engineering Foundation	ons course	
at least 3 Advanced Computing electives		
at least 1 Design Elective		
AE 202	Aerospace Flight Mechanics	3
AE 302	Aerospace Flight Mechanics II	3
AE 311		3
AE 312	Incompressible Flow Compressible Flow	3
AE 321	Mechs of Aerospace Structures	3
AE 352	Aerospace Dynamical Systems	3
AE 2E2	Aerospace Control	3
AE 353 AE 402	Systems Orbital Mechanics	3 or
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
AE 435	Electric Propulsion	3 or
AE 451	Aeroelasticity	3 or
A.E. 4.C.O.	Aerodynamics &	2
AE 460	Propulsion Lab	
Agri. Bio Eng. (ABE): all 300 and 400 level ASTR 210	Introduction to Astrophysics	3
A311(210	Computing in	
ASTR 310	Astronomy	3
ASTR 330	Extraterrestrial Life	3
	The Big Bang, Black	
ACTR 2EO	Holes, and the End of	3
ASTR 350	the Universe	2
ASTR 404 ASTR 405	Stellar Astrophysics Planetary Systems	3 3
	Galaxies and the	
ASTR 406	Universe	3
ASTR 414	Astronomical Techniques	4
ASTR 414 ASTR 450	Astrochemistry	4
ATMS 201	General Physical Meteorology	3
	Atmospheric	3
ATMS 301	Thermodynamics Atmospheric Dynamics	3
ATMS 302	I Synoptic-Dynamic Wea	4
ATMS 303	Analysis	7
ATMS 204	Radiative Transfer-	3

Remote Sens

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
ΓMS 405	Boundary Layer Processes	4	ATMS 405	Boundary Layer Processes	4
TMS 406	Tropical Meteorology	4	ATMS 406	Tropical Meteorology	4
ΓMS 410	Radar Remote Sensing	4	ATMS 410	Radar Remote Sensing	4
ΓMS 411	Satellite Remote Sensing	4	ATMS 411	Satellite Remote Sensing	4
TMS 420	Atmospheric Chemistry	4	ATMS 420	Atmospheric Chemistry	4
TMS 421	Earth Systems Modeling	4	ATMS 421	Earth Systems Modeling	4
TMS 447	Climate Change Assessment	3	ATMS 447	Climate Change Assessment	3
	Biogeochemical Cycles	4		Biogeochemical Cycles	4
TMS 449	Gene Expression &	3	ATMS 449	Gene Expression &	3
OC 406	Regulation Physical Chemistry	4	BIOC 406	Regulation Physical Chemistry	4
OC 440	Principles Physical Biochemistry	3	BIOC 440	Principles Physical Biochemistry	3
OC 446	Technqs Biochem &		BIOC 446	Technqs Biochem &	
OC 455	Biotech Conservation Principles	4	BIOC 455	Biotech Conservation Principles	4
OE 201	Bioeng Cell & Tissue	3	BIOE 201	Bioeng Cell & Tissue	3
OE 202	Engineering Lab Modeling Human	2	BIOE 202	Engineering Lab Modeling Human	2
OE 302	Physiology Biomedical	3	BIOE 302	Physiology Biomedical	3
OE 414	Instrumentation	3	BIOE 414	Instrumentation	3
OE 415	Biomedical Instrumentation Lab	2	BIOE 415	Biomedical Instrumentation Lab	2
OE 461	Cellular Biomechanics	4	BIOE 461	Cellular Biomechanics	4
DE 467	Biophotonics	3	BIOE 467	Biophotonics	3
DE 476	Tissue Engineering	3	BIOE 476	Tissue Engineering	3
	Magnetic Resonance	3 or 4		Magnetic Resonance	3 or 4
DE 480	Imaging Computational Mathematics for	3 01 4	BIOE 480	Imaging Computational Mathematics for	3 01 2
	Machine Learning and			Machine Learning and	
DE 485	Imaging	4	BIOE 485	Imaging	4
ophysics (BIOP): All 400 level courses except			Biophysics (BIOP): All 400 level courses		
BE 221	Principles of CHE	3	CHBE 221	Principles of CHE	3
BE 321	Thermodynamics	4	CHBE 321	Thermodynamics	4
IBE 421	Momentum and Heat Transfer	4	CHBE 421	Momentum and Heat Transfer	4
IBE 422	Mass Transfer Operations	4	CHBE 421	Mass Transfer Operations	4
	Chemical Reaction	3		Chemical Reaction	3
HBE 424	Engineering Unit Operations	4	CHBE 424	Engineering Unit Operations	4
IBE 430	Laboratory		CHBE 430	Laboratory	-
BE 431	Process Design	4	CHBE 431	Process Design	4
BE 440	Process Control and Dynamics	3	CHBE 440	Process Control and Dynamics	3
IBE 451	Transport Phenomena	3	CHBE 451	Transport Phenomena	3
HBE 452	Chemical Kinetics & Catalysis	3	CHBE 452	Chemical Kinetics & Catalysis	3
HBE 453	Electrochemical Engineering	2 or 3	CHBE 453	Electrochemical Engineering	2 or 3
HBE 456	Polymer Science & Engineering	3	CHBE 456	Polymer Science & Engineering	3
IDE TOU	Microelectronics	3		Microelectronics	3
HBE 457	Processing	9	CHBE 457	Processing	

