Engineering Faculty Council
Meeting Agenda
October 25, 2016
11:00 a.m.
101F Hammond Building (large conference room in Dean’s Suite)

1. Approval of minutes for the meeting of September 20, 2016
2. Dean’s Report (Peter Butler for Amr Elnashai)
3. Associate Dean for Research Initiatives (George Lesieutre)
4. Updates from Undergraduate Studies Committee (Chris Giebink)
5. Updates from Graduate Studies Committee (Esther Gomez)
6. Updates from Engineering Technology Committee (Engr Tech Chair)
7. Updates from Faculty Senate (Engineering Senator)
8. Other Business
Engineering Faculty Council

Meeting Minutes
September 20, 2016
11:00 a.m.
101F Hammond Building (large conference room in Dean’s Suite)

Present: Atchley, Butler, Derby, Flaska, Giebink, Kulkarni, Masters, Obonyo, Palacios, Parkinson, Pang, Said, Sallis, Stoffels, Tan, Wolfe

1. Approval of minutes for the meeting of August 23, 2016
   Unanimously approved.

2. Dean’s Report (Atchley)
   • Upcoming faculty/staff town halls. Will discuss results of the recent engaged climate survey.
   • Implementation of new process involving a college-level committee for fixed-term promotion decisions.
   • COE strategic plan completed and sent to University; substantial alignment with University strategic plan.
   • Peter Butler delivered a report on entrance to major considerations, including benchmarking of peer institutions and consideration of the impact resulting from potential changes. Next steps will involve following up with University-level offices (e.g. admissions) for their reaction to proposed changes.
   • Discussion regarding the voluntary retirement program put out by the university. Considered problematic for COE, with ~80 faculty eligible out of 262 total potentially leaving a large personnel gap; additionally, money saved is not retained by the college. COE will opt to stay with current published guidelines regarding early retirement.

3. Updates from Undergraduate Studies Committee (Chris Giebink) – no items to report.

4. Updates from Graduate Studies Committees (Esther Gomez) – no items to report.
   • Discussion regarding move by the Graduate School to revise the definitions between 500 and 800-level courses, essentially the distinction between courses for research and professional degrees. Could have significant ramifications for the college; target date for a vote is scheduled on Oct. 20th by the Graduate Council Joint Curricular Committee

5. Updates from Engineering Technology Committee (Engr Tech Chair)
   None.

6. Updates from Faculty Senate (Doug Wolfe)
   Updates from meeting on Sept. 6; next meeting is Oct. 18.
   Items of discussion:
   • Continuing efforts to correct LionPath problems.
   • Discussion over making better utilization of the medical center in Hershey.
   • Faculty Affairs committee is examining changes to titles.
   • Efforts aimed at simplifying/combining compliance training for new hires.
   • Student panel presented on approaches for more effective faculty engagement in diversity efforts.
   • Updates on proposal by UPUA for smoke-free University Park Campus.

7. Other Business
<table>
<thead>
<tr>
<th>Course</th>
<th>Type and Description of Change</th>
<th>Description or Rationale for Curricular Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE 463 - Daylight Analysis of Roman Architecture</td>
<td>CHANGE: course renumbering</td>
<td>Solar geometry, building orientation and form, daylight design methods, characterization of interior and exterior lighting conditions. Offered in Rome. Analysis of Roman architecture from the perspective of daylight. Topics include solar geometry; building orientation and form; daylight design methods including toplighting and sidelighting strategies; illuminance meters; characterization of interior and exterior lighting conditions; site visits. Course includes development of a software tool to compute solar geometry and daylight availability for any location on the globe and for clear, overcast, and cloudy sky conditions. The software tool will also run in reverse, providing time of day and year when the sun is in a desired position for any latitude and longitude. Offered on location in Rome. A change to course number is being proposed to have a better sequencing of courses.</td>
</tr>
<tr>
<td>AE 468 - Advanced Building Electrical and Communication Systems</td>
<td>ADD: permanent course number</td>
<td>Special Building Electrical and Communication Systems is an elective course within the architectural engineering program. It addresses specialized components and analysis of building electrical systems, cost and availability of electrical energy, and power quality. Students will also develop an a more in-depth understanding of alternative electrical sources, the National Electric Code, advanced design issues of electrical systems, as well as other electrical and building communication issues. In addition, part of the course will focus on the fundamentals of special systems typically included within the electrical discipline scope of work such as fire alarm, access control, surveillance, voice, video and data systems. Upon completion of this course, students will be able to explain the fundamentals of special electrical and communication systems within a building.</td>
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</tbody>
</table>
The objective of A E 472 is to introduce students in the construction management option of the Architectural Engineering program to the process in which building construction contractors acquire building projects, and the range of services typically provided on these projects. Upon completion of this course, students will have a working understanding of the preconstruction process and methods of acquiring negotiated work in building construction. They will be capable of assembling estimates, schedules, cash-flow curves, and site plans for building projects, and will have a working knowledge of competitive presentation strategies and develop professional presentation skills.

