APPROVED BY SENATE
04/27/2020

10KP4048BS: AEROSPACE ENGINEERING, BS

Completed Workflow

1. U Program Review (dforgacs@illinois.edu; eastuby@illinois.edu; aledward@illinois.edu)
2. 1615 Head (elliottg@illinois.edu; tbretl@illinois.edu)
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7. Senate EPC (bjlehman@illinois.edu)
8. Senate (jtempel@illinois.edu)
9. U Senate Conf (none)

Approval Path

1. Wed, 04 Sep 2019 21:33:47 GMT
   Deb Forgacs (dforgacs): Approved for U Program Review
2. Wed, 04 Sep 2019 21:54:29 GMT
   Tim Bretl (tbretl): Approved for 1615 Head
3. Wed, 13 Nov 2019 13:54:22 GMT
   Brooke Newell (bsnewell): Approved for KP Committee Chair
4. Wed, 13 Nov 2019 16:35:44 GMT
   Candy Deaville (candyd): Approved for KP Dean
5. Wed, 13 Nov 2019 17:59:01 GMT
   John Wilkin (jpwilkin): Approved for University Librarian
6. Thu, 14 Nov 2019 14:57:02 GMT
   Kathy Martensen (kmartens): Approved for Provost
7. Tue, 19 Nov 2019 15:01:39 GMT
   Barbara Lehman (bjlehman): Approved for Senate EPC
8. Tue, 10 Dec 2019 19:35:00 GMT
   Jennifer Roether (jtempel): Approved for Senate
9. Mon, 27 Jan 2020 23:30:52 GMT
   Kathy Martensen (kmartens): Approved for U Senate Conf

History

1. Jul 5, 2019 by Deb Forgacs (dforgacs)
2. Aug 9, 2019 by Deb Forgacs (dforgacs)
3. Aug 12, 2019 by Deb Forgacs (dforgacs)
4. Jan 27, 2020 by Tim Bretl (tbretl)

Date Submitted:Tue, 04 Feb 2020 22:17:02 GMT

Viewing:10KP4048BS : Aerospace Engineering, BS

Changes proposed by: Tim Bretl

Proposal Type

Proposal Type:

Major (ex. Special Education)

This proposal is for a:

Revision

Proposal Title:

if this proposal is one piece of a multi-element change please include the other impacted programs here.*example: A BS revision with multiple concentration revisions*

Curriculum revision to improve the first-year experience.

Revising how general education requirements are shown; revising how free and liberal education electives are shown. This could not be part of the bulk degree program revisions because they were in workflow at the time.

EP Control Number

EP.20.171

Official Program Name

Aerospace Engineering, BS

Effective Catalog Term

Fall 2020

Sponsor College

Grainger College of Engineering

Sponsor Department

Aerospace Engineering

Sponsor Name

Timothy Bretl

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Program Description and Justification

Justification for proposal change:

WHAT THE CHANGE IS

The proposed curriculum change does five things:

1) It removes ECE 206 (Electrical and Electronic Circuits Lab) as a required course.
2) It removes IE 300 (Analysis of Data) as a required course.
3) It reduces AE 483 (UAV Navigation and Control) from 3 hours to 2 hours.
4) It adds AE 100 (Intro to Aerospace Engineering) as a required course.
5) It adds CS 101 (Intro Computing: Engrg & Sci) as a required course.

There will be a net zero change in the total number of required hours - changes (1) - (3) reduce the number of hours by 5, while changes (4) - (5) increase the number of hours by 5.

The total number of basic math and science hours will decrease from 34 hours to 31 hours, which remains above the minimum of 30 hours that are required for ABET accreditation (https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2019-2020/#GC5).

A course change proposal to reduce AE 483 from 3 hours to 2 hours is currently under review.

The other minor changes (how gen-ed requirements are shown, how free/liberal electives are shown) are to clarify the requirements for the degree program for students.

THE REASONS FOR REMOVING ECE 206

ECE 206 was previously a 1-hour lab that students took concurrently with ECE 205 (which did not itself have a separate lab), and that was strongly linked with ECE 205 content. ECE 206 is now a 1-hour lab that students are required to take *after* ECE 205 (which now *does* have a separate lab) - in a different semester - and that is no longer strongly linked with ECE 205 content. The AE Undergraduate Curriculum Committee determined that AE students, in general, did not receive enough benefit from ECE 206 to warrant the reduction in flexibility due to the requirement that it be taken in a different semester from ECE 205.