	Die ab amaical	ı		Dia ah awaisa l	ı
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
CURE 474		3 or 4	CHBE 474		3 or 4
CHBE 474 CHEM 102	General Chemistry I	3	CHEM 102	General Chemistry I	3
CUEM 403	General Chemistry Lab I	1	CUEM 402	General Chemistry Lab I	1
CHEM 103 CHEM 104	General Chemistry II	3	CHEM 103 CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab	1	CHEM 105	General Chemistry Lab	1
Chemistry (CHEM): All 200, 300 and 400 level	courses except 397, 497,		Chemistry (CHEM): All 200, 300 and 400		
CEE 310	Transportation Engineering	3	CEE 310	Transportation Engineering	3
	Environmental	3		Environmental	3
CEE 330	Engineering Railroad Transportation		CEE 330	Engineering Railroad Transportation	
CEE 408	Engrg	3 or 4	CEE 408	Engrg	3 or 4
CEE 410	Railway Signaling & Control	3 or 4	CEE 410	Railway Signaling & Control	3 or 4
CEE 416	Traffic Capacity	3 or 4	CEE 416	Traffic Capacity	3 or 4
CEE 416	Analysis Ecological Quality	2	CEE 416	Analysis Ecological Quality	2
CEE 430	Engineering	2	CEE 430	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
	Genetic Engineering	3		Genetic Engineering	3
CPSC 265	Lab		CPSC 265	Lab	
	Intro Computing: Engrg & Sci (By Approval)	3		Intro Computing: Engrg & Sci (By Approval)	3
CS 101 CS 242	Programming Studio	3	CS 101 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
	Intro to Combinatorics	3 or 4			3 or 4
CS 413 CS 414	Multimedia Systems	3 or 4	CS 413 CS 414	Multimedia Systems	3 or 4
CS 416	Data Visualization	3 or 4	CS 414 CS 416	Data Visualization	3 or 4
•	Interactive Computer	3 or 4	•	Interactive Computer	3 or 4
CS 418	Graphics Production Computer		CS 418	Graphics Production Computer	
CS 419	Graphics	3 or 4	CS 419	Graphics	3 or 4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4	CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
	Programming	2 or 4		Programming	2 or 4
CS 421	Languages & Compilers	3 or 4	CS 421	Languages & Compilers	3 or 4
CS 422	Programming Language Design	3 or 4	CS 422	Programming Language Design	3 or 4
C3 422	Operating Systems	3 or 4		Operating Systems	3 or 4
CS 423	Design		CS 423	Design	
CS 424 CS 425	Real-Time Systems Distributed Systems	3 or 4 3 or 4	CS 424 CS 425	Real-Time Systems Distributed Systems	3 or 4 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
	Software Engineering II,	3		Software Engineering II,	3
CS 429 CS 431	ACP Embedded Systems	3 or 4	CS 429 CS 431	ACP Embedded Systems	3 or 4
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CS 433 CS 435	Computer System Organization Cloud Networking	3 or 4 3 or 4	CS 433 CS 435	Computer System Organization Cloud Networking	3 or 4 3 or 4
	Computer Networking Laboratory	3 or 4	•	Computer Networking Laboratory	3 or 4
CS 436	Communication		CS 436	Communication	
CS 438	Networks	3 or 4	CS 438	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
C3 440	Computational		C5 140	Computational	
CS 445	Photography	3 or 4	CS 445	Photography	3 or 4
CS 446	Machine Learning	3 or 4	CS 446	Machine Learning	3 or 4
	Natural Language	3 or 4		Natural Language	3 or 4
CS 447	Processing		CS 447	Processing	
CS 450 CS 460	Numerical Analysis Security Laboratory	3 or 4 3 or 4	CS 450 CS 460	Numerical Analysis Security Laboratory	3 or 4 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	4	CS 465	User Interface Design	4
	Introduction to	3 or 4		Introduction to	3 or 4
CS 466	Bioinformatics		CS 466	Bioinformatics	
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
63 47 6		3 01 4	23 470		3 01 4
	Formal Software	3 or 4		Formal Software	3 or 4
CS 477	Development Methods		CS 477	Development Methods	
	Advanced Topics in			Advanced Topics in	
	Stochastic Processes &	3 or 4		Stochastic Processes &	3 or 4
CS 481	Applications		CS 481	Applications	
CC 494	Parallel Programming	3 or 4	CS 484	Parallel Programming	3 or 4
CS 484	Special Topics (As		C3 484	Special Topics (As	
CS 398	approved)	1 to 4	CS 398	approved)	1 to 4
	Special Topics (As		33 333	Special Topics (As	
CS 498	approved)	1 to 4	CS 498	approved)	1 to 4
ECE 297	Individual Study	1	ECE 297	Individual Study	1
ECE 304	Photonic Devices	3	ECE 304	Photonic Devices	3
505.207	Techniques for Engrg	3	505 007	Techniques for Engrg	3
ECE 307	Decisions Digital Signal		ECE 307	Decisions Digital Signal	
ECE 310	Digital Signal Processing	3	ECE 310	Digital Signal Processing	3
202 310	Digital Signal		ECE 310	Digital Signal	
ECE 311	Processing Lab	1	ECE 311	Processing Lab	1
	Probability in	1		Probability in	1
ECE 314	Engineering Lab	1	ECE 314	Engineering Lab	1
ECE 329	Fields and Waves I	3	ECE 329	Fields and Waves I	3
ECE 220	Power Ckts &	3	ECE 220	Power Ckts &	3
ECE 330	Electromechanics		ECE 330	Electromechanics	
ECE 333	Green Electric Energy	3	ECE 333	Green Electric Energy	3
	Semiconductor			Semiconductor	
ECE 340	Electronics	3	ECE 340	Electronics	3
ECE 342	Electronic Circuits	3	ECE 342	Electronic Circuits	3
	Electronic Circuits	1		Electronic Circuits	1
ECE 343	Laboratory		ECE 343	Laboratory	
ECE 350	Fields and Waves II	3	ECE 350	Fields and Waves II Data Science and	3
ECE 365	Data Science and Engineering	3	ECE 365	Engineering	3
ECE 380	Biomedical Imaging	3	ECE 380	Biomedical Imaging	3
	Advanced Digital			Advanced Digital	
ECE 395	Projects Lab	2 or 3	ECE 395	Projects Lab	2 or 3
ECE 396	Honors Project	1 to 4	ECE 396	Honors Project	1 to 4
505 207	Individual Study in ECE	0 to 4	505.007	Individual Study in ECE	0 to 4
ECE 397	·		ECE 397	·	
ECE 402	Electronic Music Synthesis	3	ECE 402	Electronic Music Synthesis	3
00	57.10.10015	I	101 101	J,11010313	I

