Adopted: May 20 2014

ACADEMIC SENATE
OF
CALIFORNIA POLYTECHNIC STATE UNIVERSITY
San Luis Obispo, California

AS-785-14

RESOLUTION ON NEW MASTERS OF SCIENCE DEGREE IN FIRE PROTECTION ENGINEERING

WHEREAS, The College of Engineering is proposing the implementation of a Masters of Science in Fire Protection Engineering; and

WHEREAS, The Masters of Science in Fire Protection Engineering has been a successful pilot program for the past four years; and

WHEREAS, The College of Engineering now proposes to convert this program to permanent status; and

WHEREAS, There are no Fire Protection Engineering Masters programs in the Western United States; and

WHEREAS, There is significant industry demand and support for such a program at Cal Poly; and

WHEREAS, The Academic Senate Curriculum Committee has carefully considered this proposal and recommends its approval; and

WHEREAS, A summary of the proposal is attached to this resolution with the full proposal available in the Registrar's office; therefore be it

RESOLVED, That the Academic Senate of Cal Poly approve the proposal for a Masters of Science in Fire Protection Engineering and that the proposal be sent to the Chancellor's Office for final approval.

Proposed by: Academic Senate Curriculum Committee
Date: April 15 2014

Cal Poly, San Luis Obispo

Summary Statement of Proposed New Degree Program for Academic Senate

April 9, 2014

1. **Title of proposed program:** MS in Fire Protection Engineering

2. **Reason for proposing the program**

Fire Protection Engineering is an interdisciplinary profession that applies engineering sciences, technologies and management techniques to help make the world safer from fire. Fire Protection Engineering is recognized as a unique discipline by the National Council of Examiners for Engineering and Surveying (NCEES), the nationally recognized organization dedicated to advancing professional licensure for engineers and surveyors. Currently, 46 states, including California, and the District of Columbia recognize professional licensure in the Fire Protection Engineering discipline. Despite this almost universal recognition in the United States of Fire Protection Engineering as a distinctly licensed engineering discipline, and its important role in reducing the impact of fire on society and the environment, Cal Poly is currently only one of three academic institutions with Fire Protection Engineering programs. The MS degree program in Fire Protection Engineering at Cal Poly is designed to build on the skills, knowledge, and broad engineering principles students acquire in an undergraduate engineering program or related technical field. The required and elective courses composing the MS degree in Fire Protection Engineering address the specific body of knowledge required by the fire protection engineering profession. Students completing the program will possess the technical knowledge, skills and tools required to practice fire protection engineering in a variety of local, national and international settings. Graduates will also possess the necessary knowledge and skills to pursue professional certification and licensure in the fire protection engineering discipline.

The Fire Protection Engineering MS degree program at Cal Poly was developed and approved during the 2009-2010 academic year as a self-support pilot program offered by the College of Engineering through Special Session. With this approval, the FPE MS degree program was launched during the Fall 2010 term. The FPE program is the first self-support graduate program offered through Special Session by the College of Engineering at Cal Poly. This program is also the first to be offered in a hybrid on-campus/online format, with some students attending classes on-campus and others attending classes online. Due to its successful implementation as a pilot program for the past four years, the FPE program is widely considered to be the prototype for other self-support and distance programs offered through Special Session at Cal Poly.

3. **Expected student learning outcomes and methods for assessing outcomes**

The educational objective of the Fire Protection Engineering program is to provide students with the knowledge, skills and tools needed to solve fire protection engineering problems and develop fire safety design solutions in a variety of professional settings. Upon completing the requirements for a Master of Science degree in Fire Protection Engineering, students should be able to:

a) Identify relevant fire safety codes, standards and regulations, comprehend the fire safety performance objectives and criteria associated with these documents, and apply these fire safety objectives and criteria to a broad range of applications.

b) Analyze the flammability characteristics of different materials, interpret the results of standard and non-standard fire test methods and evaluate the fire hazards associated with different materials in a range of anticipated settings.

c) Analyze the dynamics of fires in and around buildings and other structures through the application of fundamental principles and the use of state-of-the-art computer-based fire simulation models.

d) Explain how people interact with fire conditions in buildings and calculate evacuation times through the application of fundamental principles of people movement and the use of state-of-the-art computer-based evacuation models.

e) Design and evaluate fire detection and alarm systems, fire suppression systems, smoke management systems, egress systems and structural fire protection to achieve specified performance objectives.

f) Perform comprehensive fire and life safety evaluations of buildings and other structures through application of the knowledge, skills and tools acquired in this program and effectively communicate the results and findings of such evaluations.

Evaluation of the capstone project (FPE 596) is used as the primary assessment tool for the student learning outcomes. Capstone projects include elements of all the student learning outcomes; a scoring rubric has been developed to assess the proficiency of students in applying the different learning outcomes to their capstone projects. This scoring rubric is used by external FPE professionals from academia and industry invited to evaluate the students' final project. Program evaluation surveys are used as a tool for graduates to assess the achievement of the course learning objectives and the extent to which the course contributed to meeting the overall program goals and student learning outcomes. Program evaluation surveys are also used as a tool for employers to determine if curricular modifications are necessary to keep the program goals and courses aligned with the needs of the profession. Finally, the percentage of graduates who pursue and obtain professional engineering licensure in the fire protection engineering discipline or a related field will be used to assess achievement of the program goals.

