APPROVED BY SENATE
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ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

# Proposal to the Senate Educational Policy Committee

**PROPOSAL TITLE:** A Proposal to rename the General Engineering Degree to *Systems Engineering and Design*.

**SPONSOR:** Rakesh Nagi, Head, Department of Industrial and Enterprise Systems Engineering, nagi@illinois.edu, 244-3848

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**BRIEF DESCRIPTION:** The General Engineering Degree first became an option in 1921. However, the name "General" does not convey the depth or breadth of the education our students receive and, therefore, is widely unrecognized beyond specific companies that work regularly with our undergraduate students. We propose several modifications (outlined below) which focus on combining two strengths of our curriculum, Systems Engineering and Design. The Systems Engineering and Design degree will have the same content as our current General Engineering degree and also highlights the strength of the design components in the curriculum. The Systems Engineering and Design will be more highly recognizable and accepted amongst employers who do not have a category for General Engineers. In addition, a name change would permit General Engineering to now be ranked as a Systems Engineering and Design program; there is no current ranking system for General Engineering programs. There is no common accreditation body for the General Engineering degree program but as a Systems Engineering and Design program, the program can be accredited by the American Society of Engineering Education (ASEE). At the same time, we have historically had a strong design component focus in the department, and we believe that merging the concepts of design into systems engineering would provide us with a timely, novel, and important degree focus.

The proposed specific changes are threefold:

- Change the degree name from "General Engineering" to "Systems Engineering and Design".
- Change the rubric "GE" to "SED"
- Replace the "Design Elective" with a "Systems Engineering and Design Elective".

**JUSTIFICATION:** The Department of Industrial and Enterprise Systems Engineering currently has two undergraduate degrees: Industrial Engineering and General Engineering. The General Engineering Degree was started in 1921. Motivated by a number of reasons, we believe that renaming the General Engineering degree to Systems Engineering and Design would provide a number of advantages. The actual *content* of the degree would be modified only by replacing a "Design" elective with a "Systems Engineering and Design" elective (which would allow students a focus on systems-related course offerings). The name of "General Engineering" is not in step with modern engineering practice, and leads to confusion of what the degree, such as confusing the degree with "Engineering Undeclared".

Firstly, there are only several other institutions with "General Engineering" Programs. Johns Hopkins (see http://engineering.jhu.edu/academics/general-engineering/) offers a Bachelor of *Arts* in General Engineering; that degree is "intended for undergraduate students who desire a background in engineering and technology yet have neither the desire nor the intention to become professional engineers". Virginia Tech (see http://www.admiss.vt.edu/majors/index.php/majors/major/GE) uses "General Engineering" as the common freshman-sophomore engineering experience, but has no formal degree with the name. San Jose State University (http://generalengineering.sjsu.edu/) has a degree in General Engineering, but they clearly are not a peer institution. Our desired peer institutions typically offer some combination of degrees in Industrial Engineering and Systems Engineering.[1]

The General Engineering degree was originally designed as a way for students to secure fundamental training in the principles of engineering theory in order to ally themselves with a wide range of industrial and commercial developments in the fields of management, operation, and construction. The more modern terminology of "Systems Engineering" has a similar focus, but with the added goal of formally combining the different strains of engineering into a synergetic whole, often in the face of complex interactions.

A number of factors motivate this transition. We believe that students, alumni, faculty, the department, and the college will benefit.

High school students often compare universities based on ranked lists and lists of peer institutions. As a result, our general engineering degree is often misunderstood to be an "undeclared engineering" or overlooked due to the lack of commonality with our peer institutions. At the other end of the college experience, companies (often Human Resources professionals) use the most common degree names as a way to rank or reject job candidates; a General Engineering degree does not fit within standard taxonomies. More precisely, when a student is applying for a job and has to check a box identifying whether their degree is Aerospace Engineering, Civil Engineering, etc., *there is no box for General Engineering*. This does a *huge* disservice to our students and handicaps them at the outset of their career.

[1] A table of curricula of comparison programs is attached.

We do not have a graduate program in General Engineering. Only San Jose State has a Master's degree in General Engineering. This gives the impression that there is no distinct intellectual core in the area. Our graduate, Masters and Doctorate, degrees already include the term Systems Engineering in the title (Systems and Entrepreneurial Engineering).

Converting our General Engineering Degree to Systems Engineering and Design would probably also help us attract a larger pool of high-quality applicants for faculty positions; we would be able to cast a broader net.

The inclusion of designing our new degree reflects both strengths and opportunities. We currently have a uniquely strong collection of faculty interested in various aspects of engineering design. With increasingly common uses of additive printing, and new fields of compliant design, for example, new fields of engineering design are opening up. We have partnered with the Department of Industrial Design on a number of efforts, and some of our design classes are extremely popular. Formalizing design as part of our degree will solidify some of the opportunities in our department, and also bring a novel and forward-looking aspect to our degree program. Note that the Department of Industrial and Enterprise Systems Engineering serves many of the freshman in the College of Engineering in the GE 101: Engineering Graphics and Design course.

Our General Engineering degree is currently accredited by the American Society of Engineering Education (ASEE); we will ask them to continue and be the accrediting body for the SED degree.

**BUDGETARY AND STAFF IMPLICATIONS:** *(Please respond to each of the following questions.)*

1) Resources: **No new resources are needed (name change only)**.
    a. How does the unit intend to financially support this proposal?
    b. How will the unit create capacity or surplus to appropriately resource this program? If applicable, what functions or programs will the unit no longer support to create capacity?
    c. Will the unit need to seek campus or other external resources? If so, please provide a summary of the sources and an indication of the approved support.
    d. Please provide a letter of acknowledgment from the college that outlines the financial arrangements for the proposed program.