ECE 403 ECE 407	Audio Engineering	3 3 or 4	ECE 403 ECE 407	Audio Engineering Cryptography	3 3 or 4
•	Cryptography Applied Parallel	4	•	Applied Parallel	4
ECE 408	Programming		ECE 408	Programming	
	Computer Organization & Design	4		Computer Organization & Design	4
ECE 411	-		ECE 411	-	
ECE 412	Microcomputer Laboratory	3	ECE 412	Microcomputer Laboratory	3
LCL 412	Biomedical		LCL 412	Biomedical	•
ECE 414	Instrumentation	3	ECE 414	Instrumentation	3
	Biomedical	2		Biomedical	2
ECE 415 ECE 416	Instrumentation Lab Biosensors	3	ECE 415 ECE 416	Instrumentation Lab Biosensors	3
LCL 410	Multimedia Signal		LCL 410	Multimedia Signal	
ECE 417	Processing	4	ECE 417	Processing	4
	Image & Video	4		Image & Video	4
ECE 418 ECE 419	Processing Security Laboratory	3 or 4	ECE 418 ECE 419	Processing Security Laboratory	3 or 4
ECE 419	Security Laboratory Embedded DSP		ECE 419	Security Laboratory Embedded DSP	
ECE 420	Laboratory	2	ECE 420	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	Design Distributed Systems	3 or 4
ECE 431	Electric Machinery	4	ECE 431	Electric Machinery	4
FCF 422	Advanced Electric	3	FOF 422	Advanced Electric	3
ECE 432	Machinery		ECE 432	Machinery	
	Computer Networking	3 or 4		Computer Networking	3 or 4
ECE 435	Laboratory		ECE 435	Laboratory	
	Sensors and	3		Sensors and	3
ECE 437	Instrumentation		ECE 437	Instrumentation	
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
	Physcs & Modeling	3		Physcs & Modeling	3
ECE 441	Semicond Dev		ECE 441	Semicond Dev	
ECE 442 ECE 443	Silicon Photonics LEDs and Solar Cells	3 or 4 4	ECE 442 ECE 443	Silicon Photonics LEDs and Solar Cells	3 or 4 4
LCL 443	IC Device Theory &		LCL 443	IC Device Theory &	
ECE 444	Fabrication	4	ECE 444	Fabrication	4
505.445	Senior Design Project	4	505.445	Senior Design Project	4
ECE 445	Lab		ECE 445	Lab	
	Principles of			Principles of	
	Experimental Research	4		Experimental Research	
505.446	in Electrical Engineering		565.446	in Electrical Engineering	3
ECE 446	Active Microwave Ckt		ECE 446	Active Microwave Ckt	
ECE 447	Design	3	ECE 447	Design	3
	Artificial Intelligence	3 or 4		Artificial Intelligence	3 or 4
ECE 448	•	3 01 4	ECE 448	_	3 01 4
ECE 451	Adv Microwave Measurements	3	ECE 451	Adv Microwave Measurements	3
ECE 451			ECE 451		
ECE 452	Electromagnetic Fields	3	ECE 452	Electromagnetic Fields	3
	Wireless			Wireless	
505.450	Communication	4	505.450	Communication	4
ECE 453 ECE 454	Systems Antennas	3	ECE 453 ECE 454	Systems Antennas	3
ECE 455	Optical Electronics	3 or 4	ECE 455	Optical Electronics	3 or 4
	Global Nav Satellite	4		Global Nav Satellite	4
ECE 456	Systems	⁻	ECE 456	Systems	7
ECE 457	Microwave Devices & Circuits	3	ECE 457	Microwave Devices & Circuits	3
LCL 4J/	Applic of Radio Wave		EUE 43/	Applic of Radio Wave	
ECE 458	Propag	3	ECE 458	Propag	3
	Communications	3		Communications	3
	Systems	-	ECE 459	Systems	_
ECE 459 ECE 460	Optical Imaging	4	ECE 460	Optical Imaging	4

ECE 461	Digital Communications	3	ECE 461	Digital Communications	3
ECE 461 ECE 462	Logic Synthesis	3	ECE 461 ECE 462	Logic Synthesis	3
	Digital Communications	2		Digital Communications	2
ECE 463	Lab		ECE 463	Lab	
ECE 464	Power Electronics Optical	3	ECE 464	Power Electronics Optical	3
	Communications	3		Communications	3
ECE 465	Systems		ECE 465	Systems	
	Optical	1		Optical	1
ECE 466 ECE 467	Communications Lab Biophotonics	3	ECE 466 ECE 467	Communications Lab Biophotonics	3
LCL 407	•		LCL 407	·	
ECE 468	Optical Remote Sensing	3	ECE 468	Optical Remote Sensing	3
FGF 4G0	Power Electronics	2	FCF 4C0	Power Electronics	2
ECE 469	Laboratory Introduction to		ECE 469	Laboratory Introduction to	
ECE 470	Robotics	4	ECE 470	Robotics	4
	Biomedical Ultrasound	3		Biomedical Ultrasound	3
ECE 472	Imaging		ECE 472	Imaging	J
ECE 473	Fund of Engrg Acoustics	3 or 4	ECE 473	Fund of Engrg Acoustics	3 or 4
	Power System Analysis	2		Power System Analysis	2
ECE 476	Power System Analysis	3	ECE 476	Power System Analysis	3
	Formal Software	3 or 4		Formal Software	3 or 4
ECE 478	Development Methods	3 01 4	ECE 478	Development Methods	3 01 4
	Magnetic Resonance	3 or 4		Magnetic Resonance	3 or 4
ECE 480	Imaging		ECE 480	Imaging	
ECE 481 ECE 482	Nanotechnology Digital IC Design	3	ECE 481 ECE 482	Nanotechnology Digital IC Design	4 3
ECE 483	Analog IC Design	3	ECE 483	Analog IC Design	3
	MEMS Devices &	3		MEMS Devices &	3
ECE 485	Systems		ECE 485	Systems	
ECE 486	Control Systems Intro Quantum Electr	4	ECE 486	Control Systems Intro Quantum Electr	4
ECE 487	for EEs	3	ECE 487	for EEs	3
505.400	Compound Semicond &	3	505.400	Compound Semicond &	3
ECE 488	Devices Robot Dynamics and		ECE 488	Devices Robot Dynamics and	
ECE 489	Control	4	ECE 489	Control	4
	Introduction to	3 or 4		Introduction to	3 or 4
ECE 490	Optimization		ECE 490	Optimization	
ECE 491	Numerical Analysis Parallel Progrmg: Sci &	3 or 4	ECE 491	Numerical Analysis Parallel Progrmg: Sci &	3 or 4
ECE 492	Engrg	3 or 4	ECE 492	Engrg	3 or 4
	Advanced Engineering	3 or 4		Advanced Engineering	3 or 4
ECE 493	Math Photonic Device		ECE 493	Math Photonic Device	
ECE 495	Laboratory	3	ECE 495	Laboratory	3
	Senior Research Project	2		Senior Research Project	2
ECE 496	•		ECE 496	•	
ECE 499	Senior Thesis Special Topics in ECE	2	ECE 499	Senior Thesis Special Topics in ECE	2
ECE 298	(As approved)	1 to 4	ECE 298	(As approved)	1 to 4
	Special Topics in ECE	0 to 4		Special Topics in ECE	0 to 4
ECE 398	(As approved) Special Topics in ECE		ECE 398	(As approved) Special Topics in ECE	
ECE 498	(As approved)	0 to 4	ECE 498	(As approved)	0 to 4
	Interdisciplinary Design			Interdisciplinary Design	
	Proj (CubeSat, Solar			Proj (CubeSat, Solar	
	Decathlon, Formula	1 to 4		Decathlon, Formula	1 to 4
	SAE, Baja SAE or by approval)			SAE, Baja SAE or by approval)	
ENG 491			ENG 491		
GEOL 107	Physical Geology History of the Earth	4	GEOL 107	Physical Geology History of the Earth	4
GEOL 208	System	4	GEOL 208	System	4
	Earth Materials and the	4		Earth Materials and the	4
GEOL 333	Env		GEOL 333	Env	-
GEOL 380	Environmental Geology	4	GEOL 380	Environmental Geology	4
		1			•