Here is the course description for ECE 205:

"ECE 205 is an introductory course on circuit analysis and electronics for non-majors in engineering. The course includes bi-weekly electronics lab experiments designed to provide students with hands-on experience. Basic principles of circuit analysis and DC circuits; time-domain analysis of 1st and 2nd order linear circuits; complex numbers, phasors, AC steady-state analysis; frequency response; op-amp, diode, and BJT circuits; logic gates and digital logic circuits. Prerequisite: PHYS 212."

Here is the course description for ECE 206:

"Laboratory experiments in digital logic and controllers; transistor amplifier and switching circuits; DC motor control and voltage regulators; sensors and motion control with feedback; wireless communication. Prerequisite: ECE 205."

THE REASONS FOR REMOVING IE 300

We had added IE 300 to our curriculum in 2013 primarily to prepare our students for laboratory work - all three of our laboratory courses (AE 460, AE 461, and AE 483) involve data analysis. The AE Undergraduate Curriculum Committee has since determined that AE students are no better prepared for these laboratory courses after having taken IE 300. In particular, instructors reported having to review basic methods of data analysis to the same extent, whether students had taken IE 300 or not. Student survey data are consistent with these reports. As a consequence, the committee determined that students will benefit significantly more from being required to take CS 101 than from being required to take IE 300.

THE REASONS FOR REDUCING AE 483 FROM 3 HOURS TO 2 HOURS

AE 483 is a relatively new course, having been piloted first in Spring 2011. It has always had a significant 2-hour laboratory component, but has until now been a 3-hour course because - as originally conceived - it covered new technical material in the area of dynamics and control. Since 2011, our department has made improvements to our junior-level dynamics and control sequence (AE 352 and AE 353) so that these courses cover the topics that would otherwise have been introduced by AE 483. As a consequence, we can remove the corresponding hour of AE 483. This change also puts AE 483 in line with the other two required AE laboratory courses (AE 460 and AE 461), both of which are already 2 hours.

A course change proposal to reduce AE 483 from 3 hours to 2 hours is currently under review.

Here is the proposed course description for AE 483:

"Theory and application of experimental techniques in aerospace engineering with emphasis on autonomous systems."

THE REASONS FOR ADDING AE 100

The key reason to add AE 100 as a required course is to improve the freshman experience. AE 100 is a project-based introduction to Aerospace Engineering. It is already taken (as an elective) by nearly all of our undergraduate students. The AE Undergraduate Curriculum Committee determined that the course provides a significant benefit and should simply be required.

Here is the course description for AE 100:

"Introduction to the Aerospace Engineering curriculum and career. Typical section topics include aircraft and rocket design and flight. Overviews of the topics are presented along with theory to be experimentally verified."

THE REASONS FOR ADDING CS 101

The key reason to add CS 101 as a required course is to help provide our students with a strong background in applied computing. There is consensus among students, faculty, alumni, and industry partners that strong computational skills are essential for our graduates. The AE Undergraduate Curriculum Committee has determined that an introductory computing course (designed to be taken by engineers and scientists outside of computer science) like CS 101 is a prerequisite for success in the core AE curriculum, which increasingly relies on a basic understanding of computing and a fluency in some programming language.

Here is the course description for CS 101:

"Fundamental principles, concepts, and methods of computing, with emphasis on applications in the physical sciences and engineering. Basic problem solving and programming techniques; fundamental algorithms and data structures; use of computers in solving engineering and scientific problems. Intended for engineering and science majors."

Corresponding Degree

BS Bachelor of Science

Is this program interdisciplinary?

No

Academic Level

Undergraduate

CIP Code

140201 - Aerospace, Aeronautical and Astronautical/Space Engineering.

Is This a Teacher Certification Program?

No

Will specialized accreditation be sought for this program?

No

Admission Requirements

Desired Effective Admissions Term

Fall 2020

Is this revision a change to the admission status of the program?

No

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.

Unchanged.

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

Unchanged.

Enrollment

Describe how this revision will impact enrollment and degrees awarded.

No impact.