2) Resource Implications
    a. Please address the impact on faculty resources including the changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc.
    b. Please address the impact on course enrollment in other units and provide an explanation of discussions with representatives of those units. *(A letter of acknowledgement from units impacted should be included.)*
    c. Please address the impact on the University Library *(A letter of estimated impact from the University Librarian must be included for all new program proposals. If the impact is above and beyond normal library business practices, describe provisions for how this will be resourced.)*

d. Please address the impact on technology and space (e.g. computer use, laboratory use, equipment, etc.)

For new degree programs only:

3) Briefly describe how this program will support the University's mission, focus, and/or current priorities. Include specific objectives and measurable outcomes that demonstrate the program's consistency with and centrality to that mission.
4) Please provide an analysis of the market demand for this degree program. What market indicators are driving this proposal? What type of employment outlook should these graduates expect? What resources will be provided to assist students with job placement?
5) If this is a proposed graduate program, please discuss the programs intended use of waivers. If the program is dependent on waivers, how will the unit compensate for lost tuition revenue?

**DESIRED EFFECTIVE DATE:** Fall 2016 if possible; if not, Fall 2017.

**STATEMENT FOR PROGRAMS OF STUDY CATALOG[2]:** Systems Engineering and Design is a comprehensive, interdisciplinary program emphasizing interactions between parts of a whole. It brings together basic sciences, engineering analysis, and engineering design. The curriculum offers flexibility through the Secondary Field Option, while providing a broad background in engineering as a whole and decision-making that supports overall design. Systems Engineers understand how to coordinate interacting parts of whole and to evaluate engineering within economic and physical constraints.

Design experience and project management are emphasized and integrated across the core with a focus on establishing critical problem-solving skills applied across disciplines, strong communication skills, and the ability to work effectively and get results in a team environment.

The capstone experience for Systems Engineering and Design undergraduates is the Senior Project Course. Students work collaboratively with industry and a team of faculty members on a real-world problem during their final semester. The results are documented in a final written report and a formal presentation at the end of the semester to the company so that the student recommendations may be implemented.

**EXISTING GENERAL ENGINEERING STATEMENT FOR PROGRAMS OF STUDY CATALOG:** General Engineering is a comprehensive, interdisciplinary program emphasizing real-world problem solving through a unique orientation toward partnerships with industry. It brings together basic sciences, engineering sciences, and engineering design. The curriculum offers flexibility through the Secondary Field Option, while providing a broad background in mechanics and structures,

[2] A full Program of Study is attached.

control systems, and decision making that support a systems approach to engineering.

General Engineers understand how to apply business fundamentals to promote utilization of new technology, engage in entrepreneurship, and succeed in engineering and non-engineering careers. The curriculum emphasizes the integration of engineering and business principles, preparing students to apply both functions to bring a product from invention to market.

Design experience and project management are emphasized and integrated across the core with a focus on establishing critical problem-solving skills applied across disciplines, strong communication skills, and the ability to work effectively and get results in a team environment.

The capstone experience for General Engineering undergraduates is the Senior Project Course. Students work collaboratively with industry and a team of faculty members on a real-world problem during their final semester. The results are documented in a final written report and a formal presentation at the end of the semester to the company so that the student recommendations may be implemented.

**CLEARANCES:** *(Clearances should include signatures and dates of approval.* ***These signatures must appear on a separate sheet.*** *If multiple departments or colleges are sponsoring the proposal, please add the appropriate signature lines below.)*

Signatures:

Unit Representative: _____ Date: 10/20/2015

College Representative: _____ Date: 12/1/15

Graduate College Representative: _____ Date: 10/22/15

Council on Teacher Education Representative: _____ Date: _____

# Appendix A:
# (Proposed Curriculum Revisions)

*(Replace the following material with your appendix, if any.)*

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For example only, formats may vary.

| Current Requirements: | Current Hours | Revised Requirements: | Revised Hours |
|---|---|---|---|
| ***Major Core Requirement*** | | ***Major Core Requirement*** | |
| **XXXX 100 – Intro to XXXX** | 4 Hours | XXXX 100 – Intro to XXXX | 4 Hours |
| **XXXX 120 – Contemporary XXXX** | 3 Hours | XXXX 220 – Modern XXXX | 4 Hours |
| **Total Core Required Hours** | 7 Hours | **Total Core Required Hours** | 8 Hours |
| ***Elective Requirement*** | 12 Hours | ***Elective Requirement*** | 11 Hours |

# ~~General Engineering~~Systems Engineering and Design

## For the Degree of Bachelor of Science in ~~General Engineering~~Systems Engineering and Design

Systems Engineering and Design is a comprehensive, interdisciplinary program emphasizing interactions between parts of a whole. It brings together basic sciences, engineering analysis, and engineering design. The curriculum offers flexibility through the Secondary Field Option, while providing a broad background in engineering as a whole and decision-making that supports overall design. Systems Engineers understand how to coordinate interacting parts of a whole and to evaluate engineering within economic and physical constraints.

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The capstone experience for Systems Engineering and Design undergraduates is the Senior Project Course. Students work collaboratively with industry and a team of faculty members on a real-world problem during their final semester. The results are documented in a final written report and a formal presentation at the end of the semester to the company so that the student recommendations may be implemented.

## Overview of Curricular Requirements

The curriculum requires 128 hours for graduation and is organized as shown below.

Note: Technical grade point average requirements for graduation and advanced-level course registration are being considered for this curriculum. If added, these rules will be summarized at the College of Engineering's undergraduate advising website.