	Structural Geol and	4		Structural Geol and	4
GEOL 411	Tectonics	4	GEOL 411	Tectonics	4
	Geol Field Methods,	6		Geol Field Methods,	6
GEOL 417	Western US	8	GEOL 417	Western US	0
	Mineralogy and	4		Mineralogy and	4
GEOL 432	Mineral Optics	4	GEOL 432	Mineral Optics	4
	Petrology and	4		Petrology and	4
GEOL 436	Petrography	7	GEOL 436	Petrography	⁻
	Sedimentology and	4		Sedimentology and	4
GEOL 440	Stratigraphy	7	GEOL 440	Stratigraphy	
	Probing the Earth's	3		Probing the Earth's	3
GEOL 450	Interior		GEOL 450	Interior	٠
	Introduction to	4		Introduction to	4
GEOL 452	Geophysics	7	GEOL 452	Geophysics	
GEOL 460	Geochemistry	3	GEOL 460	Geochemistry	3
	Deterministic Models ir	,		Deterministic Models in	1
	Optimization	3		Optimization	3
IE 310	•		IE 310	·	
	Industrial Quality	3		Industrial Quality	3
IE 330	Control	3	IE 330	Control	,
	Facilities Planning and	3		Facilities Planning and	3
IE 360	Design	3	IE 360	Design	,
	Production Planning &	3		Production Planning &	3
IE 361	Control	J	IE 361	Control	J
	Design & Anlys of	3 or 4		Design & Anlys of	3 or 4
IE 400	Experiments	3 01 4	IE 400	Experiments	3 01 4
	Advanced Topics in			Advanced Topics in	
	Stochastic Processes &	3 or 4		Stochastic Processes &	3 or 4
IE 410	Applications		IE 410	Applications	
	Optimization of Large	3 or 4		Optimization of Large	3 or 4
IE 411	Systems	3 01 4	IE 411	Systems	3 01 4
	OR Models for Mfg	3 or 4		OR Models for Mfg	3 or 4
IE 412	Systems	3 01 4	IE 412	Systems	3 01 4
IE 413	Simulation	3 or 4	IE 413	Simulation	3 or 4
	Financial Engineering	3 or 4		Financial Engineering	3 or 4
IE 420	i manciai Engineering	3 01 4	IE 420	i manciai Engineering	3 01 4
	Economic Found of	3 or 4		Economic Found of	3 or 4
IE 430	Quality Syst	3 01 4	IE 430	Quality Syst	3 01 4
IE 431	Design for Six Sigma	3	IE 431	Design for Six Sigma	3
	Organismal &	4		Organismal &	4
IB 150	Evolutionary Biol	7	IB 150	Evolutionary Biol	<u> </u>
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
	Fish and Wildlife	3		Fish and Wildlife	3
IB 348	Ecology		IB 348	Ecology	
	Vertebrate Natural	4		Vertebrate Natural	4
IB 368	History		IB 368	History	
	Introduction to	3 or 4		Introduction to	3 or 4
IB 401	Entomology		IB 401	Entomology	
ID 405	Evolution of Traits and	3	ID 405	Evolution of Traits and	3
IB 405	Genomes	_	IB 405	Genomes	
IB 420	Plant Physiology	3	IB 420	Plant Physiology	3
IB 421	Photosynthesis	3	IB 421	Photosynthesis	3
ID 426	Env and Evol Physl of	3	ID 426	Env and Evol Physl of	3
IB 426	Animals		IB 426	Animals	
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
ID 440	Plants and Global	3	ID 440	Plants and Global	3
IB 440	Change	,	IB 440	Change	ء ا
IB 443	Evolutionary Ecology	3	IB 443	Evolutionary Ecology	3 2 or 4
IB 444	Insect Ecology	3 or 4	IB 444	Insect Ecology	3 or 4
ID 4E1	Conservation Biology	4	ID 4E1	Conservation Biology	4
IB 451		,	IB 451		,
IB 452	Ecosystem Ecology	3	IB 452	Ecosystem Ecology	3
IB 453 IB 461	Community Ecology	3	IB 453 IB 461	Community Ecology	3
IB 461	Ornithology Mammalogy	4	IB 461	Ornithology Mammalogy	4
IB 462 IB 463	Mammalogy Ichthyology	4	IB 462 IB 463	Mammalogy Ichthyology	4
עטד טו	интуонову	→	עטד טו	ichthyology	→

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IB 464	Herpetology	4	IB 464	Herpetology	4
ID 467	Principles of	4	ID 467	Principles of	4
IB 467	Systematics Insect Classification		IB 467	Systematics Insect Classification	
IB 468	and Evol	4	IB 468	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
ID 404	Vector-borne Diseases	4	ID 404	Vector-borne Diseases	4
IB 481	Insect Pest		IB 481	Insect Pest	
IB 482	Management	3	IB 482	Management	3
IB 483	Insect Pathology	3	IB 483	Insect Pathology	3
	Environ Toxicology &			Environ Toxicology &	
IB 485	Health	3	IB 485	Health	3
IB 486	Pesticide Toxicology	3 or 4	IB 486	Pesticide Toxicology	3 or 4
	Anat & Physiol Spch	4		Anat & Physiol Spch	4
LING 300	Mechanism		LING 300	Mechanism	
	Introduction to Computational	3 or 4		Introduction to Computational	3 or 4
LING 406	Linguistics	3 01 4	LING 406	Linguistics	3 01 4
	Logic and Linguistic	2 4		Logic and Linguistic	2 4
LING 407	Analysis	3 or 4	LING 407	Analysis	3 or 4
	Language and the Brain	3 or 4		Language and the Brain	3 or 4
LING 427			LING 427		
MSE 280	Engineering Materials	3	MSE 280	Engineering Materials	3
Material Science and Engineering (MSE): All 30	0 and 400 level courses		Material Science and Engineering (MSE):	All 300 and 400 level	
Widelian Science and Engineering (WSE). Am So	Fundamental		Material Science and Engineering (14132).	Fundamental	
MATH 347	Mathematics	3	MATH 347	Mathematics	3
	Fundamental	4		Fundamental	4
MATH 348	Mathematics-ACP	4	MATH 348	Mathematics-ACP	
MATH 357	Numerical Methods I	3	MATH 357	Numerical Methods I	3
MATH 402	Non Euclidean	3 or 4	MATH 402	Non Euclidean	3 or 4
MATH 402 MATH 403	Geometry Euclidean Geometry	3 or 4	MATH 403	Geometry 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
NAATU 447	Intro to Abstract	3 or 4	AAATU 447	Intro to Abstract	3 or 4
MATH 417	Algebra Intro to Abstract		MATH 417	Algebra Intro to Abstract	
MATH 418	Algebra II	3 or 4	MATH 418	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
	Honors Advanced	3		Honors Advanced	3
MATH 425	Analysis		MATH 425	Analysis	
MATH 427	Honors Abstract Algebra	3	MATH 427	Honors Abstract Algebra	3
WATT 427	Honors Topics in		MATTI 427	Honors Topics in	
MATH 428	Mathematics	3	MATH 428	Mathematics	3
	Set Theory and	2 or 4		Set Theory and	2 or 4
MATH 432	Topology	3 or 4	MATH 432	Topology	3 or 4
	Intro Partial Diff	3 or 4		Intro Partial Diff	3 or 4
MATH 442	Equations		MATH 442	Equations	
MATH 444	Elementary Real Analysis	3 or 4	MATH 444	Elementary Real Analysis	3 or 4
	Applied Complex			Applied Complex	
MATH 446	Variables	3 or 4	MATH 446	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 MATH 473	Number Theory	3 or 4	MATH 473	Number Theory	3 or 4
IVIATO 473	Algorithms Formal Models of	4	MATH 473	Algorithms Formal Models of	4
MATH 475	Computation	3 or 4	MATH 475	Computation	3 or 4
	Vector and Tensor	2 or 4		Vector and Tensor	2 05 4
MATH 481	Analysis	3 or 4	MATH 481	Analysis	3 or 4
MATH 482	Linear Programming	3 or 4	MATH 482	Linear Programming	3 or 4