The content of the course centers upon the process in which companies plan for and acquire projects as construction managers and general contractors. Specific topics include schematic estimating and scheduling, design coordination of structural, architectural, and mechanical systems, value engineering processes, and site planning. The financial aspects of construction work are also presented, including project financing, cash flow, and accounting. A significant portion of the course is also devoted to the development of strategic and competitive business presentation, including risk assessment, fee structure, team dynamics, and technical presentation skills.

The class relies heavily upon the application of all content by students in the context of a team project. The project involves the distribution of a "Request for Proposal" for which students prepare a competitive proposal for an actual building construction project planned on the Penn State University Campus. Class activities include the presentation of key issues followed by in-class or independent exercises to reinforce themes and strategies to be applied in the project proposal. Students are assessed on their performance on discussion quizzes, independent exercises, class participation, a team presentation, and exams.

While doing a curriculum review it was identified that the courses need to be sequenced so AE 475 came before AE 472 due to the reliance on the material, but the prerequisite was listed as semester standing. Students will need the content from AE 475 to be successful in AE 472.
<table>
<thead>
<tr>
<th><strong>CE 435 - Foundation Engineering</strong></th>
<th>CHANGE: prerequisites</th>
</tr>
</thead>
</table>
| Submitted by: Ming Xiao          | CE 435 provides students with a working knowledge of the state-of-practice of foundation engineering, covering bearing capacity, settlement, and structural design of shallow foundations; lateral earth pressure; design of retaining and sheet-pile walls; and an introduction to deep foundations. The course is an elective for students in the civil engineering major and serves as an essential prerequisite for continued study in the areas of construction and structural engineering. The course concentrates on practice oriented design problems in foundation engineering.  

The proposed change is to remove the pre- and concurrent requisite of CE341 Design of Concrete Structure. Since CE 435 has focused on the geotechnical aspect of the foundation design, structural analysis has not been covered and required in CE 435.  

Students who have not taken CE 341 can understand the CE 435 material and achieve the course objectives of CE 435. |

<table>
<thead>
<tr>
<th><strong>ENGR 460 - Teaching Intern Seminar</strong></th>
<th>ADD: Permanent Course Number</th>
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</thead>
<tbody>
<tr>
<td>Submitted by: Tom Litzinger</td>
<td>This course prepares students for the responsibilities involved in serving as Teaching Interns in the College of Engineering. Topics addressed in the course include: Individual differences and implication for learning, preparing for and conducting office hours, grading and assessment, instructional design, effective teaching practices, and faculty careers. Findings from research on how people learn and strategies for increasing student engagement are integrated into the course discussions. Issues related to academic integrity and ethical aspects of teaching are addressed as they evolve from in-class discussions.</td>
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Graduate Studies and Research Committee Activity Summary
for EFC Meeting - October 25, 2016
GS&R Committee Activity
Prepared by Lori Long
Proposal report and approved proposals attached to email

Graduate Faculty Nominations:
Category R
- Charles Cox, PhD – EDSGN – Approved

Program/Minor Proposals:
- MEng ELIM Program Revision-Minor – Approved, with minor revisions

Graduate Certificate Proposals:
- HUMFAC_GCERT-Renew -Change - Approve

Course Proposals:
- ACS 566_Add - Returned to proposer for revisions and resubmission