### Orientation and Professional Development

These courses introduce the opportunities and resources your college, department, and curriculum can offer you as you work to achieve your career goals. They also provide the skills to work effectively and successfully in the engineering profession.

| | | |
|---|---|---|
| ENG 100 | Engineering Orientation [1] | 0 |
| ~~GE~~SED 100 | Introduction to ISE [1] | 1 |
| ~~GE~~SED 390 | ~~General Engineering~~Systems Engineering and Design Seminar | 0 |

| | | |
|---|---|---|
| Total Hours | | 1 |

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

## Foundational Mathematics and Science

These courses stress the basic mathematical and scientific principles upon which the engineering discipline is based.

| | | |
|---|---|---|
| CHEM 102 | General Chemistry I | 3 |
| CHEM 103 | General Chemistry Lab I | 1 |
| MATH 221 | Calculus I [1] | 4 |
| MATH 231 | Calculus II | 3 |
| MATH 241 | Calculus III | 4 |
| MATH 285 | Intro Differential Equations | 3 |
| MATH 415 | Applied Linear Algebra | 3 OR 4 |
| PHYS 211 | University Physics: Mechanics | 4 |
| PHYS 212 | University Physics: Elec & Mag | 4 |
| PHYS 213 | Univ Physics: Thermal Physics | 2 |
| Total Hours | | 31 |

[1] *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.*

## ~~General Engineering~~Systems Engineering and Design Technical Core

These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of ~~general engineering~~Systems Engineering and Design.

| | | |
|---|---|---|
| CS 101 | Intro Computing: Engrg & Sci | 3 |
| ECE 110 | Introduction to Electronics | 1 TO 3 |
| ECE 211 | Analog Circuits & Systems | 2 |
| ~~GE~~SED 101 | Engineering Graphics & Design | 3 |
| ~~GE~~SED 261 | Business Side of Engineering | 1 |
| ~~GE~~SED 310 | ~~General Engineering~~Intro to Engineering Systems Design ~~Design~~ | 3 |
| ~~GE~~SED 311 | Engineering Design Analysis | 3 |
| ~~GE~~SED 312 | Instrumentation and Test Lab | 1 |
| ~~GE~~SED 320 | Control Systems | 4 |
| ~~GE~~SED 424 | State Space Design for Control | 3 |
| ~~GE~~SED 494 | Senior Engineering Project I | 3 |
| ~~GE~~SED 495 | Senior Engineering Project II | 2 |
| IE 300 | Analysis of Data | 3 |
| IE 310 | Operations Research | 3 |
| TAM 211 | Statics | 3 |
| TAM 212 | Introductory Dynamics | 3 |

| | | |
|---|---|---|
| TAM 251 | Introductory Solid Mechanics | 3 |
| TAM 335 | Introductory Fluid Mechanics | 4 |
| Total Hours | | 50 |

## Secondary Field Option Electives

These courses enable the student to tailor the studies to one's interests and career goals in both technical and nontechnical areas.

| | |
|---|---|
| Secondary field option electives selected from departmentally approved lists or by petition to the department. See the Secondary Field Options section below. | 12 |

## Technical Electives

The Systems Engineering and dDesign elective augments a student's knowledge in one or more subdisciplines of mechanics and structures, control systems, and decision making that support a systems approach to engineering. The engineering science elective extends the knowledge of that area.

| | |
|---|---|
| Systems Engineering and Design elective selected from the departmentally approved list of Systems Engineering and Design Electives. | 3 |
| Engineering science elective selected from the departmentally approved list of Engineering Science Electives. | 3 |
| Total Hours | 6 |

### Liberal Education

The liberal education courses develop students' understanding of human culture and society, build skills of inquiry and critical thinking, and lay a foundation for civic engagement and lifelong learning.

| | | |
|---|---|---|
| ECON 102 | Microeconomic Principles | 3 |
| or ECON 103 | Macroeconomic Principles | |
| Electives from the campus General Education social & behavioral sciences list. | | 3 |
| Electives from the campus General Education humanities & the arts list. | | 6 |
| Electives either from a list approved by the college, or from the campus General Education lists for social & behavioral sciences or humanities & the arts. | | 6 |
| Total Hours | | 18 |

Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course and (ii) one non-western/U.S. minority culture(s) course from the General Education cultural studies lists. Most students select liberal education courses that simultaneously satisfy these cultural studies requirements. Courses from the western and non-western lists that fall into free electives or other categories may also be used satisfy the cultural studies requirements.

### Composition

These courses teach fundamentals of expository writing.

| | | |
|---|---|---|
| RHET 105 | Writing and Research | 4 |
| Advanced Composition (satisfied by completing the combination ~~GE~~SED 494 + ~~GE~~SED 495 in the ~~General Engineering~~Systems Engineering and Design Technical Core) | | |
| Total Hours | | 4 |

### Free Electives

These unrestricted electives, subject to certain exceptions as noted at the College of Engineering advising website, give the student the opportunity to explore any intellectual area of unique interest. This freedom plays a critical role in helping students to define research specialties or to complete minors.

| | |
|---|---|
| Free electives. Additional unrestricted course work, subject to certain exceptions as noted at the College of Engineering advising Web site, so that there are at least 128 credit hours earned toward the degree. | 6 |

## Secondary Field Options

Secondary field options are of two types: preapproved and customized. Preapproved secondary fields have designated titles and a specified list of courses, from which several may be selected. Approval for the substitution of a course for one on the specified list may be requested via a petition form submitted to the department. Customized secondary fields may be created to achieve goals in areas not provided by preapproved fields. To do this, a suitable title and all the courses must be petitioned for acceptance by the department. Petition approval is based on the merit of the secondary field and the coherence of the courses within it relative to the student's goals.

Pursuit of campus minors, dual degrees, and James Scholar contracts may be integrated with customized secondary field options. Courses taken may be applied to minors, dual degrees, or contracts as well as secondary field options.

### Preapproved Secondary Fields

Preapproved secondary fields are listed below. Approved courses for each are specified at the department's secondary field website. The following course substitutions may be used interchangeably to comply with prerequisites of specified courses in some of the secondary fields:

- CEE 202, IE 300, STAT 400
- CEE 201, IE 310
- MSE 406, CEE 300

- ECE 486, ~~GESED~~ 320, ME 340

Students may petition to the department for inclusion of a course in the secondary fields listed below. The most likely classes to be accepted are nonpermanent and experimental offerings relevant to the various fields. A current list of these may be found at the department's secondary field website.