	Nonlinear	3 or 4		Nonlinear	3 or 4
MATH 484	Programming	3 01 1	MATH 484	Programming	3 01 1
NAATH AO7	Advanced Engineering	3 or 4	MATH 407	Advanced Engineering	3 or 4
MATH 487	Math Dynamics & Differential		MATH 487	Math Dynamics & Differential	
MATH 489	Eqns	3 or 4	MATH 489	Eqns	3 or 4
	Molec & Cellular Basis			Molec & Cellular Basis	
MCB 150	of Life	4	MCB 150	of Life	4
MCB 250	Molecular Genetics	3	MCB 250	Molecular Genetics	3
	Exp Techniqs in	2		Exp Techniqs in	2
MCB 251	Molecular Biol		MCB 251	Molecular Biol	
MCB 252	Cells, Tissues & Development	3	MCB 252	Cells, Tissues & Development	3
NICB 232	Exp Techniqs in Cellular		WCD 232	Exp Techniqs in Cellular	
MCB 253	Biol	2	MCB 253	Biol	2
MCB 300	Microbiology	3	MCB 300	Microbiology	3
	Experimental	3		Experimental	3
MCB 301	Microbiology		MCB 301	Microbiology	
MCB 314	Introduction to Neurobiology	3	MCB 314	Introduction to Neurobiology	3
NICB 314	-		WCB 314		
MCB 316	Genetics and Disease	4	MCB 316	Genetics and Disease	4
	Biochem & Phys Basis	3		Biochem & Phys Basis	3
MCB 354	of Life		MCB 354	of Life	
MCB 400	Cancer Cell Biology	3	MCB 400	Cancer Cell Biology	3
MCB 401	Cellular Physiology Sys & Integrative	3	MCB 401	Cellular Physiology Sys & Integrative	3
MCB 402	Physiology	3	MCB 402	Physiology	3
	Cell & Membrane			Cell & Membrane	4 0
MCB 403	Physiology Lab	1 or 2	MCB 403	Physiology Lab	1 or 2
	Sys & Integrative	1 to 2		Sys & Integrative	1 to 2
MCB 404	Physiol Lab		MCB 404	Physiol Lab	
MCB 406	Gene Expression & Regulation	3	MCB 406	Gene Expression & Regulation	3
MCB 408	Immunology	3	MCB 408	Immunology	3
	0,			<u>.</u>	
	Developmental Biology, Stem Cells and	3		Developmental Biology, Stem Cells and	3
	Regenerative Medicine			Regenerative Medicine	
MCB 410		2	MCB 410		2
MCB 413	Endocrinology Brain, Behavior & Info	3	MCB 413	Endocrinology Brain, Behavior & Info	3
MCB 419	Process	3	MCB 419	Process	3
MCB 421	Microbial Genetics	3	MCB 421	Microbial Genetics	3
	Microbial Biochemistry	3		Microbial Biochemistry	3
MCB 424	·····orodiai biooneiiiisti y		MCB 424	, more solar broomermoury	
MCB 426	Bacterial Pathogenesis	3	MCB 426	Bacterial Pathogenesis	3
NICB 420			WCB 420		
MCB 430	Molecular Microbiology	3	MCB 430	Molecular Microbiology	3
MCB 431	Microbial Physiology	3	MCB 431	Microbial Physiology	3
	Virology & Viral	3		Virology & Viral	3
MCB 433	Pathogenesis		MCB 433	Pathogenesis	
MCB 435	Evolution of Infectious Disease	3	MCB 435	Evolution of Infectious Disease	3
IVICE 433			IVICB 455		
MCB 446	Physical Biochemistry	3	MCB 446	Physical Biochemistry	3
	Eukaryotic Cell	3		Eukaryotic Cell	3
MCB 480	Signaling		MCB 480	Signaling	
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	3	4	ME 330	0 0	4
NAS 240	Dynamics of	3.5	N45 242	Dynamics of	3.5
ME 340	Mechanical Systems		ME 340	Mechanical Systems	
ME 370 ME 371	Mechanical Design I Mechanical Design II	3	ME 370 ME 371	Mechanical Design I Mechanical Design II	3
37 I	Energy Conversion		IVIL 37 I	Energy Conversion	
ME 400	Systems	3 or 4	ME 400	Systems	3 or 4
	Refrigeration and	3 or 4		Refrigeration and	3 or 4
ME 401	Cryogenics	'	ME 401	Cryogenics	'