Other:
### Proposal Submitted to EFC

<table>
<thead>
<tr>
<th>Proposal Type</th>
<th>Title</th>
<th>Mnemonic</th>
<th>One Year Masters</th>
<th>Number</th>
<th>Action Requested</th>
<th>Vote</th>
<th>Justification (Why/What for)</th>
<th>Summary of Discussion Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change</td>
<td>Proposal for Revisions to the Engineering Leadership and Innovation Management (ELIM) Program (M. Eng. and Minor)</td>
<td>ELIM OYM M Eng and Certificate</td>
<td>Change</td>
<td>Approved - with revisions</td>
<td>This proposal is for a modification to the Master's Program in Engineering Leadership and Innovation Management (ELIM). The modifications include a change in the course requirements and the addition of a Minor to the Engineering Leadership and Innovation Management (ELIM). The change in the course requirements is needed due to a change in the restructuring of ENGR 408 and ENGR 493. Previously ENGR 408 (2 credits) and ENGR 493 (1 credit) were companion courses with ENGR 493 serving as the project component for ENGR 408. During the spring of 2016 ENGR 408 was modified to include the project component previously in ENGR 493 and is now a 3 credit course. The proposed change is to drop ENGR 493 and modify ENGR 408 to reflect the 3 credits. The second modification is to add prescribed requirements for a minor in Engineering Leadership and Innovation Management (ELIM).</td>
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<tr>
<td>Change</td>
<td>Human Factors Engineering and Ergonomics</td>
<td>HUMFAC_GCT</td>
<td>Certificate</td>
<td>Change</td>
<td>Approved</td>
<td>The HFEE Certificate was nominated started in 2004 with the idea of mailing videotapes, but really started in 2008 using streaming videos on ANGEL. So far 47 students have been admitted with 10 completing the certificate. More importantly, the last three years have shown rapid growth: 9 were admitted between 2008-2012, 8 in 2013, 9 in 2014, 15 in 2015 and 6 so far in 2016. All of these are distance students and working professionals who are not able to come to a Penn State campus to take courses on site. Most are using the certificate for advancement or to show expertise in the human factors area as their job assignments change. Thus, the certificate seems to be useful asset to such professionals who have no other option in advancing their careers.</td>
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*Proposal U = Unanimously Approved*
October 11, 2016

Dear GS&R,

Thank you for reviewing our proposal to modify the ELIM M.Eng. and to add a graduate minor. Based on your comments below, we have made the following modifications to the proposal:

- Added a table of contents on page 2
- Removed Gul Kremer from the list of graduate faculty on page 6 as the following two sentences essentially cover the same thing.
- Replaced ‘doctoral minor in Electrochemical Science and Engineering’ with ‘Engineering Leadership and Innovation Management’ (thanks for catching that!)
- Removed the first sentence in the program description on page
- We also realized that the wording within the original program description needed tweaked to better incorporate the minor into the bulletin description. To do this we changed ‘this one-year program’ to ‘the full one-year program’ and added the following sentence to the end of the description: “Students enrolled in other M.S., M.Eng., or Ph.D. programs can also build knowledge and competencies in Engineering Leadership and Innovation Management through the minor described below.” on page 6.

Thank you again for reviewing our proposal,

Dena Lang

The GS&R committee noted the following in their review:

- The 1st sentence of the major program description (p. 5) could be more concrete - what does "solidly grounded" and "globally engaged" really mean, in the context of the program? Otherwise, looks good to me.
- Gul Kremer is listed as one of the graduate faculty - she left Penn State. Should her name be removed? Other than that the proposal is fine
- On page 8 for the section "other program requirements", why does the statement discuss a doctoral minor in Electrochemical Science and Engineering? Should this be revised to ELIM?

Otherwise, this looks fine to me and I approve (with above edits made).

- Administrative Comment (Must include Table of Contents)

You will need to address GS&R’s comments upon submitting your Final proposal. Please indicate where, and what page the changes have been made in a document or email that is kept separate from the proposal, as this is for our internal College review/approval process, and will not be submitted with the proposal.
PROPOSAL FOR REVISIONS TO THE
ENGINEERING LEADERSHIP AND INNOVATION MANAGEMENT (ELIM)
PROGRAM (M. ENG. AND MINOR)

THE PENNSYLVANIA STATE UNIVERSITY — COLLEGE OF ENGINEERING
SCHOOL OF ENGINEERING DESIGN, TECHNOLOGY, AND PROFESSIONAL PROGRAMS
DR. SVEN G. BILÉN — PROGRAM HEAD; PROFESSOR-IN-CHARGE
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A. Program Modification Justification

This proposal is for a modification to the Master’s Program in Engineering Leadership and Innovation Management (ELIM). The modifications include a change in the course requirements and the addition of a Minor to the Engineering Leadership and Innovation Management (ELIM). The change in the course requirements is needed due to a change in the restructuring of ENGR 408 and ENGR 493. Previously ENGR 408 (2 credits) and ENGR 493 (1 credit) were companion courses with ENGR 493 serving as the project component for ENGR 408. During the spring of 2016 ENGR 408 was modified to include the project component previously in ENGR 493 and is now a 3 credit course. The proposed change is to drop ENGR 493 and modify ENGR 408 to reflect the 3 credits.

The second modification is to add prescribed requirements for a minor in Engineering Leadership and Innovation Management (ELIM).