- Automotive Engineering
- Bioengineering[1]
- Business Systems Integration and Consulting
- Civil Engineering Structures
- Communications and Computer Systems
- ~~Computer-Aided Design and Manufacturing (CAD/CAM)~~
- Computer Science[1]
- Construction
- Control Systems
- Digital Prototyping
- Engineering Administration
- Engineering Marketing
- Environmental Quality
- Manufacturing Engineering[1]
- Nondestructive Testing and Evaluation
- Operations Research
- Quality Control
- Rehabilitation Engineering
- Robotics
- Theoretical and Applied Mechanics

[1] *Students fulfilling the corresponding Campus Minor may simultaneously complete the requirements of this* ~~*General Engineering*~~*Systems Engineering and Design secondary field option.*

## Customized Secondary Fields

Customized secondary fields differ from preapproved ones in that no sets of specified courses to choose from have been predefined. For all customized secondary field options, a course list must be constructed and submitted for approval by the department.

The following list contains examples of over sixty titles of customized secondary field options which have been approved. The complete list may be found at the department's secondary field website. Additional titles beyond those listed may be proposed.

- A foreign language (several)
- An engineering discipline (several)
- Audio Engineering
- Economics

- Entrepreneurship
- Finance
- 
- Fluid Dynamics
- International Business
- Mathematics
- ~~Military Science~~
- Pre-Law
- Pre-Med
- ~~Religious Studies~~
- Renewable Energy

## Suggested Sequence

The schedule that follows is illustrative, showing the typical sequence in which courses would be taken by a student with no college course credit already earned and who intends to graduate in four years. Each individual's case may vary, but the position of required named courses is generally indicative of the order in which they should be taken.

| | **First Year** | |
|---|---|---|
| | **First Semester** | **Hours** |
| CHEM 102 | General Chemistry I | 3 |
| CHEM 103 | General Chemistry Lab I | 1 |
| Liberal education elective[3] | | 3 |
| ENG 100 | Engineering Orientation | 0 |
| ~~GE~~SED 100 | Introduction to ISE | 1 |
| ~~GE~~SED 101 or RHET 105[1] | Engineering Graphics Design | 3-4 |
| MATH 221[2] | Calculus I | 4 |
| | Semester Hours | 15-16 |
| | **Second Semester** | |
| ECE 110 | Introduction to Electronics | 1 TO 3 |
| PHYS 211 | University Physics: Mechanics | 4 |
| MATH 231 | Calculus II | 3 |
| CS 101 | Intro Computing: Engrg Sci | 3 |
| RHET 105 or ~~GE~~SED 101[1] | Writing and Research | 4-3 |
| | Semester Hours | 17-16 |
| | **Second Year** | |
| | **First Semester** | |
| ~~GE~~SED 261 | Business Side of Engineering | 1 |
| MATH 241 | Calculus III | 4 |

| | | |
|---|---|---|
| PHYS 212 | University Physics: Elec Mag | 4 |
| TAM 211 | Statics | 3 |
| Liberal education elective[3] | | 3 |
| | Semester Hours | 15 |
| | **Second Semester** | |
| IE 300 | Analysis of Data | 3 |
| MATH 285 | Intro Differential Equations | 3 |
| PHYS 213 | Univ Physics: Thermal Physics | 2 |
| TAM 212 | Introductory Dynamics | 3 |
| TAM 251 | Introductory Solid Mechanics | 3 |
| Liberal education elective[3] | | 3 |
| | Semester Hours | 17 |
| | **Third Year** | |
| | **First Semester** | |
| ECE 211 | Analog Circuits Systems | 2 |
| ~~GE~~SED 310 | ~~General Engineering~~Systems Engineering and Design Design | 3 |
| ~~GE~~SED 320 | Control Systems | 4 |
| MATH 415 | Applied Linear Algebra | 3 OR 4 |
| Secondary field option elective[4] | | 3 |
| | Semester Hours | 15 |
| | **Second Semester** | |
| ~~GE~~SED 311 | Engineering Design Analysis | 3 |
| Secondary field option elective[4] | | 3 |
| Liberal education elective[3] | | 3 |
| ~~GE~~SED 312 | Instrumentation and Test Lab | 1 |
| ~~GE~~SED 390 | ~~General Engineering~~Systems Engineering and Design Seminar | 0 |
| ~~GE~~SED 424 | State Space Design for Control | 3 |
| IE 310 | Operations Research | 3 |
| | Semester Hours | 16 |
| | **Fourth Year** | |
| | **First Semester** | |
| Liberal education elective[3,5] | | 3-5 |
| OR | | |
| ~~GE~~SED 494 & ~~GE~~SED 495[6] | | |
| TAM 335 | Introductory Fluid Mechanics | 4 |
| ~~Design elective~~Systems Engineering and Design elective[7] | | 3 |
| Engineering science elective[8] | | 3 |
| Secondary field option elective[4] | | 3 |
| | Semester Hours | 16-18 |

**Second Semester**

| | | |
|---|---|---|
| ~~GE~~SED 494 & ~~GE~~SED 495[5,6] | Senior Engineering Project I | 5-3 |
| OR | | |
| Liberal education elective[3] | | |
| Secondary field option elective[4] | | 3 |
| Liberal education elective[3] | | 3 |
| Free electives | | 6 |
| | Semester Hours | 17-15 |
| | Total Hours: | 128 |

[1] *RHET 105 may be taken in the first or second semester of the first year as authorized. The alternative is ~~GE~~SED 101.*