		_			
	Design of Thermal	or 4		Design of Thermal	3 or 4
ME 402	Systems		ME 402	Systems	
NAE 402	Internal Combustion 3 o	or 4	NAT 402	Internal Combustion	3 or 4
ME 403	Engines Intermediate		ME 403	Engines Intermediate	
ME 404	Thermodynamics 4		ME 404	Thermodynamics	4
	Intermediate Gas			Intermediate Gas	
ME 410	Dynamics 3 o	or 4	ME 410	Dynamics	3 or 4
	Viscous Flow & Heat			Viscous Flow & Heat	4
ME 411	Transfer 4		ME 411	Transfer	4
	Numerical Thermo-	:o 4		Numerical Thermo-	2 to 4
ME 412	Fluid Mechs	.5 4	ME 412	Fluid Mechs	2 10 4
	Intermediate Heat			Intermediate Heat	4
ME 420	Transfer		ME 420	Transfer	
ME 430	Failure of Engrg Materials	or 4	ME 430	Failure of Engrg Materials	3 or 4
WE 430	Machanical Component		WIL 430	Mechanical Component	+
ME 431	Failure 3 o	or 4	ME 431	Failure	3 or 4
	Kinem & Dynamics of			Kinem & Dynamics of	
ME 440	Mech Syst 3 o	or 4	ME 440	Mech Syst	3 or 4
	Introduction to 4			Introduction to	4
ME 445	Robotics		ME 445	Robotics	7
	Computer-Aided Mfg 3 o	or 4		Computer-Aided Mfg	3 or 4
ME 451	Systems		ME 451	Systems	,
NAE 452	Num Control of Mfg	or 4	ME 4F3	Num Control of Mfg	3 or 4
ME 452	Processes Industrial Control		ME 452	Processes Industrial Control	
ME 460	Systems 4		ME 460	Systems	4
WE 400	Computer Cotrl of		WIL 400	Computer Cntrl of	
ME 461	Mech Systems 3 o	or 4	ME 461	Mech Systems	3 or 4
	·	4			2 1
ME 471	Finite Element Analysis 3 o	or 4	ME 471	Finite Element Analysis	3 or 4
	Introduction to	or 4		Introduction to	3 or 4
ME 472	Tribology	J1 4	ME 472	Tribology	3 01 4
	MEMS Devices &			MEMS Devices &	3
ME 485	Systems		ME 485	Systems	
ME 487	MEMS-NEMS Theory & Fabrication		ME 487	MEMS-NEMS Theory & Fabrication	4
IVIE 407	Elect Music Techniques		IVIE 487	Elect Music Techniques	
MUS 407	I 3		MUS 407		3
	Elec Music Techniques			Elec Music Techniques	
MUS 409	II 2		MUS 409		2
	Cog Neuroscience of	or 4		Cog Neuroscience of	3 or 4
NEUR 453	Vision	01 4	NEUR 453	Vision	3 01 4
NPRE 201	· ,	or 3	NPRE 201	Energy Systems	2 or 3
	Modeling Nuclear			Modeling Nuclear	3
NPRE 247	Energy System		NPRE 247	Energy System	
			NPRE 330	Materials in Nuclear Engngineering	3
	Nuclear Power		NFRE 330	Nuclear Power	
NPRE 402	Engineering 3 o	or 4	NPRE 402	Engineering	3 or 4
	Nuclear Power Econ &	4		Nuclear Power Econ &	2 1
NPRE 412	Fuel Mgmt	or 4	NPRE 412	Fuel Mgmt	3 or 4
	Plasma and Fusion			Plasma and Fusion	3
NPRE 421	Science		NPRE 421	Science	
NPRE 423	Plasma Laboratory 2		NPRE 423	Plasma Laboratory	2
NPRE 429	Plasma Engineering 3		NPRE 429	Plasma Engineering	3
NPRE 431	Course Not Found				
NDDE 422	Nuclear Engrg 2		NDDE 422	Nuclear Engrg	2
NPRE 432 NPRE 435	Materials Lab Radiological Imaging 3		NPRE 432 NPRE 435	Materials Lab	2
NPRE 441	Radiological Imaging 3 Radiation Protection 4		NPRE 445 NPRE 441	Radiological Imaging Radiation Protection	3 4
NE 771	Radioactive Waste		141 IVE 111	Radioactive Waste	
NPRE 442	Management 3		NPRE 442	Management	3
	Nuclear Analytical			Nuclear Analytical	2 -
NPRE 444	Methods Lab	or 3	NPRE 444	Methods Lab	2 or 3
	Radiation Interact 3			Radiation Interact	3
NPRE 446	w/Matter I		NPRE 446	w/Matter I	J
	Radiation Interact			Radiation Interact	3
		•	NIDDE 447	/ 8 4 - 4 4 11	_
NPRE 447	w/Matter II		NPRE 447	w/Matter II	
NPRE 447 NPRE 448	w/Matter II Nuclear Syst Engrg & Design		NPRE 447 NPRE 448	W/Matter II 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
Wile 133	Safety Anlys Nucl	2 or 4	W NE 433	Safety Anlys Nucl	2 0 5 4
NPRE 457	Reactor Syst	3 or 4	NPRE 457	Reactor Syst	3 or 4
NPRE 458	Design in NPRE	4	NPRE 458	Design in NPRE	4
	Fuel Cells & Hydrogen			Fuel Cells & Hydrogen	_
NPRE 470	Sources	3	NPRE 470	Sources	3
					2 4
NPRE 475	Wind Power Systems	3 or 4	NPRE 475	Wind Power Systems	3 or 4
	Relativity & Math			Relativity & Math	_
PHYS 225	Applications	2	PHYS 225	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
					3 3
	Modern Experimental	4 or 5		Modern Experimental	4 or 5
PHYS 403	Physics		PHYS 403	Physics	
	Acoustical Physics of			Acoustical Physics of	
PHYS 406	Music	4	PHYS 406	Music	4
11113 100	Space, Time, and		11113 100	Space, Time, and	
PHYS 419	Matter-ACP	3 or 4	PHYS 419	Matter-ACP	3 or 4
11113 413	Space, Time, and		71113 413	Space, Time, and	
PHYS 420	Matter	2	PHYS 420	Matter	2
PH13 420	Thermal & Statistical		PH13 420	Thermal & Statistical	
PHYS 427		4	PHYS 427		4
PR13 427	Physics		PR13 427	Physics	
DUNG ACO	Condensed Matter	4	DLIVE 450	Condensed Matter	4
PHYS 460	Physics		PHYS 460	Physics	
2000	Atomic Scale	3 or 4		Atomic Scale	3 or 4
PHYS 466	Simulations		PHYS 466	Simulations	
PHYS 470	Subatomic Physics	4	PHYS 470	Subatomic Physics	4
	Atomic Phys &	3		Atomic Phys &	3
PHYS 485	Quantum Theory		PHYS 485	Quantum Theory	
PHYS 486	Quantum Physics I	4	PHYS 486	Quantum Physics I	4
PHYS 487	Quantum Physics II	4	PHYS 487	Quantum Physics II	4
	Intro to Brain and	3		Intro to Brain and	3
PSYC 204	Cognition	3	PSYC 204	Cognition	3
SHS 200	General Phonetics	3	SHS 200	General Phonetics	3
	Intro Sound & Hearing	3		Intro Sound & Hearing	2
SHS 240	Science	3	SHS 240	Science	3
	Anat & Physiol Spch	,		Anat & Physiol Spch	4
SHS 300	Mechanism	4	SHS 300	Mechanism	4
	Carranal Crassals Calarra	,		Caranal Caranals Calara	4
SHS 301	General Speech Science	4	SHS 301	General Speech Science	4
	Development of	2		Development of	2
SHS 320	Spoken Language	3	SHS 320	Spoken Language	3
	Intro Audiol & Hear	_		Intro Audiol & Hear	
SHS 450	Disorders	4	SHS 450	Disorders	4
SHS 470	Neural Bases Spch Lang	4	SHS 470	Neural Bases Spch Lang	4
	Methods of Applied			Methods of Applied	
STAT 420	Statistics	3 or 4	STAT 420	Statistics	3 or 4
STAT 424	Analysis of Variance	3 or 4	STAT 424	Analysis of Variance	3 or 4
STAT 425	Statistical Modeling I	3 or 4	STAT 425		3 or 4
	9			0	
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
	Statistical Data			Statistical Data	
STAT 440	Management	3 or 4	STAT 440	Management	3 or 4
31777 710			31/11 110		
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 420	Mechatronics	3
51 125	State Space Design for	J	JE 123	State Space Design for	3
SE 424	Control	3	SE 424	Control	3
TAM 211	Statics	3	TAM 211	Statics	3
1, 1141 5 7 7			17 UV1 ZII		
TAM 212	Introductory Dynamics	3	TAM 212	Introductory Dynamics	3
.,		1	1, 1111 212		I

