TO: The Engineering Faculty

FROM: The Faculty of the Interdisciplinary Engineering Program

RE: Updated Engineering Concentration within an Existing Graduate Program

The Faculty of the Interdisciplinary Engineering team has approved the following updates to a graduate Concentration from the College of Engineering. This action is now submitted to the Engineering Faculty with a recommendation for approval.

TITLE:

Quality Engineering

DESCRIPTION:

The MS(E) Interdisciplinary Engineering program (IDE) offers graduate-level, distance-learners the opportunity to pursue a highly ranked and regarded master's degree while continuing to work full time, generally as mid-level engineers across a wide variety of engineering disciplines.

Within IDE, there are 10 available concentrations. Concentrations offer a way to specialize while still maintaining a relatively flexible and customized graduate degree. A declared concentration is not required for IDE students.

The concentration in Quality Engineering within the Interdisciplinary Engineering master's program prepares mid-career professionals looking for a competitive edge in a wide variety of industries regarding the overall quality of manufactured products.

RATIONALE FOR CHANGING THE CONCENTRATION REQUIREMENTS:

One of the available concentrations in IDE is **Quality Engineering (QUAL).** This concentration has existed for a long time; the last known graduate was in 2009. There are currently two students within this concentration set to move towards graduation soon. There are several issues with the current concentration related to course offerings and structure. These challenges present a timely need to restructure the concentration, along with the opportunity to expand and modernize this area of interest.

The American Society for Quality has the following categories for the "Certified Quality Engineer" exam body of knowledge:

- Management and Leadership
- The Quality System
- Product, Process, and Service Design
- Product and Process Control
- Continuous Improvement
- Quantitative Methods and Tools
- Risk Management

While the concentration does not need to cover 100% of this list, looking at the course possibilities under this lens will make it easier to identify additional courses that are well-suited to support this pathway.

A committee was formed to further analyze the curriculum and recommend improvements. The committee members were as follows:

- Dr. Patrick Brunese (IE), Chair
- Dr. Aaron Lottes (BME)
- Dr. Ben Fong (IE)

The committee utilized the Body of Knowledge for the ASQ Certified Quality Engineer (CQE) as a basis for organizing the resulting proposed concentration curriculum.

Administrative Support was provided by:

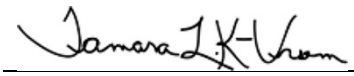
- John Fassnacht, Principle Managing Director, Purdue University Online
- Alisyn Gruener, Senior Program Manager, Interdisciplinary Engineering

The committee found the following:

The elective sets are substantially out of date. Further, they do not reflect the typical organization of quality engineering knowledge from established professional bodies (e.g., American Society for Quality, ASQ).

Specific issues were identified, as follows:

- ME 55700 – Design for Manufacturability is listed in Process Emphasis, even though it would be a better fit for Product Emphasis.
- Two courses in the Product Emphasis (IE 59000 & IE 59000) have uncertain histories, and were likely independent studies, rather than established special topics courses.
- Under Testing Emphasis there is a reference to generic special topics courses (IE 59000, ME 59700, and STAT 59800), which is far too open-ended to be beneficial to students considering the construction of their plan of study.
- STAT 52200 is not offered via Purdue Online Learning.
- The required capstone/project course has little guidance. The last graduate, in 2009, appeared to complete an independent study (likely connected to their place of work).



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Target Audience

The Quality Engineering concentration is designed for mid-career leaders with professional or academic backgrounds in engineering.

MS/MSE in IDE with a Quality Engineering Concentration Curriculum

Core Quality Engineering Courses: 12 credits
Required Quality Engineering Electives: 15 credits
Required Capstone Project Course: 3 credits

Note re: Engineering Requirements

A minimum of 18 credits of engineering courses (prefixes AAE, BME, CE, ECE, IE, ME, etc.) are required to complete an interdisciplinary engineering degree.

Depending on how a student fulfills the 12 credits of 'Core Quality Engineering Courses,' they may be required to take all engineering courses for their 15 credits of electives; the capstone/project course will add 3 credits of engineering coursework.

Interdisciplinary Engineering Advisors are responsible for working with students to develop an electronic plan of study that ensures a minimum of 18 credits of engineering coursework are mapped out for each advisee.

Details

Required: Core Courses (12 credit hours)

STAT 51100	Statistical Methods
STAT 51200	Applied Regression Analysis
IE 53300 **OR** STAT 51400	Industrial Applications of Statistics Design of Experiments
IE 53000/STAT 51300	Quality Control

Required Electives - (choose 5; 15 hours)

Students may select any 5 courses (totaling 15 credits) from the tables below. The subject area groups are designed to help students prepare and plan their course of study. Students are not required to take courses in the same subject area group(s).

Product, Process, and Service Design	
IE 56600	Production Management Control (offered summer)
IE 57900	Design and Control of Production and Manufacturing Systems
IE 53200 **OR** ME 57100	Reliability Reliability-Based Design
ME 55300	Product and Process Design
ME 55700	Design for Manufacturability *(requires 3 on-campus, Saturday labs) **

** This course has not been offered for some time and it's unclear if it will be offered in future. If offered in future, the requirement for on-campus Saturday labs is not guaranteed.*

Quality Systems Design, Management, and Leadership	
IE 59000	Quality Systems Management
AAE 57100	Complex System Safety
BME 56100	Preclinical and Clinical Study Design
BME 56300	Quality Systems for Regulatory Compliance
SYS 51000	Tools and Methodologies for Designing Systems
SYS 59000	Systems Engineering Processes and Professional Competencies

Continuous Improvement	
MSE 53500	Lean Manufacturing Materials
IE 59000**	Design for Lean Six Sigma Black Belt

Quantitative Tools	
STAT 51700	Statistical Inference

Metrology and Measurement Systems	
AAE 55200	Nondestructive Evaluation of Structures and Materials
IE 57000	Manufacturing Process Engineering

Required Capstone/project course*** (3 hours)

Students will complete one of the following:

- IE 59000** – Design for Lean Six Sigma Black Belt, which features an industry project related to quality engineering; or
- An appropriate quality engineering related industry project, registered as a titled independent study (e.g, IE 59000, ME 59700, etc.), mentored by a faculty member.

***Students can use IE 59000 - Design for Lean Six Sigma Black Belt toward their capstone project requirement **or** as an elective, but not both.*