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

[3] *Liberal education electives must include 6 hours of social & behavioral sciences and 6 hours of humanities & the arts course work from the campus General Education lists. ECON 102 or ECON 103 must be one of the social & behavioral sciences courses, highly recommended before the fourth semester. The remaining 6 hours may be selected from a list maintained by the college, or additional course work from the campus General Education lists for social & behavioral sciences or humanities & the arts. Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course and (ii) one non-western/U.S. minority culture(s) course from the General Education cultural studies lists. Most students select liberal education courses that simultaneously satisfy these cultural studies requirements. Courses from the western and non-western lists that fall into free electives or other categories may also be used satisfy the cultural studies requirements.*

[4] *Selected from the departmentally approved lists of Secondary Field Option Electives or by petition to the department.*

[5] *~~GE~~SED 494 and ~~GE~~SED 495 may be taken in the first or second semester of the fourth year as authorized. The alternative is a liberal education elective.*

[6] *Combination satisfies the General Education Advanced Composition requirement.*

[7] *Selected from the departmentally approved list of Systems Engineering and Design Electives.*

[8] *Selected from the departmentally approved list of Engineering Science Electives.*

Table 1. Comparison of Systems Engineering Programs

| | | | SYSTEMS ENGINEERING PROGRAMS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | UIUC GE | | George Mason | | U Ark (LR) | | Arizona | | UNC Charlotte | | U Virginia | | # Schools | |
| Courses / Sequences | Course | # Hours | #C | #H | #C | #H | #C | #H | #C | #H | #C | #H | | UIUC Course Titles |
| Math | 5 | 17 | 5 | 17 | 5 | X | 5 | 16 | 5 | 15 | 4 | 15 | 11 | Calc I-III, Lin Alg, Diff Eq |
| Physics | 3 | 10 | 2 | 8 | 2 | X | 2 | 8 | 2 | 8 | 2 | 8 | 11 | Phys I-III (Mech, E+M, Thermo) |
| Chemistry | 1 | 4 | - | - | 1 | X | 2 | 8 | 1 | 4 | 1 | 4 | 10 | Chem I |
| Operations Research | 1 | 3 | 2 | 6 | 1 | X | 2 | 6 | 2 | 6 | 2 | 6 | 11 | Operations Research |
| Data (Prob/Stats) | 1 | 3 | 2 | 6 | 1 | X | 1 | 3 | 1 | 3 | 2 | 6 | 11 | Analysis of Data |
| Sr Design | 2 | 5 | 2 | 6 | 2 | X | 2 | 6 | 2 | 4 | 2 | 6 | 11 | Senior Engineering Project |
| Computer Science | 1 | 3 | 2 | 7 | 1 | X | 1 | 3 | - | - | 1 | 3 | 10 | Prog I |
| Simulation | - | - | 1 | 3 | 1 | X | 1 | 3 | 1 | 3 | 1 | 4 | 10 | |
| Systems*** | - | - | 5 | 16 | 1 | X | 3 | 9 | 3 | 6 | 2 | 6 | 10 | |
| Eng Bus/Econ | 2 | 4 | - | - | 1 | X | 1 | 3 | 1 | 3 | - | - | 9 | Business Side of Eng, Micro/Maco Econ |
| Hum Fac / Ergonomics | - | - | 1 | 3 | - | - | 1 | 3 | - | - | 1 | 3 | 8 | |
| Sys/Proj Management | - | - | 2 | 6 | 1 | X | - | - | 1 | 3 | - | - | 8 | |
| Electrical/Computer Eng | 2 | 6 | - | - | 1 | X | 1 | 3 | - | - | - | - | 8 | Intro, Analog Cicruits |
| DOE / Quality Control | - | - | - | - | - | - | 1 | 3 | 2 | 3 | - | - | 7 | |
| TAM Mechanics | 4 | 13 | - | - | - | - | - | - | - | - | - | - | 6 | Statics, Dynamics, Solid Mech, Fluids |
| Mfg / SC / Logistics | - | - | - | - | - | - | - | - | - | - | - | - | 5 | |
| Decision/Risk Analysis | - | - | 1 | 3 | 1 | X | - | - | 1 | 3 | - | - | 8 | |
| Prod Plan / Fac / Inv | - | - | - | - | - | - | - | - | 1 | 3 | - | - | 6 | |
| Embedded/Software Sys | - | - | - | - | - | - | 1 | 3 | - | - | 1 | 3 | 7 | |
| Eng. Graphics | 1 | 3 | - | - | - | - | 1 | 3 | - | - | - | - | 7 | Eng Graphics |
| Public Speaking | - | - | 1 | 3 | - | - | - | - | - | - | - | - | 6 | |
| Reliability | - | - | - | - | - | - | - | - | - | - | - | - | 5 | |
| Comp/Num Methods | - | - | - | - | - | - | - | - | 2 | 6 | - | - | 6 | |
| Work Measurement | - | - | - | - | - | - | - | - | - | - | - | - | 5 | |
| Spreadsheet Apps | - | - | - | - | - | - | - | - | - | - | - | - | 5 | |
| Cognitive Systems | - | - | - | - | - | - | - | - | - | - | - | - | 5 | |
| GE Mechanical Design | 2 | 8 | - | - | - | - | - | - | - | - | - | - | 6 | GE Design, Eng Design Analysis |
| Control Systems | 2 | 7 | - | - | - | - | - | - | - | - | - | - | 6 | Controls, State Space |
| Data/Information Eng. | - | - | - | - | - | - | - | - | - | - | 1 | 3 | 6 | |
| Lin. Stat. Modeling | - | - | - | - | - | - | - | - | - | - | 1 | 3 | 6 | |
| Marketing | - | - | - | - | - | - | - | - | - | - | - | - | 5 | |
| Operations Planning | - | - | - | - | - | - | - | - | - | - | - | - | 5 | |
| Accounting | - | - | - | - | - | - | - | - | - | - | - | - | 5 | |
| Electives (non-SFO) | 2 | 6 | - | - | - | - | 1 | 3 | 4 | 12 | 4 | 12 | 9 | |
| SFO** | varies | 12 | 3 | 9 | 14 | 40* | 6 | 18 | 4 | 12 | 3 | 9 | 11 | |
| Total Represented Hours | | 104 | | 93 | | 0 | | 101 | | 94 | | 91 | | |