B. Proposed Changes

1. Modification to Course Requirements:

The current ELIM Course requirements are shown in Table 1 below and the revised course requirements are shown in Table 2.

<table>
<thead>
<tr>
<th>Table 1: Existing course requirements.</th>
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</thead>
<tbody>
<tr>
<td><strong>ENGR 408</strong>: Leadership Principles</td>
</tr>
<tr>
<td><strong>ENGR 493</strong>: Individual Leadership Experience</td>
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<tr>
<td><strong>ENGR 411</strong>: Business Basics for Entrepreneurs</td>
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<tr>
<td><strong>ENGR 501</strong>: Engineering Leadership for Corporate Innovation</td>
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<tr>
<td><strong>ENGR 405</strong>: Project Management for Professionals</td>
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<tr>
<td><strong>ENGR 802</strong>: Engineering Across Cultures and Nations</td>
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<tr>
<td><strong>ENGR 804</strong>: Engineering Product Innovation</td>
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<tr>
<td><strong>ENGR 805</strong>: ELIM Capstone Project</td>
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<tr>
<td>400-, 500-, or 800-level Elective</td>
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<td>500- or 800-level Elective</td>
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<td>500-level Elective</td>
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<table>
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<tr>
<th>Table 2: Proposed course requirements.</th>
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<td><strong>ENGR 408</strong>: Leadership Principles</td>
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<td><strong>ENGR 804</strong>: Engineering Product Innovation</td>
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</tbody>
</table>
The electives (3 credits each – course option list available) will be chosen by the student, in consultation with their company (if they are associated with a sponsoring company) and the ELIM program director. The electives will utilize existing courses within the graduate curricula of the College of Engineering, Smeal College of Business, Psychology, or Organization Development and Change and Workforce Education and Development within the College of Education, allowing the student to expand his/her knowledge in either a technical, business, or psychology focus area.

2. Addition of a Prescribed Minor to the ELIM Program:

The ELIM program will offer a minor with prescribed requirements as outlined below:

**Name of the Minor Program:** Engineering Leadership and Innovation Management

Successful engineers and technical experts are expected to be well versed not only in technical skills but also in so-called soft skills such as communication, ethics, entrepreneurial thinking, and professionalism. These areas of leadership and innovation set technical experts apart and prepare them to be future global business leaders. This graduate minor is highly relevant to numerous graduate degrees associated with engineering, business, technical, or science related programs. This graduate minor consists of four 3-credit courses (12 credits) for master’s students and five 3-credit courses (15 credits) for doctoral students.

**List of Courses* Included in the Master’s Minor:**

The Engineering Leadership and Innovation Management (ELIM) minor (12-credits) is comprised of four courses:

- ENGR 501 Engineering Leadership for Corporate Innovation (3 credits-required course)
- ENGR 802 Engineering Across Cultures and Nations (3 credits- required course)
- ENGR 804 Engineering Product Innovation (3 credits)
- ENGR 405 Project Management for Professionals (3 credits-required course)*

*Related courses may be substituted for ENGR 405 per an approved list of courses by the ELD office. Other elective courses outside this list may be petitioned for substitution to meet the ENGR 405 requirement.

**List of Courses* Included in the Doctoral Minor:**

The Engineering Leadership and Innovation Management (ELIM) doctoral minor (15-credits) is comprised of five courses:

- ENGR 501 Engineering Leadership for Corporate Innovation (3 credits-required course)
o ENGR 802 Engineering Across Cultures and Nations (3 credits- required course)
o ENGR 804 Engineering Product Innovation (3 credits)
o ENGR 405 Project Management for Professionals (3 credits-required course)*
o 500-level elective in a related field

*Related courses may be substituted for ENGR 405 per an approved list of courses by the ELD office. Other elective courses outside this list may be petitioned for substitution to meet the ENGR 405 requirement.

C. Graduate Bulletin Copy

**ENGINEERING LEadership AND Innovation MANAGEMENT**

Dr. Sven Bilén, Ph.D., P.E., Head of the School of Engineering Design, Technology, and Professional Programs
Department office: 213 Hammond Building
814-865-7589

**Degree Conferred:**

Master of Engineering (M.Eng.)
Minor (Residential and World Campus)

The Graduate Faculty

**Engineering Leadership and Innovation Management**

**Sven G. Bilén**, Ph.D. (Michigan), P.E., Professor of Engineering Design, Electrical Engineering, and Aerospace Engineering

**Wesley E. Donahue**, Ph.D. (Pennsylvania State University), Director of Technology and Workforce Development Portfolio; Associate Professor of Management Development