Estimated Annual Number of Degrees Awarded

What is the matriculation term for this program?

Fall

Delivery Method

Is this program available on campus and online?

No

This program is available:

On Campus

Budget

Are there budgetary implications for this revision?

No

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

No

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

Faculty Resources

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

No change

Library Resources

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

No change

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 this new program/proposed change result in the replacement of another program?

No

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

Yes

Required courses

CS 101 - Intro Computing: Engrg & Sci

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

The aerospace admission target is 120 freshmen each year. Approximately 15% each year will arrive with credit for CS 101. Approximately 10-15% of our students attempt to pursue a CS minors, so they enroll in CS 125. We would expect the remaining 70-85% of each cohort to enroll in CS 101, which could be dispersed over multiple terms.

For the past two years we have been advising Aerospace freshmen to take either CS 101 or CS 125 as an elective course. As a result, the majority of Aerospace students admitted in FA18 and FA19 enrolled in either course, if they did not already have credit from other sources.

Attach letters of support from other departments.

CS LOS for AE BS Curriculum Change SP2020.pdf

Financial Resources

How does the unit intend to financially support this proposal?

No change

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

No

Will an existing tuition rate be used or continue to be used for this program?

Yes

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).

The plan for program regulation and assessment is consistent with what was presented to the ABET accreditation board in Fall 2019 (pending approval). What follows is a summary of our stated process for update and assessment of Program Educational Objectives and of Student Outcomes.

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AE PROGRAM EDUCATIONAL OBJECTIVES UPDATE AND ASSESSMENT PROCESS

This document describes the process that is used to update and assess the Program Education Objectives (PEOs) in the Department of Aerospace Engineering at the University of Illinois. In particular, it describes both the data that are collected and the way in which these data are used to make adjustments to the PEOs, when adjustments are needed. This entire process is managed by the Undergraduate Curriculum Committee.
The educational objectives of the AE undergraduate program are for the graduates to achieve the following within a few years of graduation:
• Obtain employment in industry or government institutions, engage in entrepreneurship, and/or pursue graduate degrees.
• Solve engineering problems throughout their careers using the knowledge and skills earned during their engineering degree program.
• Advance their careers by demonstrating leadership, teamwork, and communication skills in addition to technical knowledge.
• Continue their professional development utilizing educational and career building opportunities through their employer, educational institutions, and/or professional societies.
• Make a positive contribution to society through advancing the state of the art in science and engineering, professional service, community service, and/or mentoring.

STEP 1: Update Determination

Every year, the Undergraduate Curriculum Committee has a discussion about the PEOs and decides—on the basis of emerging trends in the field, informal feedback from constituencies, data from past assessments, or other factors—if these PEOs are still appropriate for the department.
Every three years, constituency groups are asked if they believe an update to the PEOs is necessary.
If either the committee or the constituency groups recommend an update to the PEOs, then the formal process described below begins with Step 2: Input from Constituencies.

STEP 2: Input from Constituencies

The Undergraduate Curriculum Committee recommends draft changes to the PEOs. These draft changes are then discussed with both the Alumni Advisory Board and the Rcent Alumni Board during their annual meetings on campus. The old PEOs, the draft new PEOs, and the PEOs from several peer institutions are presented to the board, to provide sufficient context. The two boards represent input from broad constituencies in industry, universities, and government labs, at varying career levels. Input is provided during the meeting and interactions are allowed to continue between board members and the Director of Undergraduate Programs for several weeks, as necessary. The Director of Undergraduate Programs presents findings from the board meetings to the Undergraduate Curriculum Committee, which further revises the draft PEOs.

STEP 3: Final Approval

After iteration on the draft PEOs by the Directory for Undergraduate Programs, the Alumni Boards, and the Undergraduate Curriculum Committee, these PEOs are presented at a full faculty meeting for discussion. Feedback from the faculty are then discussed again with the curriculum committee. If the input is relatively minor, then the department head approves the new version of the PEOs, and they are published. If significant changes are requested from the faculty and supported by the curriculum committee, then the PEOs would be presented to the full faculty again for comments and feedback.