		_	_		_
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
	Continuum Mechanics	4			4
TAM 445	Intermediate Solid	4	TAM 445	Intermediate Solid	4
TAM 451	Mechanics		TAM 451	Mechanics	_
Select one course from the following list of El			Select one course from the following list		
ECE 310	Digital Signal	3	ECE 310	Digital Signal Processing	3
ECE 310	Processing Power Ckts &		ECE 310	Power Ckts &	
ECE 330	Electromechanics	3	ECE 330	Electromechanics	3
ECE 329	Fields and Waves I	3	ECE 329	Fields and Waves I	3
	Semiconductor			Semiconductor	
ECE 340	Electronics	3	ECE 340	Electronics	3
ECE 461	Digital Communications	3	ECE 461	Digital Communications	3
ECE 486	Control Systems	4	ECE 486	Control Systems	4
Select three courses from the following list of			Select three courses from the following		
CS 357	Numerical Methods I	3	CS 357	Numerical Methods I	3
CS 411	Database Systems	3 or 4	CS 411	Database Systems	3 or 4
	Introduction to Data	3 or 4		Introduction to Data	3 or 4
CS 412	Mining		CS 412	Mining	
CS 414	Multimedia Systems	3 or 4	CS 414	Multimedia Systems	3 or 4
CC 419	Interactive Computer	3 or 4	CC 410	Interactive Computer	3 or 4
CS 418	Graphics Production Computer		CS 418	Graphics Broduction Computer	
CS 419	Production Computer Graphics	3 or 4	CS 419	Production Computer Graphics	3 or 4
C3 413	Parallel Progrmg: Sci &		C3 419	Parallel Progrmg: Sci &	
CS 420	Engrg	3 or 4	CS 420	Engrg	3 or 4
65 125			55 125		
	Programming	3 or 4		Programming	3 or 4
CS 421	Languages & Compilers		CS 421	Languages & Compilers	
	Operating Systems	3 or 4		Operating Systems	3 or 4
CS 423	Design		CS 423	Design	
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 431	Embedded Systems	3 or 4	CS 431	Embedded Systems	3 or 4
		0 0		Mobile Computing &	
			CS 434	Application	3 or 4
				Tonics in Internet of	3 or 4
			CS 437	Inings	3 01 4
	Applied Machine			Applied Machine	_
CS 441	Learning	3 or 4	CS 441	Learning	3 or 4
	Computer Networking	2 4		Computer Networking	2 1
CS 436	Laboratory	3 or 4	CS 436	Laboratory	3 or 4
C3 436	Communication		C3 430	Communication	
CS 438	Networks	3 or 4	CS 438	Networks	3 or 4
			55 155		
CS 440	Artificial Intelligence	3 or 4	CS 440	Artificial Intelligence	3 or 4
				Deep Learning for	2 05 4
			CS 444	Computer Vision	3 or 4
CS 446	Machine Learning	3 or 4	CS 446	Machine Learning	3 or 4
CS 450	Numerical Analysis	3 or 4	CS 450	Numerical Analysis	3 or 4
CS 461	Computer Security I	4	CS 461	Computer Security I	4
CS 475	Formal Models of	3 or 4	CC 475	Formal Models of	3 or 4
CS 475	Computation Program Verification		CS 475 CS 476	Computation	
CS 476	Program Verification	3 or 4	C3 4/0		3 or 4
	Formal Software	3 or 4		Formal Software	3 or 4
CS 477	Development Methods	5 51 7	CS 477	Development Methods	3 51 4
			1		I

CS 483	Applied Parallel Programming	4
ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4
ECE 412 ECE 419 ECE 422 ECE 424	Microcomputer Laboratory Security Laboratory Computer Security I Computer Security II	3 3 or 4 4 3 or 4
ECE 425 ECE 428	Intro to VLSI System Design Distributed Systems	3 3 or 4
ECE 435	Computer Networking Laboratory	3 or 4
ECE 438 ECE 439	Communication Networks Wireless Networks	3 or 4 3 or 4
ECE 448	Artificial Intelligence	3 or 4
ECE 462 ECE 470	Logic Synthesis Introduction to Robotics	3
ECE 478	Formal Software Development Methods	3 or 4
ECE 484	Principles of Safe	4
ECE 491	Autonomy Numerical Analysis	3 or 4
ECE 492	Parallel Progrmg: Sci & Engrg	3 or 4
Select one from the following list of Design E	lectives	
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	
The Grainger College of Engineering Liberal Education course list, or	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.

CS 483	Applied Parallel Programming	4
ECE 408	Applied Parallel Programming	4
ECE 411	Computer Organization & Design	4
	Microcomputer	3
ECE 412	Laboratory	2 4
ECE 419	Security Laboratory	3 or 4
ECE 422 ECE 424	Computer Security I	4 3 or 4
ECE 424	Computer Security II Intro to VLSI System	3 01 4
ECE 425	Design	3
ECE 428	Distributed Systems	3 or 4
ECE 435	Computer Networking Laboratory	3 or 4
	Communication	
ECE 438	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
	Formal Software	
ECE 478	Development Methods	3 or 4
LCL 478	IoT and Cognitive	
ECE 479	Computing	4
ECE 484	Principles of Safe	4
I ECE 491	Autonomy Numerical Analysis	3 or 4
202 431	Parallel Progrmg: Sci &	
ECE 492	Engrg	3 or 4
Select one from the following list of Des	ign Electives	
•	Commuter Organization	
ECE 411	Computer Organization & Design	4
	Senior Design Project	_
ECE 445	Lab	4
ECE 496	Senior Research Project	4

Free Electives	
Additional unrestricted course work, subject to o	certain 16

Total Hours of Curriculum to Graduate 128

111

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

- ⁴ MATH 213 may be substituted.
- ⁵ STAT 410 may be substituted.

Advanced Composition may be satisfied by completing ECE 445 or

or a course within
either the general
education or free
elective categories
which has the

ECE 496 and ECE 499

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.