* - Four Different and Extenstive Options are Available (Computer, Telecommunications, Electrical, Mechanical)
** - Not always possible to tell if electives are required to be "packaged" as similar to SFO
*** - General "Systems" courses

Systems Sequences:

George Mason
- Understanding Sys Eng
- Systems Design
- Dynamical Systems I+Lab
- Dynamical Systems II
- Systems Methods

SPSU
- Systems Analysis and Design
- Contemporary Technological Systems

UNC Charlotte:
- Systems Engineering Concepts
- System Design and Deployment
- Total Quality Systems

U Virginia:
- Systems Engineering Concepts
- Systems Evaluation

Arizona:
- Intro to Systems and Industrial Eng
- Mathematical Foundations of Sys. Ind. Eng
- The Systems Engineering Process

U Arkansas (Little Rock): Systsems Engineering Design and Analysis

U Minn: Foundations of Ind. Sys. Eng.

Table 2. Comparison of Industrial and Systems Engineering Programs

| INDUSTRIAL AND SYSTEMS ENGINEERING PROGRAMS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | U Florida | | U Minn | | Ohio State | | Auburn | | # Schools | |
| Courses / Sequences | #C | #H | #C | #H | #C | #H | #C | #H | | UIUC Course Titles |
| Math | 5 | 19 | 4 | 16 | 4 | 16 | 5 | 18 | 11 | Calc I-III, Lin Alg, Diff Eq |
| Physics | 2 | 8 | 2 | 8 | 2 | 10 | 2 | 8 | 11 | Phys I-III (Mech, E+M, Thermo) |
| Chemistry | 1 | 4 | 1 | 4 | - | 4 | 1 | 4 | 10 | Chem I |
| Operations Research | 2 | 8 | 3 | 12 | 2 | 6 | 2 | 6 | 11 | Operations Research |
| Data (Prob/Stats) | 2 | 6 | 1 | 4 | 1 | 3 | 2 | 7 | 11 | Analysis of Data |
| Sr Design | 1 | 3 | 1 | 4 | 1 | 4 | 1 | 3 | 11 | Senior Engineering Project |
| Computer Science | 1 | 3 | 1 | 4 | 1 | 3 | 1 | 2 | 10 | Prog I |
| Simulation | 1 | 3 | 1 | 4 | 1 | 4 | 1 | 3 | 10 | |
| Systems*** | - | - | 1 | 4 | - | - | - | - | 10 | |
| Eng Bus/Econ | 3 | 11 | 1 | 4 | 1 | 2 | 1 | 3 | 9 | Business Side of Eng, Micro/Maco Econ |
| Hum Fac / Ergonomics | - | - | 1 | 4 | 1 | 3 | 1 | 3 | 8 | |
| Sys/Proj Management | - | - | 1 | 4 | 1 | 3 | - | - | 8 | |
| Electrical/Computer Eng | 1 | 3 | - | - | - | - | 1 | 3 | 8 | Intro, Analog Cicruits |
| DOE / Quality Control | 1 | 3 | - | - | 1 | 3 | 1 | 3 | 7 | |
| TAM Mechanics | 3 | 9 | - | - | 1 | 4 | - | - | 6 | Statics, Dynamics, Solid Mech, Fluids |
| Mfg / SC / Logistics | | 6 | - | - | 1 | 3 | 2 | 6 | 5 | |
| Decision/Risk Analysis | - | - | - | - | - | - | - | - | 8 | |
| Prod Plan / Fac / Inv | 3 | 10 | 1 | 4 | 1 | 4 | - | - | 6 | |
| Embedded/Software Sys | 1 | 3 | - | - | - | - | - | - | 7 | |
| Eng. Graphics | 1 | 3 | - | - | - | - | - | - | 7 | Eng Graphics |
| Public Speaking | - | - | - | - | - | - | - | - | 6 | |
| Reliability | - | - | 1 | 4 | - | - | - | - | 5 | |
| Comp/Num Methods | - | - | - | - | 1 | 3 | - | - | 6 | |
| Work Measurement | - | - | - | - | 1 | 2 | 1 | 3 | 5 | |
| Spreadsheet Apps | 1 | 4 | - | - | - | - | 1 | 3 | 5 | |
| Cognitive Systems | - | - | - | - | 1 | 3 | - | - | 5 | |
| GE Mechanical Design | - | - | - | - | - | - | - | - | 6 | GE Design, Eng Design Analysis |
| Control Systems | - | - | - | - | - | - | - | - | 6 | Controls, State Space |
| Data/Information Eng. | - | - | - | - | - | - | - | - | 6 | |
| Lin. Stat. Modeling | - | - | - | - | - | - | - | - | 6 | |
| Marketing | - | - | 1 | 3 | - | - | - | - | 5 | |
| Operations Planning | - | - | - | - | - | - | 1 | 3 | 5 | |
| Accounting | 1 | 3 | - | - | - | - | - | - | 5 | |
| Electives (non-SFO) | - | - | - | - | 3 | 9 | 3 | 9 | 9 | |
| SFO** | 3 | 9 | 5 | 15 | 3 | 9 | 2 | 6 | 11 | |
| Total Represented Hours | 118 | | 98 | | 98 | | 93 | | | |

**UIUC General EngineeringCurriculum**

*ORIENTATION AND PROFESSIONAL DEVELOPMENT*

| Course Title | Course Num | Hours |
|---|---|---|
| Eng Orientation | ENG 100 | 0 |
| Intro to ISE | GE 100 | 0 |
| GE Seminar | GE 390 | 0 |
| | TOTAL: | 0 |