STEP 4: Assessment

The Program Educational Objectives are assessed primarily through alumni surveys of recent graduates, since the PEOs are intended to be achieved within a few years of graduation. Surveys of non-recent graduates are also conducted to supplement these assessment data, in particular to track if objectives related to professional development and societal contribution continue to grow in alumni long after graduation. Expected response rates are 30-40%. Data are expected to show that all PEOs are attained at a high level. If data do not show these results or otherwise raise concerns, the Undergraduate Curriculum Committee engages in further discussion about whether the PEOs need to be changed (Step 1: Update Determination) or about whether changes to the undergraduate program need to be considered (see outcomes assessment process).

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AE STUDENT OUTCOMES ASSESSMENT PROCESS

This document describes the process that is used to assess student outcomes in the Department of Aerospace Engineering at the University of Illinois. In particular, it describes both the data that are collected and the way in which these data are used to make adjustments to the undergraduate program, when adjustments are needed.

The Aerospace Engineering Program prepares graduates to achieve the following student outcomes by the time of graduation:
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. 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. An ability to communicate effectively with a range of audiences.
4. 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. 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. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

STEP 1: Data Collection

Every academic year student outcome attainment data are collected in five of the senior-year required courses (AE 442, 460, 383, 443, 461). These courses include the senior design sequence and the required laboratory courses. All of the student outcomes are assessed several times across all of these courses, but not all outcomes are assessed in within each single course. Additionally, student outcome attainment data are collected in all the other required AE courses every three years. If an area of concern has been identified, outcomes attainment in these other courses may be assessed more frequently.
Prior to each semester in which data will be collected for a course, the instructor for that course is consulted by the Director of Undergraduate Programs to determine if the previously identified outcomes are still appropriate. In courses like senior design, it is expected that all outcomes will always be assessed, but in other required courses, the outcomes could evolve. Once the outcomes have been identified, the specific assessment instruments are discussed. Generally, the assessment instruments are homework or exam problems, presentation grades, or report grades. The outcomes assessed in each course and the assessments methods will be summarized for the Undergraduate Curriculum Committee by the Director of Undergraduate Programs. After the instructor commits to a particular set of outcomes and outcome assessment tools for his/her class, the instructor is expected to submit a summary to the Director of Undergraduate Programs at the end of the semester. This summary includes the details of the particular assessment, the outcome that is demonstrated by the assessment, and the student data—usually grades—showing the level at which students have attained the outcome. The data for all students in the course in the semester of the assessment is submitted. The Director of Undergraduate Programs is responsible for ensuring that the outcome assessment data provided by the instructor is consistent with what was agreed upon and approved by the Undergraduate Curriculum Committee, and for ensuring the integrity of these data.
Additional outcome data are obtained through an indirect assessment using the graduating senior survey. These survey data are used to identify areas for improvement related to student outcomes. The survey includes questions about the curriculum, improvements to the educational experience, involvement in opportunities outside of class, and qualitative questions about levels of student outcome attainment. Students' perceptions of their own levels of student outcome attainment are used to guide subsequent direct assessment in areas of concern. The senior survey is conducted annually using an online tool, a few weeks prior to graduation during the spring semester. The data are summarized by the Director of Undergraduate Programs for the Undergraduate Curriculum Committee to review.
The review performed by the Undergraduate Curriculum Committee of all these data—collected by direct assessment of student outcome attainment in courses (e.g., homework and exam grades), and by indirect assessment of student outcome attainment in the graduating senior survey—involves computing the percentage of students who achieve the desired level of attainment. This desired level is 70% or higher on each assessment instrument. For direct assessment in junior required courses, the percentage achieving the outcome is expected to be between 70% and 100%. For direct assessment in senior required courses, the percentage achieving the outcome is expected to be between 85% and 100%.

STEP 2: Data Analysis and Recommendations

With the outcome summary report that is produced by Step 1: Data Collection (see above) as a guide, the Undergraduate Curriculum Committee arrives at consensus about whether the levels of student outcome attainment are acceptable for the undergraduate program. One of three possible decisions are made:

a. Everything looks good. In this case, the committee would take no further action and would repeat the full review process during the next, regularly scheduled assessment period.
b. The attainment level of a particular outcome is either slightly below what is expected or is somewhat inconsistent with other assessments of the same outcome. In this case, the committee would recommend making a change to the assessment tool and/or reassessing the outcome during the following semester. If this applies to one of the courses that would not normally be assessed each year, the Director of Undergraduate Programs would work with the instructor to ensure an assessment occurs during the next offering.
c. The attainment level of a particular outcome is far below what is expected, is highly inconsistent with other assessments of the same outcome, or otherwise raises a significant concern. In this case, the committee would consider a variety of different ways to address the concern, and would likely recommend a significant change to the course or to the undergraduate curriculum. The Undergraduate Curriculum Committee would present this recommendation to the full faculty. This recommendation would then be discussed at a faculty meeting, where it would be subject to modification. A decision would then be made by the faculty in the meeting (following standard rules of order) about whether to proceed with the recommendation—suitably modified—or to request that the Undergraduate Curriculum Committee reconsider how to best address the concern. If the faculty decides to proceed with a curriculum revision, a faculty vote would be required, followed by additional approvals at the college and campus level.

STEP 3: Implementation

Instructors are responsible for implementing any course or curriculum changes that are recommended by the full faculty in Step 2: Data Analysis and Recommendations (see above). The Undergraduate Curriculum Committee and the Director for Undergraduate Programs are available to consult with the responsible instructors about how these changes should best be implemented.

STEP 4: Reassessment

If either an assessment tool in a course has changed or the Undergraduate Curriculum Committee has recommended reassessing student outcome attainment in that course, student outcome attainment data are collected again from that particular course during its next offering. As in the regular,

recurring outcome assessment (see Step 1: Data Collection), the instructor collects data from all students enrolled in the course and provides those data to the Director of Undergraduate Programs.

If a course has been changed, student outcome attainment data are collected again from that particular course during its next offering. As in the regular, recurring outcome assessment (see Step 1: Data Collection), the instructor collects data from all students enrolled in the course and provides those data to the Director of Undergraduate Programs.

If the curriculum has been changed, student outcome attainment data are collected from all required AE undergraduate courses during the next semester. As in the regular, recurring outcome assessment (see Step 1: Data Collection), the instructor collects data from all students enrolled in the course and provides those data to the Director of Undergraduate Programs.

The Director of Undergraduate Programs presents the new student outcome attainment data to the Undergraduate Curriculum Committee for review (Step 2: Data Analysis and Recommendations). The committee determines if its earlier recommendations, now implemented, have had the intended impact on student outcome attainment. If the levels of attainment indicate improvement and/or no longer raise concerns, then student outcome attainment data will be collected and reassessed once more in the next offering or semester before returning to the regular assessment schedule. If the levels of attainment do not indicate improvement and/or continue to raise concerns, then the Undergraduate Curriculum Committee will reconvene to make further recommendations, to present these recommendations to the full faculty for review, to proceed (upon approval by the faculty) with implementation, and to do subsequent reassessment. These steps—(1) data collection, (2) data analysis and recommendations, (3) implementation, and (4) reassessment—repeat until the concern with student outcome attainment is sufficiently addressed.

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

No

Program of Study

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

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

Revised programs

AE Program of Study Change 2020.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

Catalog Page Text: Description of program for the catalog page. This is not official content, it is used to help build the catalog pages for the program. Can be edited in the catalog by the college or department.

The Aerospace Engineering curriculum provides a strong fundamental background in engineering, mathematics, and science, along with the ability to apply this fundamental knowledge to the analysis and design of future aircraft and spacecraft. It also prepares students for lifelong learning and the attainment of their career goals in the field of aerospace engineering and in a wide range of other areas. The concepts of system design are introduced early in the curriculum and culminate in the yearlong senior capstone design experience (AE 442, AE 443), in which students work in teams to respond to a design challenge from industry, government, or a professional engineering society. A total of 18 hours of technical and free electives allows the student to pursue an individualized program of study.