**Andrew M. Erdman**, M.S. (University of Southern California) Director of Engineering Leadership Development

**Meredith H. Handley**, M.S. (Georgia State University), Associate Director of Engineering Leadership Outreach

**Kathryn Jablakow**, Ph.D. (Ohio State) Associate Professor of Mechanical Engineering and Engineering Design

**Frank Koe**, Ph.D. (Pennsylvania State University), Associate Professor of Engineering Entrepreneurship

**Gül E. Okudan Kremer**, Ph.D. (Missouri—Rolla) Professor of Engineering Design and Industrial Engineering
**Teresa (Dena) H. Lang**, Ph.D. (Pennsylvania State University), Associate Director of Engineering Leadership Research

**Esther Obonyo**, Ph.D. (Loughborough University), Associate Professor of Engineering Design and Architectural Engineering.

**Conrad Tucker**, Ph.D. (Illinois, Urbana - Champaign) Assistant Professor of Engineering Design and Industrial Engineering

**Sarah E. Zappe**, Ph.D. (Pennsylvania State University), Affiliate- Research Associate/Director of Assessment and Instructional Support

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**Master of Engineering in Engineering Leadership and Innovation Management**

The ELIM program is aimed at enhancing the key attributes of a “World-Class Engineer”: solidly grounded, technically broad, globally engaged, ethical, innovative, excellent collaborators, and visionary leaders. The program is designed to develop the attributes required by today’s successful engineering executives. Specifically, these include increased technical competency, expanded professional skills, the ability to identify opportunities for improvement, and the ability to work effectively in a globally connected engineering environment. Upon completion of the full one-year program, the successful student will have developed and demonstrated abilities enabling them to: establish and ensure team/project alignment with an organization’s mission, vision, strategy, and tactics; identify needs and effectively allocate resources to complete a project; form, lead, and serve effectively on teams (e.g., handling diversity in its many manifestations, negotiating effectively, and resolving personnel conflict or team dysfunction); work with others to identify opportunities for new products and businesses within an existing business structure; develop a product, service, or process from a concept to fielded solution or commercialization; identify personal strengths and workplace trait preferences through self-critical reflection and create a plan that incorporates identified personal strengths to address personal development opportunities; apply these critical skills to develop others in the work group; identify organizational strengths and weaknesses in order to define improvement strategies and plans; and lead cross-cultural and international projects, teaming with engineers and business professionals from around the U.S. and the world. These learning outcomes will be achieved through a combination of lectures by faculty, invited guest lecturers, reading of key literature, individual and team projects (including international virtual-team projects), and practical involvement in an engineering capstone design/market development team. Students enrolled in other M.S., M.Eng., or Ph.D. programs can also build knowledge and competencies in Engineering Leadership and Innovation Management through the minor described below.
Master of Engineering Admission Requirements

Educational Background

Admission requirements listed here are in addition to requirements stated in the GENERAL INFORMATION section of the Graduate Bulletin.

The student cohort should reflect today’s international engineering environment, with selective admittance. The admission requirements include:

- B.S. degree in an Engineering field with a 3.0 minimum undergraduate GPA (or equivalent). Exceptions to the minimum 3.0 grade-point average may be made for students with special backgrounds, abilities, and interests. Applicants will be accepted up to the number of places available for new students.
- 1 year of professional experience in an engineering position (or equivalent). Students wishing to enter the program directly from an undergraduate degree can fulfill the 1 year requirement for engineering experience through summer internships, summer employment, or co-op experiences plus additional experience within professional societies. Justification for this experience should be included in the Leadership and Innovation Portfolio during the application process.
- Submission of a completed online Graduate School Application for Admission, including a Statement of Purpose, Leadership and Innovation Portfolio, resume, and three letters of recommendation.
- Submission of official transcripts from all post-secondary institutions attended.
- Submission of official scores from the Graduate Record Examination General Test (GRE)

Applicants who are still completing their baccalaureate requirements at the time of application may be provisionally admitted to the Graduate School conditional on the awarding of the baccalaureate degree.

Core Application Packet

- Completed official online Graduate School application and payment of nonrefundable application fee.
- Statement of purpose: a 2-3 page essay articulating career and educational goals that demonstrates your written communication skills.
- Vita or Résumé.
- Three letters of recommendation that attest to your readiness for graduate study and document the requisite minimum of one year of work experience. Letters must be submitted through the online application. Within the online application you will be asked to enter the names and email addresses of three individuals who will be providing your recommendation. Those individuals will receive a note via email asking them to
complete a brief form that will serve as your recommendation. Please inform all recommenders they must submit the form in order for your application to be complete.

