December 11, 2019

TO: Members of the Board of Trustees

FROM: John A. Elliott, Ph.D.
Provost and Executive Vice President for Academic Affairs

RE: Graduate Certificate in Process Engineering

RECOMMENDATION:

That the Board of Trustees approve a new Graduate Certificate in Process Engineering.

BACKGROUND:

The ability to develop and optimize processes is something which all large chemical, manufacturing, and pharma companies require. However, this need is not being met in the local region. The University of Connecticut possesses the expertise to educate the workforce of these companies. The expertise at UConn is unique in the state. In that respect, it is incumbent upon the University to address this need.

Process engineering is the merger of fundamental engineering science and knowledge with empirical information to develop and optimize processes. The fundamental knowledge is encoded in mathematical models, whereas the empirical information is represented by data science/machine learning models. To be an effective process engineer, one must develop a familiarity with both of these areas, as well as the ability to integrate them. Over the course of this program, the student will be introduced to these concepts within the context of real-world case studies.

After conversations with Unilever, Pfizer, ExxonMobil and Pratt & Whitney, we are estimating at least 10 students in year 1, and hope to incrementally increase each year thereafter. Year 2 (and subsequent years to follow) we would anticipate 15-20 students.

It is anticipated that the students will be sponsored by their employer. Some students may pay out of pocket, however the majority will be sponsored by their company.
Request for New UConn Academic Degree Program

General Information
Name of degree program: Graduate Certificate in Process Engineering
Name of sponsoring Department: Chemical and Biomolecular Engineering
Name of sponsoring College: School of Engineering
Campuses: Program Entirely Online
Contact persons: Kylene Perras
Type of Proposal: New
Type of Program: Graduate Certificate
Anticipated Initiation Date: Fall 2020
Anticipated Date of First Graduation: Spring 2021
Entrepreneurial program, approved by
Provost’s Office:
Tuition for the program approved by
Provost’s Office: Yes
CIP Code: Fee-based
14.0799 (Chemical Engineering, Other)

Justification for the New Program
The ability to develop and optimize processes is something which all large chemical, manufacturing, and pharma companies require. However, this need is not being met in the local region. The University of Connecticut possesses the expertise to educate the workforce of these companies. The expertise at UConn is unique in the state. In that respect, it is incumbent upon the University to address this need.

Are there similar programs in CT or elsewhere?
There is no process engineering certificate or master’s program in the region.

What are the desired learning outcomes of the program?
- Develop, solve and analyze process models by applying fundamental concepts from physics, biology, chemistry and mathematics
- Demonstrate the ability to simulate processes at different levels of complexity by summarizing and explaining model assumptions, writing governing equations, and solving the equations using mathematical programming
- Develop an understanding of principles underlying optimization theory
- Gain a familiarity with different optimization strategies and be able to apply the appropriate methodology to different use cases
- Gain experience with real world examples and case studies
Program Description
Process engineering is the merger of fundamental engineering science and knowledge with empirical information to develop and optimize processes. The fundamental knowledge is encoded in mathematical models, whereas the empirical information is represented by data science/machine learning models. To be an effective process engineer, one must develop a familiarity with both of these areas, as well as the ability to integrate them. Over the course of this program, the student will be introduced to these concepts within the context of real-world case studies.

The courses are as follows (students will be required to take four out of the five courses for the certificate):

- Advanced Chemical Engineering Fundamentals
- Advanced Engineering Mathematics
- Intro to Computer Simulation in Chemical Engineering
- Applied Machine Learning for Chemical Engineers
- Uncertainty Analysis, Robust Design, and Optimization

Proposed Graduate Catalogue Copy
The Chemical and Biomolecular Engineering Department offers a 12-credit certificate program in Process Engineering. Process engineering is the merger of fundamental engineering science and knowledge along with empirical information to develop and optimize processes. Process Engineering is primarily grounded in the discipline of Chemical Engineering and its core areas, including thermodynamics, transport phenomenon, and kinetics. The fundamental knowledge for Process Engineering is encoded in mathematical models, whereas the empirical information is represented by data science/machine learning models. To be an effective process engineer, one must develop a familiarity with both of these areas, as well as the ability to integrate them. Over the course of this program, the student will be introduced to these concepts within the context of real-world case studies.

Required Courses: CHEG 5001, 5330, 5333, and 5339.

This certificate is offered by the School of Engineering.

Faculty Involvement
- George Bollas (Professor)
- Jeffrey McCutcheon (Associate Professor)
- Jennifer Pascal (Assistant Professor in Residence)
- Ranjan Srivastava (Professor)
- Matthew Stuber (Assistant Professor)
- Julia Valla (Associate Professor)
Enrollment and graduate projections
After conversations with Unilever, Pfizer, ExxonMobil and Pratt & Whitney, we are estimating at least 10 students in year 1, and hope to incrementally increase each year thereafter. Year 2 (and subsequent years to follow) we would anticipate 15-20 students.

Program Evaluation
Program assessment will be carried out in a variety of ways. First, all enrolled in the program will be provided with a survey upon completion of the program so that they can provide immediate feedback. A second survey will be carried out one year after students have completed the program to see if their feedback has change based on additional experience and the opportunity to apply the material learned.

For students being sponsored by a company, appropriate company contacts will be surveyed a year after their employees have completed the course. This latter survey will be carried out to determine whether the companies felt that the skill being taught to their employees were having an impact at work. All surveys will be developed in conjunction with CETL.

The program will also be reviewed by the Departmental Industrial Advisory Board annually and feedback will be solicited. All feedback will be reviewed by the Department Head and/or appropriate designee(s) (e.g. Grad Program Director) and all faculty members involved with the program annually, with input from CETL as appropriate to determine where opportunities for improvement exist.

Program Administration
The program will be administered jointly by the Department of Chemical & Biomolecular Engineering and the School of Engineering Professional Education Office.

Funding and Financial Resources Needed
It is anticipated that the students will be sponsored by their employer. Some students may pay out of pocket, however the majority will be sponsored by their company.

Internal and external applicants can apply to this program.

Anticipated term and year of first enrollment
Spring 2020

Admission Requirements
Bachelors degree in engineering or field that closely relates (STEM) which would be evaluated by Department to determine if the candidate would be successful. For admission, GPA of 3.0 or
better. GRE is not required. Application directly to the Graduate School will be necessary for admission. Also, four calculus classes prior to admission is strongly recommended.

**Required for application:**
- Personal Statement
- One Letter of Recommendation

**Term(s) to which students will be admitted**
- Fall
- Spring
- Summer

**Rolling application deadline.**

**Initiator**
Kylene Perras, kylene.perras@uconn.edu, 860486-0870

**Program Director Name**
Professor Ranjan Srivastava, ranjan.srivastava@uconn.edu, 860-486-4020

**Administrative Contact Email**
Kacey Pilver, kacey.pliver@uconn.edu