Graduation Requirements

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

Orientation and Professional Development

Code	Title	Hours
AE 100	Intro to Aerospace Engineering[1]	2
ENG 100	Engineering Orientation[2]	0
Total Hours		2

Foundational Mathematics and Science

Code	Title	Hours
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
MATH 221	Calculus I[3]	4
MATH 225	Introductory Matrix Theory	2
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
Total Hours		28

Aerospace Engineering Technical Core

Code	Title	Hours
AE 140	Aerospace Computer-Aided Design (Aerospace Computer-Aided Design)	2
AE 202	Aerospace Flight Mechanics	3
AE 311	Incompressible Flow	3
AE 312	Compressible Flow	3
AE 321	Mechs of Aerospace Structures	3
AE 323	Applied Aerospace Structures	3
AE 352	Aerospace Dynamical Systems	3
AE 353	Aerospace Control Systems	3
AE 370	Aerospace Numerical Methods	3
AE 433	Aerospace Propulsion	3
AE 442	Aerospace Systems Design I[4]	3
AE 443	Aerospace Systems Design II[4]	3
AE 460	Aerodynamics & Propulsion Lab	2
AE 461	Structures & Control Lab	2
AE 483	Autonomous Systems Lab	3
ECE 205	Electrical and Electronic Circuits	3
ECE 206	Electrical and Electronic Circuits Lab	1
IE 300	Analysis of Data[5]	3
ME 200	Thermodynamics	3
MSE 280	Engineering Materials	3
TAM 210	Introduction to Statics	2

TAM 212	Introductory Dynamics	3
Total Hours		60

Technical Electives

Code	Title	Hours
Selected from the departmentally approved list of Technical Electives, satisfying these distribution requirements:		
Chosen from AE Technical Electives listed below		6
AE 199	Undergraduate Open Seminar	0 to 5
AE 402	Orbital Mechanics	3 or 4
AE 403	Spacecraft Attitude Control	3 or 4
AE 410	Computational Aerodynamics	3 or 4
AE 412	Viscous Flow & Heat Transfer	4
AE 416	Applied Aerodynamics	3 or 4
AE 419	Aircraft Flight Mechanics	3 or 4
AE 420	Finite Element Analysis	3 or 4
AE 427	Mechanics of Polymers	3
AE 428	Mechanics of Composites	3
AE 434	Rocket Propulsion	3 or 4
AE 435	Electric Propulsion	3 or 4
AE 451	Aeroelasticity	3 or 4
AE 454	Systems Dynamics & Control	3 or 4
AE 456	Global Nav Satellite Systems	4
AE 468	Optical Remote Sensing	3
AE 482	Introduction to Robotics	4
AE 497	Independent Study	1 to 4
AE 498	Special Topics	1 to 4
ENG 491	Interdisciplinary Design Proj (CU1 & CU2)	1 to 4
Chosen from AE Technical Electives or Non-AE Technical Electives		6
ASTR 404	Stellar Astrophysics	3
ASTR 405	Planetary Systems	3
ASTR 406	Galaxies and the Universe	3
ASTR 414	Astronomical Techniques	4
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 306	Cloud Physics	3
ATMS 313	Synoptic Weather Forecasting	4
ATMS 406	Tropical Meteorology	4
ATMS 410	Radar Remote Sensing	4
CEE 310	Transportation Engineering	3
CEE 330	Environmental Engineering	3
CEE 360	Structural Engineering	3
CEE 380	Geotechnical Engineering	3
CEE 407	Airport Design	3 or 4
CEE 412	High-Speed Rail Engineering	3 or 4
CEE 451	Environmental Fluid Mechanics	3
CEE 471	Structural Mechanics	3 or 4
CHEM 232	Elementary Organic Chemistry I	3 or 4
CHEM 233	Elementary Organic Chem Lab I	2
CHEM 236	Fundamental Organic Chem I	4