*FOUNDATIONAL MATHEMATICS AND SCIENCE*

| Course Title | Course Num | Hours |
|---|---|---|
| General Chem I | CHEM 102 | 3 |
| Gen Chem Lab I | CHEM 103 | 1 |
| Calculus I | MATH 221 | 4 |
| Calculus II | MATH 231 | 3 |
| Calculus III | MATH 241 | 4 |
| Intro Diff Eq | MATH 285 | 3 |
| App Lin Alg | MATH 415 | 3 |
| Phys: Mech | PHYS 211 | 4 |
| Phys: Elec/Mag | PHYS 212 | 4 |
| Phys: Themal | PHYS 213 | 2 |
| | TOTAL: | 31 |

*GENERAL ENGINEERING TECHNICAL CORE*

| Course Title | Course Num | Hours |
|---|---|---|
| Intro CS | CS 101 | 3 |
| Intro ECE | ECE 110 | 4 |
| Analog Circ/Sys | ECE 211 | 2 |
| Eng Graphics | GE 101 | 3 |
| Business Side of Eng | GE 261 | 1 |
| Gen Eng Design | GE 310 | 3 |
| Eng Design Analysis | GE 311 | 3 |
| Instr and Test Lab | GE 321 | 1 |
| Control Systems | GE 320 | 4 |
| State Space Controls | GE 424 | 3 |
| Sr Eng Proj I | GE 494 | 3 |
| Sr Eng Proj II | GE 495 | 2 |
| Analysis of Data | IE 300 | 3 |
| Oper Res | IE 310 | 3 |
| Statics | TAM 211 | 3 |
| Intro Dynamics | TAM 212 | 3 |
| Intro Solid Mech | TAM 251 | 3 |
| Intro Fluid Mech | TAM 335 | 4 |
| | TOTAL: | 51 |

*SECONDARY FIELD OPTION ELECTIVES*

| Course Title | Course Num | Hours |
|---|---|---|
| varies | varies | 12 |
| | TOTAL: | 12 |

*TECHNICAL ELECTIVES*

| Course Title | Course Num | Hours |
|---|---|---|
| Design Elective | varies | 3 |
| Eng Sci Elective | varies | 3 |
| | TOTAL: | 6 |

*LIBERAL EDUCATION*

| Course Title | Course Num | Hours |
|---|---|---|
| Economics | ECON 102 or 103 | 3 |
| Soc/Beh Sci | varies | 3 |
| Hum/Arts | varies | 6 |
| Other | varies | 6 |
| | TOTAL: | 18 |

*COMPOSITION*

| Course Title | Course Num | Hours |
|---|---|---|
| Principles of Comp | RHET 105 | 4 |
| Adv Comp (satisfied) | GE 494/495 | 0 |
| | TOTAL: | 4 |

FREE ELECTIVES

| Course Title | Course Num | Hours |
|---|---|---|
| varies | varies | 6 |
| | TOTAL: | 6 |
| | | |
| | OVERALL HRS: | 128 |

**UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN**
**AEROSPACE ENGINEERING DEPARTMENT**
104 South Wright Street, 306 Talbot Lab., MC-236
Urbana, Illinois 61801-2935

Philippe H. Geubelle
Bliss Professor and Head
Aerospace Engineering
Director of Illinois Space Grant Consortium
Office: 306F Talbot Laboratory

Telephone: (217) 244-7648
FAX: (217) 244-0720
www.ae.illinois.edu/~geubelle/
www.ae.illinois.edu/ISGC/
geubelle @ illinois.edu

September 11, 2015

Dean Andreas Cangellaris, Chair
College of Engineering Executive Committee
Engineering Hall

Dear Andreas,

The Department of Industrial and Enterprise Systems Engineering (ISE) is in the process of renaming its BS in General Engineering degree to BS in Systems Engineering and Design. We believe that this will position the ISE Department and also the College of Engineering in a way to more favorably take advantage of the opportunities in the future.

Since the proposed degree name has likely to some interaction with the degrees in the Department of Aerospace Engineering, I am writing to support the proposal.

The General Engineering degree was started in 1921, and, while it has strong educational appeal in training engineers with broad skills, the current landscape of engineering education puts the name "General Engineering" at a disadvantage. Systems Engineering is a more contemporary term and it emphasizes dealing with complexity as well as the integration of multiple engineering disciplines. The term "General Engineering" conveys the presence of multiple disciplines, but does not adequately convey that these disciplines are in fact intertwined and need to applied in a principled way to design and operate complex engineered systems.

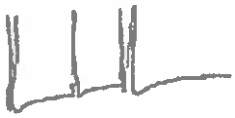
Aircraft and spacecraft are some of the most complex man-made systems. We therefore believe that systems science and systems thinking are important for aerospace engineers to study. Systems engineering concepts are discussed in our capstone senior design courses. A few years ago, we also created a certificate in Aerospace Systems Engineering as part of our coursework-only MS program.

Problem solving and decomposition skills and synthesis are essential for all engineers. We believe that most engineering departments cover analysis and synthesis for their domains, and their enrollments will not be affected by the GE degree name change. ISE's Systems Engineering and Design degree will continue to emphasize engineering design and control systems while affording students to determine their own secondary field option.

Since the GE degree has a significant amount of design content in its curriculum, the modifier of Systems Engineering and Design is apropos. The ISE department covers the first course in computer aided design for a number of majors in the college.

In summary, I am enthusiastically supportive of the name change proposal and believe this is in the best interest of ISE, College of Engineering and the Aerospace Engineering Department.