COLLEGE OF AGRICULTURAL, CONSUMER & ENVIRONMENTAL SCIENCES

Office of the Dean 227 Mumford Hall, MC-710 1301 W. Gregory Drive Urbana, IL 61801

January 13, 2022

Dear Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from our college. Grainger Engineering students will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

Sincerely,

Germán Bollero, Interim Dean



COLLEGE OF APPLIED HEALTH SCIENCES

Office of the Dean 110 Huff Hall, MC-586 1206 S. Fourth St. Champaign, IL 61820

January 25, 2022

Dear Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from our college. Grainger Engineering students will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

While I support the move the give your students more freedom in course selection, it is important to express my concern that discontinuing your Liberal Education requirement may negatively impact my college's finances by reducing the IUs generated from lower enrollments in AHS courses. As you know, the current budget model rewards colleges financially based on the number of registrants in courses. I am hopeful that your students and advisors will continue to view AHS courses as relevant and valuable when they are selecting electives.

Sincerely,

Chery Hanly-Maxwell

Dean





Undergraduate Student Academic Affairs Office 110 Education Building, MC-708 1310 S. Sixth St. Champaign, IL 61820

Dear Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from our college. Grainger Engineering students will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

Sincerely,

Assistant Dean for Academic Affairs

College of Education | University of Illinois at Urbana-Champaign



College of Fine & Applied Arts

Office of the Dean 100 Architecture Building, MC-622 608 E. Lorado Taft Dr. Champaign, IL 61820

21 December 2021

Rashid Bashir, Dean 306 Engineering Hall 1308 W. Green St. M/C 266 Urbana, IL 61801

Dear Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from the College of Fine & Applied Arts. Grainger Engineering students will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

Sincerely,

Kevin Hamilton Dean and Professor

College of Liberal Arts & Sciences



2090 Lincoln Hall, MC-448 702 S. Wright St. Urbana, IL 61801

December 20, 2021

Dear Dean Bashir,

Thank you for informing the College of LAS of the proposed removal of the Liberal Education requirement in all undergraduate programs in the Grainger College of Engineering. I understand that this requirement includes an extensive list of courses from which your students could choose some, many of which are from our college. Grainger Engineering students will continue to be welcome to take our courses formerly on your Liberal Education list as free electives after the removal of this requirement from their programs of study.

Sincerely,

Venetria K. Patton

Harry E. Preble Dean



College of Media

Office of the Dean 119 Gregory Hall, MC-462 810 S. Wright St. Urbana, IL 61801

January 13, 2022

Rashid Bashir, Dean The Grainger College of Engineering 306 Engineering Hall 1308 W. Green Street Urbana, IL 61801

Dear Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from our college. Grainger Engineering students will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

Sincerely,

Tracy Sulkin

Dean, College of Media

Office of the Dean 260 Wohlers Hall, 1206 S. 6th Street Champaign, IL 61820 217.333.2747



December 13th, 2021

Dean Bashir,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in The Grainger College of Engineering. I understand that this requirement included an extensive list of courses Grainger Engineering students could choose from, including some from Gies College of Business. Students from Grainger will continue to be welcome to enroll in the courses formerly on your Liberal Education list as Free Electives after the removal of this requirement.

Sincerely,

Jeffrey R. Brown

Dean, Gies College of Business

School of Information Sciences



501 E. Daniel St., MC-493 Champaign, IL 61820-6211

February 3, 2022

Dean Rashid Bashir 306 Engineering Hall 1308 West Green Street Urbana, IL 61801

Dear Rashid,

Thank you for informing us of the proposed removal of the Liberal Education requirements in all undergraduate programs in the Grainger College of Engineering. I understand that this requirement included an extensive list of courses that Grainger Engineering students could choose from, including some from the iSchool. This letter acknowledges that Grainger Engineering students will continue to be able to enroll in courses as articulated and constrained in Course Explorer and formerly on your Liberal Education list as Free Electives, after the removal of this requirement.

Sincerely,

Eunice Santos

Professor and Dean

Eunice Santos

From: Hanley-Maxwell, Cheryl D < cherylln@illinois.edu>

Sent: Monday, February 14, 2022 3:57 PM **To:** Miller, Nolan H < mmiller@illinois.edu>

Subject: RE: Senate Ed Pol - Re: change to Grainger Liberal Education requirement

That's fine. Thanks for asking

CHERYL D HANLEY-MAXWELL

Dean

University of Illinois at Urbana-Champaign College of Applied Health Sciences 108 Huff Hall 1206 S Fourth | M/C 586 Champaign, IL 61820 217.333.2131 | cherylhm@illinois.edu www.ahs.illinois.edu (217) 333-0404 (FAX)

Human kindness has never weakened the stamina or softened the fiber of a free people. A nation does not have to be cruel to be tough. -- President Franklin D. Roosevelt



Under the Illinois Freedom of Information Act any written communication to or from university employees regarding university business is a public record and may be subject to public disclosure.

From: Miller, Nolan H < nmiller@illinois.edu Sent: Monday, February 14, 2022 1:49 PM

To: Hanley-Maxwell, Cheryl D < cherylhm@illinois.edu>

Subject: RE: Senate Ed Pol - Re: change to Grainger Liberal Education requirement

Dear Cheryl,

Thanks again for talking with me about the changes to the Grainger BS programs. I read the statement you sent to the committee today. The Chair would like to include it in the record that is forwarded to the Senate. Is it ok to include the email you sent below?

Thanks,		
Nolan		



NOLAN H MILLER

Daniel and Cynthia Mah Helle Professor in Finance | Department of Finance Director, Center for Business and Public Policy Gies College of Business | University of Illinois at Urbana-Champaign 217.244.2847 | nmiller@illinois.edu | http://www.business.illinois.edu/nmiller

Under the Illinois Freedom of Information Act any written communication to or from university employees regarding university business is a public record and may be subject to public disclosure.

From: Hanley-Maxwell, Cheryl D <cherylhm@illinois.edu>

Sent: Thursday, February 10, 2022 1:49 PM **To:** Miller, Nolan H <nmiller@illinois.edu>

Subject: RE: Senate Ed Pol - Re: change to Grainger Liberal Education requirement

Hi Nolan -

I appreciate what Ed Pol does in juggling the interests and concerns of the various programs across the campus, while keeping the students in mind. I served on a committee like this at my previous institution and know that it all boils down to what is best for the students' learning. Thanks for reminding me of that.

Here is a statement: While the Grainger proposal has the potential to financially affect AHS, we want to affirm another college's right to control their program requirements and student experiences, ensuring the best possible outcomes for their students. As a result, AHS supports this proposal and hopes that Grainger advisors will recognize the valuable contribution AHS classes make to the education of their students and continue to encourage them to consider relevant and/or high interest classes in AHS.

Hope this works!

Cheryl

CHERYL D HANLEY-MAXWELL, PHD Dean

University of Illinois at Urbana-Champaign College of Applied Health Sciences 108 Huff Hall 1206 S Fourth | M/C 586 Champaign, IL 61820 217.333.2131 | cherylhm@illinois.edu www.ahs.illinois.edu (217) 333-0404 (FAX)

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