CS 101	Intro Computing: Engrg & Sci	3
CS 125	Intro to Computer Science	4
CS 225	Data Structures	4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 461	Computer Security I	4
CS 465	User Interface Design	3 or 4
CSE 412	Numerical Thermo-Fluid Mechs	2 to 4
ECE 210	Analog Signal Processing	4
ECE 220	Computer Systems & Programming	4
ECE 310	Digital Signal Processing	3
ECE 311	Digital Signal Processing Lab	1
ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3
ECE 342	Electronic Circuits	3
ECE 343	Electronic Circuits Laboratory	1
ECE 385	Digital Systems Laboratory	3
ECE 473	Fund of Engrg Acoustics	3 or 4
ECE 486	Control Systems	4
ENG 491	Interdisciplinary Design Proj (SEctions SAE and HYP)	1 to 4
MSE 401	Thermodynamics of Materials	3
MSE 440	Mechanical Behavior of Metals	3
MSE 443	Design of Engineering Alloys	3
MSE 498	Special Topics (Section CM3)	1 to 4
SE 310	Design of Structures and Mechanisms	3
SE 420	Digital Control Systems	4
SE 423	Mechatronics	3
IE 310	Deterministic Models in Optimization	3
MATH 347	Fundamental Mathematics	3
MATH 402	Non Euclidean Geometry	3 or 4
MATH 413	Intro to Combinatorics	3 or 4
MATH 416	Abstract Linear Algebra	3 or 4
MATH 442	Intro Partial Diff Equations	3 or 4
MATH 446	Applied Complex Variables	3 or 4
MATH 461	Probability Theory	3 or 4
MATH 482	Linear Programming	3 or 4
MATH 484	Nonlinear Programming	3 or 4
MATH 489	Dynamics & Differential Eqns	3 or 4
ME 320	Heat Transfer	4
ME 360	Signal Processing	3.5
ME 370	Mechanical Design I	3
ME 400	Energy Conversion Systems	3 or 4
ME 401	Refrigeration and Cryogenics	3 or 4
ME 498	Special Topics	0 to 4
MSE 450	Polymer Science & Engineering	3 or 4
MSE 453	Plastics Engineering	3
MSE 457	Polymer Chemistry	3 or 4
NPRE 201	Energy Systems	2 or 3
NPRE 402	Nuclear Power Engineering	3 or 4
NPRE 470	Fuel Cells & Hydrogen Sources	3
NPRE 475	Wind Power Systems	3 or 4
NPRE 498	Special Topics (Energy Storage and Conveyance)	1 to 4
PHYS 325	Classical Mechanics I	3

PHYS 326	Classical Mechanics II	3
PHYS 435	Electromagnetic Fields I	3
PHYS 485	Atomic Phys & Quantum Theory	3
PHYS 486	Quantum Physics I	4
STAT 428	Statistical Computing	3 or 4
STAT 448	Advanced Data Analysis	4
TAM 324	Behavior of Materials	4
TAM 451	Intermediate Solid Mechanics	4
TAM 456	Experimental Stress Analysis	3
TAM 470	Computational Mechanics	3 or 4
TE 401	Developing Breakthrough Projects	1 to 4
TMGT 461	Tech, Eng, & Mgt Final Project	2

Electives

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

1 *This optional course may be used to help meet free elective requirements.*

2 *External transfer students takeENG 300 instead.*

3 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.*

4 *AE 442andAE 443satisfy the General Education Advanced Composition requirement.*

5 STAT 400*may be substituted.*

6 *The Grainger College of Engineering approved liberal education course list can be foundhere* (https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-GeneralEducationElectives). *Note that these credit hours could carry the required cultural studies designation required for campus general education requirements.*

7 *The Grainger College of Engineering restrictions to free electives can be foundhere* (https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-FreeElectives).

EP Documentation

DMI Documentation

Banner/Codebook Name

BS: Aerospace Engr -- UIUC

Program Code:

10KP4048BS

Degree Code

BS

Major Code

4048

Key: 111

Current Requirements	*Current Hours*
Orientation and Professional Development	**0-2**
AE 100 Introduction to Aerospace Engineering*	2
ENG 100 Engineering Orientation	0
Foundational Mathematics and Science	**33**
CHEM 102 General Chemistry 1	3
CHEM 103 General Chemistry Lab 1	1
MATH 221 Calculus I	4
MATh 225 Introductory Matrix Theory	2
MATH 231 Calculus II	3
MATH 241 Calculus III	4
MATH 285 Intro Differential Equations	8
PHYS 211 University Physics: Mechanics	4
PHYS 212 University Physics: Elec & Mag	4
Aerospace Engineering Technical Core	**59**
AE 140 Aerospace Computer Aided Design	2
AE 202 Aerospace Flight Mechanics	3
AE 311 Incompressible Flow	3
AE 312 Compressible Flow	3
AE 321 Mechs of Aerospace Structures	3
AE 323 Applied Aerospace Structures	3
AE 352 Aerospace Dynamical Systems	3
AE 353 Aerospace Control Systems	3
AE 370 Aerospace Numerical Methods	3
AE 433 Aerospace Propulsion	3
AE 442 Aerospace Systems Design I	3
AE 443 Aerospace Systems Design II	3
AE 460 Aerodynamics & Propulsion Lab	2
AE 461 Structures and Control Lab	2
AE 483 Unmanned Aerial Vehicle (UAV) Navigation and Control	3
ECE 205 Electrical and Electronics Circuits	3
ECE 206 Electrical and Electronics Circuits Lab	1
IE 300 Analysis of Data	3
ME 200 Thermodynamics	2
MSE 280 Engineering Materials	3
TAM 210 Introduction to Statics	2
TAM 212 Introductory Dynamics	3
Aerospace Technical Electives	**6**
Select from department-approved list.	
Other Technical Electives	**6**
Select from department-approved list.	
Language Other Than English	**0-15**