Sincerely,



Philippe Geubelle
Bliss Professor and Head
Aerospace Engineering

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

**Department of Bioengineering**
College of Engineering
1270 Digital Computer Laboratory, MC-278
1304 West Springfield Avenue
Urbana, IL 61801

September 8, 2015

Dean Andreas Cangellaris, Chair
College of Engineering Executive Committee
Engineering Hall

Dear Andreas,

The Department of Industrial and Enterprise Systems Engineering (ISE) is in the process of renaming its BS in General Engineering degree to BS in Systems Engineering and Design. We believe that this will position the ISE Department and also the College of Engineering in a way to more favorably take advantage of the opportunities in the future.

Since the proposed degree name has likely to some interaction with the degrees in the Bioengineering department, I am writing to enthusiastically support the proposal.

The General Engineering degree was started in 1921, and, while it has strong educational appeal in training engineers with broad skills, the current landscape of engineering education puts the name "General Engineering" at a disadvantage. Systems Engineering is a more contemporary term and it emphasizes dealing with complexity as well as the integration of multiple engineering disciplines. The term "General Engineering" conveys the presence of multiple disciplines, but does not adequately convey that these disciplines are in fact intertwined and need to be applied in a principled way to design and operate complex engineered systems.

Our Department of Bioengineering deals with biological and biomedical systems – systems engineering applied to biology and medicine. We still believe that systems science and systems thinking are important for engineers to study. Since most natural and man-made systems are complex, the problem solving and decomposition skills and synthesis are essential for all engineers and for bioengineers. We believe that most engineering departments cover analysis and synthesis for their domains, and their enrollments will not be affected by the GE degree name change. ISE's Systems Engineering and Design degree will continue to emphasize engineering design and control systems while affording students to determine their own secondary field option.

Since the GE degree has a significant amount of design content in its curriculum, the modifier of Systems Engineering and Design is apropos. The ISE department covers the first course in computer aided design for a number of majors in the college.

*Telephone* 217-333-1867 *Web* bioengineering.illinois.edu *Email* bioengineering@illinois.edu

In summary, I am enthusiastically supportive of the name change proposal and believe this is in the best interest of ISE, College of Engineering and the department of bioengineering supports it.

Sincerely,

Rashid Bashir, Ph.D.

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Office of the Provost and Vice Chancellor
for Academic Affairs

Swanlund Administration Building
601 East John Street
Champaign, IL 61820

December 11, 2015

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

Dear Professor Francis:

Enclosed is a copy of a proposal from the College of Engineering to rename the Bachelor of Science in General Engineering.

Sincerely,

Kathryn A. Martensen
Assistant Provost

Enclosures

c: K. Pitts
A. Waranyuwat
R. Nagi

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

College of Engineering

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



December 1, 2015

Kristi Kuntz
Assistant Provost
217 Swanlund Administration Building
MC-304

Via: Andreas Cangellaris, Engineering College

Dear Provost Kuntz:

The College of Engineering Executive Committee has reviewed and approved the followingproposal name change:

**Proposal to Rename: The General engineering Degree to"Systems Engineering and Design"**

Attached is a copy of the request.

Sincerely yours,

Rohit Bhargava

Rohit Bhargava, Vice Chair
Executive Committee

Approval Recommended:

12-1-2015

Andreas Cangellaris, Dean
College of Engineering

Date

c: Kevin Pitts
Adva Waranyuwat
Rakesh Nagi

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

# Senate Educational Policy Committee
# Proposal Check Sheet

**PROPOSAL TITLE** (Same as on proposal): _____

**PROPOSAL TYPE** (select all that apply below):

A. ☒ Proposal for a NEW or REVISED degree program. Please consult the Programs of Study Catalog for official titles of existing degree programs.

1. Degree program level:

   ☐ Graduate ☐ Professional ☐ Undergraduate

2. ☐ Proposal for a new **degree** (e.g. B.S., M.A. or Ph.D.):

   Degree name, "*e.g., Bachelor of Arts or Master of Science*": _____

3. ☐ Proposal for a new or revised **major, concentration, or minor**:

   ☐ New or ☐ Revised **Major** in (name of existing or proposed major): _____

   ☐ New or ☐ Revised **Concentration** in (name of existing or proposed concentration): _____

   ☐ New or ☐ Revised **Minor** in (name of existing or proposed minor): _____

4. ☐ Proposal to rename an existing major, concentration, or minor:

   ☐ Major ☐ Concentration ☐ Minor

   Current name: _____

   Proposed new name: _____

5. ☐ Proposal to terminate an existing degree, major, concentration, or minor:

   ☐ Degree ☐ Major ☐ Concentration ☐ Minor

   Name of existing degree, major, or concentration: _____

6. ☐ Proposal involving a multi-institutional degree:

   ☐ New ☐ Revision ☐ Termination

   Name of existing Illinois (UIUC) degree: _____

   Name of non-Illinois partnering institution: _____

Location of non-Illinois partnering institution:

☐ State of Illinois ☐ US State: _____ ☐ Foreign country: _____

B. ☐ Proposal to create a new academic unit (college, school, department, program or other academic unit):

Name of proposed new unit: _____

C. ☐ Proposal to rename an existing academic unit (college, school, department, or other academic unit):

Current name of unit: _____

Proposed new name of unit: _____

D. ☐ Proposal to reorganize existing units (colleges, schools, departments, or program):

1. ☐ Proposal to change the status of an existing and approved unit (e.g. change from a program to department)

   Name of current unit including status: _____

2. ☐ Proposal to transfer an existing unit:

   Current unit's name and home: _____

   Proposed new home for the unit: _____

3. ☐ Proposal to merge two or more existing units (e.g., merge department A with department B):

   Name and college of unit one to be merged: _____

   Name and college of unit two to be merged: _____

   Proposed name and college of new (merged) unit: _____

4. ☐ Proposal to terminate an existing unit:

   Current unit's name and status: _____

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

Nature of the proposal: _____

Revised 10/2012