- Official transcripts from all post-secondary institutions attended.

**Master of Engineering Degree Requirements**

Requirements listed here are in addition to requirements stated in the [DEGREE REQUIREMENTS](#) section of the *Graduate Bulletin*.

Total required credits for the ELIM program is 30 credits.

**REQUIRED COURSES:** (18 credits, plus the 3-credit capstone course described below)

- ENGR 408: Leadership Principles*
- ENGR 411: Business Basics for Entrepreneurs*
- ENGR 501: Engineering Leadership for Corporate Innovation
- ENGR 802: Engineering Across Cultures and Nations
- ENGR 405: Project Management for Professionals
- ENGR 804: Engineering Product Innovation

**ELECTIVE COURSES: 9 credits**

- 500-level elective (3 credits)
- 500- or 800-level elective (3 credits)
- 400-, 500-, or 800-level elective (3 credits)

These electives (course options list available) will be chosen by the student, in consultation with their company (if they are associated with a sponsoring company) and the ELIM program director. Electives should be chosen to meet the needs and interests of the student and can be selected from across the university. The electives can utilize existing courses within the graduate curricula of the College of Engineering, Smeal College of Business, Psychology, or Organization Development and Change and Workforce Education and Development within the College of Education, allowing the student to expand his/her knowledge in a technical, business or psychology focus area. Students may also pursue a concentration in a specific related domain by completing the 9 elective credits in one of the following core areas: Psychology of Work, Leadership and Decision Making, Organization Development and Change, or Work Force Education and Development. In addition, there are two Graduate Minor Programs and one Certificate Program at the University that can be completed through the 9 elective credits: Electrochemical Science and Engineering Master’s Minor, Computational Science Graduate Minor, and Human Factors Engineering and Ergonomics Graduate Certificate Program.

**CULMINATING EXPERIENCE: 3 credits**

- ENGR 805: ELIM Capstone Project

The Capstone course provides an opportunity to apply and integrate the knowledge and skills that were gained throughout the ELIM program with strategic management concepts. Capstone projects will target real world opportunities, problems, and challenges of an existing
organization. Students who successfully complete this course will be able to: identify and assess the impact of opportunities and threats in a company’s external environment, including its industry and its set of competitors; identify and assess a company’s internal strengths and weaknesses, and match them with its opportunities and threats to suggest alternative strategies; define the business-level strategies of a company; define competitors, competitive rivalry, competitive behavior, and competitive dynamics; and describe corporate-level strategy of the company as it relates to the capstone project.

*Students entering the program who have previously taken ENGR 405, ENGR 408 or ENGR 411 will be required to substitute alternate courses under the direction of the program director.

**Engineering Leadership and Innovation Management Minor**

Successful engineers and technical experts are expected to be well versed not only in technical skills but also in so-called soft skills such as communication, ethics, entrepreneurial thinking, and professionalism. These areas of leadership and innovation set technical experts apart and prepare them to be future global business leaders. This graduate minor is highly relevant to numerous graduate degrees associated with engineering, business, technical, or science related programs. This graduate minor consists of four 3-credit courses (12 credits) for master’s students and five 3-credit courses (15 credits) for doctoral students.

**Minor Admission Requirements:**

- Applicants must hold either (1) a baccalaureate degree in engineering, science, or relevant discipline from a regionally accredited U.S. institution or (2) a tertiary (postsecondary) degree that is deemed comparable to a four-year bachelor's degree from a regionally accredited U.S. institution. This degree must be from an officially recognized degree-granting institution in the country in which it operates.
- Applicants must have a 3.0 minimum undergraduate GPA (or equivalent). Exceptions to the minimum 3.0 grade-point average may be made for students with special backgrounds, abilities, and interests.
- Applicants must be accepted and/or currently enrolled in a graduate program at Penn State.
- Applicants to the Engineering Leadership and Innovation Management (ELIM) minor must submit a minor program application (see website for details);

Admissions decisions for the program are based on the quality of the applicant's credentials. The decisions are based on a review of the complete application portfolio. During the admission process, students who appear to be better suited for another graduate level program will be encouraged to apply to the appropriate program. Graduate Record Examination (GRE) scores are not required.
Other Program Requirements:
A representative from the Graduate Faculty in the graduate minor (i.e., a “Minor Field Member”) must be appointed to the doctoral committee of each student enrolled in the doctoral minor in Engineering Leadership and Innovation Management (ELIM).