Coursework at or above the third level is required for graduation.

Humanities and the Arts Select from campus-approved list.	**6**
Social and Behavioral Sciences Select from campus-approved list.	**6**
Liberal Electives Select from college-approved list.	**6**
Cultural Studies Select one course from Western culture, one from non-Western culture, and one from U.S. minority culture from campus approved lists.	
Free Electives Select from college-approved list.	6

*AE 100 is not required but is taken by the majority of incoming students to explore their major.

RED = Course is being removed or altered in the requirements
GREEN = Course additions or alternations

Revised Requirements	*Revised Hours*
Orientation and Professional Development	**0-2**
AE 100 Introduction to Aerospace Engineering	2
ENG 100 Engineering Orientation	0
Foundational Mathematics and Science	**33**
CHEM 102 General Chemistry 1	3
CHEM 103 General Chemistry Lab 1	1
MATH 221 Calculus I	4
MATh 225 Introductory Matrix Theory	2
MATH 231 Calculus II	3
MATH 241 Calculus III	4
MATH 285 Intro Differential Equations	8
PHYS 211 University Physics: Mechanics	4
PHYS 212 University Physics: Elec & Mag	4
Aerospace Engineering Technical Core	**59**
AE 140 Aerospace Computer Aided Design	2
AE 202 Aerospace Flight Mechanics	3
AE 311 Incompressible Flow	3
AE 312 Compressible Flow	3
AE 321 Mechs of Aerospace Structures	3
AE 323 Applied Aerospace Structures	3
AE 352 Aerospace Dynamical Systems	3
AE 353 Aerospace Control Systems	3
AE 370 Aerospace Numerical Methods	3
AE 433 Aerospace Propulsion	3
AE 442 Aerospace Systems Design I	3
AE 443 Aerospace Systems Design II	3
AE 460 Aerodynamics & Propulsion Lab	2
AE 461 Structures and Control Lab	2
AE 483 Autonomous Systems Lab	2
ECE 205 Electrical and Electronics Circuits	3
ME 200 Thermodynamics	2
MSE 280 Engineering Materials	3
TAM 210 Introduction to Statics	2
TAM 212 Introductory Dynamics	3
CS 101 Introductory Computing: Engineering and Science	3
Aerospace Technical Electives	**6**
Select from department-approved list.	
Other Technical Electives	**6**
Select from department-approved list.	
Language Other Than English	**0-15**
Coursework at or above the third level is required for graduation.	

Humanities and the Arts Select from campus-approved list.	**6**
Social and Behavioral Sciences Select from campus-approved list.	**6**
Liberal Electives Select from college-approved list.	**6**
Cultural Studies Select one course from Western culture, one from non-Western culture, and one from U.S. minority culture from campus approved lists.	
Free Electives Select from college-approved list.	6

ILLINOIS

THE GRAINGER COLLEGE OF ENGINEERING

Department of Computer Science
2232 Siebel Center, MC-258
201 N. Goodwin Ave.
Urbana, IL 61801

April 8, 2020

Department of Aerospace Engineering
University of Illinois, Urbana - Champaign

To whom it may concern,

The Department of Computer Science is aware of and supports the proposal for the addition of the requirement of CS 101, Intro to Computing: Engrg & Sci to their Aerospace Engineering BS degree program, with the allowed substitution of CS 125, Intro to Computer Science. Each of these courses in general should have the capacity to allow these students to take their choice of one of these two courses within their first three terms.

Sincerely,

Elsa L. Gunter

Elsa L. Gunter
Research Professor
Director of Undergraduate Programs
Department of Computer Science
University of Illinois, Urbana - Champaign