List of Courses Included in the Master’s Minor:
The Engineering Leadership and Innovation Management (ELIM) minor (12-credits) is comprised of four courses:
- ENGR 501 Engineering Leadership for Corporate Innovation (3 credits-required course)
- ENGR 802 Engineering Across Cultures and Nations (3 credits-required course)
- ENGR 804 Engineering Product Innovation (3 credits-required course)
- ENGR 405 Project Management for Professionals (3 credits-required course)*

*Related courses may be substituted for ENGR 405 per an approved list of courses by the ELD office. Other elective courses outside this list may be petitioned for substitution to meet the ENGR 405 requirement.

List of Courses Included in the Doctoral Minor:
The Engineering Leadership and Innovation Management (ELIM) doctoral minor (15-credits) is comprised of five courses:
- ENGR 501 Engineering Leadership for Corporate Innovation (3 credits-required course)
- ENGR 802 Engineering Across Cultures and Nations (3 credits-required course)
- ENGR 804 Engineering Product Innovation (3 credits-required course)
- ENGR 405 Project Management for Professionals (3 credits-required course)*
- 500-level elective in a related field**

*Related courses may be substituted for ENGR 405 per an approved list of courses by the ELD office. Other elective courses outside this list may be petitioned for substitution to meet the ENGR 405 requirement.
**For a doctoral minor a 500-level elective in a related field is required, students must obtain approval for the elective course from their ELIM advisor.

Other Relevant Information
All graduate students must participate in Scholarship and Research Integrity (SARI) training by completing the online University module offered through the Office of Research Protections (ORP) during their first year of study and 5 hours of discussion-based training. The 5-hour discipline-specific discussion-based training may be obtained through participation in classroom discussions as part of ENGR 408 (5 hours) and ENGR 501 (5 hours), required courses within the ELIM program. If students are unable to attend the specific lectures that include the SARI training, students will be able to attend seminars hosted by the College of Engineering that include professional development. These requirements must be met before graduation.
Student Aid
Refer to the Student Aid section of the Graduate Bulletin. Students in this program are not eligible for graduate assistantships.

Courses
Graduate courses carry numbers from 500 to 599 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

D. Consultation Responses for Revised Program
Proposal Designation: HUMFAC_GCT - Human Factors Engineering and Ergonomics
This is a proposed Change to Graduate Graduate Certificate

Initiators

<table>
<thead>
<tr>
<th>Name</th>
<th>User ID</th>
<th>College</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANDRIS FREIVALDS</td>
<td>AXF</td>
<td>Engineering (EN)</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

College with curricular responsibility: Engineering (EN)

Outline

Short Title: HUMFAC-GCT

Description:
Human Factors Engineering and Ergonomics

Certificate Type: PUBLIC
Department: Industrial And Manufacturing Engineering (UPEN_IME)

Entrance Requirements:
BS in engineering or 30 credits of quantitative courses work

Effective Semester: FA 2016
Ending Semester: FA 2021

Offering Campuses
- WC (WORLD CAMPUS )

Faculty Member(s) in Charge:

- Name: ANDRIS FREIVALDS (AXF)
  Title: PROFESSOR INDUSTRIAL ENG
  Phone: +1 814 863 2361
  Address: 0310 LEONHARD BUILDING
  Campus:
  City:
  Fax:

- Name: ANDRIS FREIVALDS (AXF)
  Title: PROFESSOR INDUSTRIAL ENG
  Phone: +1 814 863 2361
  Address: 0310 LEONHARD BUILDING
  Campus:
  City:
  Fax:

Is not eligible for aid

CIP Code: 143501
IPEDs Type: Post Baccalaureate Certificate

State the learning objectives for this certificate:
Students will be expected: 1) to design a consumer product, 2) measure both the physical and informational loading of a job and 3) to redesign a job and/or workstation to reduce the loading per the criteria measured in #2.

State how these learning objectives will be evaluated:
The outcomes will be measured by student performance on laboratories, homework and exams.

State how this data will be used to improve the certificate program:
If the student performance uniformly seems to be lower than expected, then the course material will be adjusted so as to improve student understanding.

REQUIREMENTS FOR THE CERTIFICATE: (9 Credits)

REQUIRED COURSES (9 credits)
IE 479 (3), IE 553 (3), IE 558 (3)

Review History
This section represents all consultation history that has occurred on this proposal

Legend

Approve  Rejected  Waiting Review  User Action Required

Pending Action(s)  Moved to Rejected Status  Approved  (#) - Review Order Sequence Number

Associate Dean

Recipient Name: PETER BUTLER  Department: (Not Available)
Position: Associate Dean  Campus: UNIVERSITY PARK CAMPUS
Title:

Concur: [Not Yet Reviewed]
Comments: [Not Yet Reviewed]
Reviewed On: [Not Yet Reviewed]

Review on Behalf of the Dean of the Graduate School

Recipient Name: VICKI HEWITT  Department: (Not Available)
Position: Review on Behalf of the Dean of the Graduate School  Campus: UNIVERSITY PARK CAMPUS
Title:
Registrar Data Entry

Recipient Name: PAULA HAMATY   Department: (Not Available)
Position: Registrar Data Entry   Campus: UNIVERSITY PARK CAMPUS
Title:


Publication Of Approval Information By Faculty Senate

Recipient Name: CORTNEY SMITH   Department: (Not Available)
Position: Publication Of Approval Information By Faculty Senate   Campus: UNIVERSITY PARK CAMPUS
Title:


Recipient Name: KADI CORTER   Department: (Not Available)
Position: Publication Of Approval Information By Faculty Senate   Campus: UNIVERSITY PARK CAMPUS
Title:


Curricular Information
Blue Sheet Item #:  
Review Date:  

Program Codes
Option Codes
HUMFAC_GCT - Human Factors Engineering and Ergonomics:

UPLOADED DOCUMENTS:
Context Type: Certificate Bulletin Listing
File Description: pdf
File Name: HFEECertificateRenewal2016a.pdf
NAME OF THE PROGRAM: College of Engineering Graduate Certificate Program in Human Factors Engineering and Ergonomics

PERSON IN CHARGE: Andris Freivalds
ADDRESS: Harold & Inge Marcus Department of Industrial & Manufacturing Engineering 310 Leonhard Building
TELEPHONE: 814-863-2361
FAX: 814-863-4745
E-MAIL: axf@psu.edu

DESCRIPTION OF THE CERTIFICATE PROGRAM INCLUDING PURPOSE, OBJECTIVES, CREDITS REQUIRED (not to exceed 1000 characters, including spaces):

Individuals involved in the design and development of products for human use will find the program content immediately applicable to their job. With an emphasis on the application of user engineering design principles, the tools and methods to assess and enhance quality and productivity for both consumers and employees are provided. Applications include medical devices, consumer products, military systems, software design and the workplace. The program is comprised of three courses from the Penn State curriculum. These courses provide students with both a breadth and depth in their exposure to user engineering tools and principles.

ADMISSION REQUIREMENTS (including completion of a baccalaureate degree) as applicable:

The successful applicant will possess a baccalaureate degree in a related technical field (with courses in calculus and physics) and is generally expected to have a minimum GPA of 3.0. Exceptions to the minimum 3.00 grade-point average may be made for students with special backgrounds, abilities, and interests. International students must satisfy the Graduate School’s English language requirement. Professional experience will be taken into consideration for admission.

GRE scores are not required for nondegree graduate students. Individuals who wish to apply to the graduate degree program in Industrial Engineering must submit an application for admission, along with all of the required supporting documentation – including GRE scores.

PRESCRIBED COURSES (9 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I E 479</td>
<td>Human Centered Product Design and Innovation (3)</td>
<td>Consumer product design for a global market, incorporating human factors principles and user desires in a multicultural perspective.</td>
</tr>
<tr>
<td>I E 553</td>
<td>Engineering of Human Work (3)</td>
<td>Physics and physiology of humans at work; models of muscle strength, dynamic movements; neural control; physical work capacity; rest allocation.</td>
</tr>
<tr>
<td>I E 558</td>
<td>Engineering of Cognitive Work (3)</td>
<td>Information processing and decision making models of the human in the modern workplace, emphasizing visual inspection and other industrial applications.</td>
</tr>
</tbody>
</table>

Applicants who do not have the necessary background for the above courses will need to take the appropriate prerequisite courses.

EFFECTIVE DATE: Spring Semester, 2017
EXPIRATION DATE: Fall Semester, 2022
Consultation With Appropriate Units/Programs. Biomedical Engineering has been contacted.

Justification for Renewal. The HFEE Certificate was nominally started in 2004 with the idea of mailing videotapes, but really started in 2008 using streaming videos on ANGEL. So far 47 students have been admitted with 10 completing the certificate. More importantly, the last three years have shown rapid growth: 9 were admitted between 2008-2012, 8 in 2013, 9 in 2014, 15 in 2015 and 6 so far in 2016. All of these are distance students and working professionals who are not able to come to a Penn State campus to take courses on site. Most are using the certificate for advancement or to show expertise in the human factors area as their job assignments change. Thus, the certificate seems to be useful asset to such professionals who have no other option in advancing their careers.