4. Student Demand

The FPE program was launched in Fall 2010 with 27 students. In the current academic year, 2013-2014, there are 64 students matriculated in the MS program, 3 students in the graduate certificate program (FPE Applications), and 19 non-matriculated students. Most non-matriculated students end up applying and being admitted into the program.

The numbers provided below are based on data from the first four years of Fire Protection Engineering program operation as a pilot program along with the assumption that the program goal is to have 30 graduates from the MS degree program each year under steady state.

	Number of Students		
	at initiation	3 years after initiation	5 years after initiation
Number of Majors	20	30	30
Number of Graduates	20	30	30

5. **Indicate the kind of resource assessment used in developing the program proposal. If additional resources will be required, the summary should indicate the extent of department and/or college commitments(s) to allocate them**

   Because this is a pilot program conversion, all faculty positions, staff support positions, and operating budget needed to implement the Fire Protection Engineering program are already in place. Because the Fire Protection Engineering program is self-supporting, all program expenses are supported by revenues generated by the program.

6. **Societal and Public Need**

   The Society of Fire Protection Engineers (SFPE) projects growing demand for qualified fire protection engineers especially in the western United States. This is due to increased retirements in the field, population growth and related development in the western part of the country, and new fire protection standards in California.

   The Department of Fire Protection Engineering at the University of Maryland maintains a listing of available jobs on its website (http://www.fpe.umd.edu/employment/jobs.html). A recent review (March 2014) of this website indicated the availability of more than 45 post-graduate jobs across a broad spectrum of private and public sector employers. Since many of the graduates of the existing fire protection programs are hired directly out of school by a few well-known employers, these job postings provide an indication of the types of job opportunities that commonly go unfilled due to a lack of more fire protection engineering graduates.

   It is difficult to quantify the demand for fire protection engineering graduates because many prospective employers have stopped trying to hire new graduates after years of unsuccessful attempts. More fire protection engineering graduates entering the work force, particularly on the West Coast, will be likely to reinvigorate the demand for fire protection engineers among those employers with a need but with little likelihood of success in the past.

   The public sector in particular has been hampered by the lack of available fire protection engineering graduates. With the increasing use of performance-based building fire safety design and regulation, increasing demands are being placed on the technical qualifications of building and fire officials. Many jurisdictions would like to hire fire protection engineers, but have not been able to compete effectively in the marketplace due to the limited supply of graduates. Similarly, the fire service is a virtually untapped employment opportunity for fire protection engineers in the United States. This program will help to alleviate this shortage of qualified fire protection engineers in the public sector, particularly in California and other western states.

7. **Briefly describe how the new program fits with the mission and/or strategic plan for the department, college and/or university**

This program will not impede the successful operation and growth of existing programs on campus. As a special session program offered under Executive Order 1047, the program will be administratively and academically completely financially self-supporting. No general fund resources from either the College of Engineering or any other academic units will be used to support this program. The program's interdisciplinary structure, application of theory to practice, and outreach and engagement features support and advance the missions of Cal Poly, the College of Engineering, and Extended Education.

Cal Poly's Mission Statement
Cal Poly fosters teaching, scholarship, and service in a Learn by Doing environment in which students, staff, and faculty are partners in discovery. As a polytechnic university, Cal Poly promotes the application of theory to practice. As a comprehensive institution, Cal Poly provides a balanced education in the arts, sciences, and technology, while encouraging cross-disciplinary and co-curricular experiences. As an academic community, Cal Poly values free inquiry, cultural and intellectual diversity, mutual respect, civic engagement, and social and environmental responsibility.

Mission Statement of the College of Engineering
The College of Engineering provides an excellent Learn by Doing education and graduates in-demand, Day One-ready professionals.

8. Attach a display of curriculum requirements

Required Courses	Units	Prerequisite
FPE 501 Fundamental Thermal Sciences	4	Grad Standing or consent
FPE 502 Fire Dynamics	4	FPE 501 or consent
FPE 503 Flammability Assessment Methods	4	FPE 502
FPE 504 Fire Modeling	4	FPE 502, FPE 503
FPE 521 Egress Analysis and Design	4	Grad Standing or consent
FPE 522 Fire Detection, Alarm and Communication Systems	4	Grad Standing or consent
FPE 523 Water-based Fire Suppression	4	Grad Standing or consent
FPE 524 Structural Fire Protection	4	Grad Standing or consent
FPE 596 Culminating Experience in Fire Protection Engineering	5	FPE 504, advanced graduate standing, completion of, or concurrent enrollment in, engineering courses in program, & consent
FPE 599 Design Thesis (May be taken in lieu of FPE 596 and one elective course)	(9)	Advanced graduate standing, completion of, or concurrent enrollment in, engineering courses in program, & consent
TOTAL	37	
Elective Courses	**Units**	**Prerequisite**
FPE 551 Fire Safety Regulation and Management	4	Grad Standing or consent
FPE 552 Smoke Management and Special Hazards	4	FPE 502, FPE 504
FPE 554 Forensic Fire Analysis	4	Grad Standing or consent
FPE 555 Fire Protection Management in the Wildland-Urban Interface	4	Grad Standing or consent
Choose a total of 8 units from the elective courses	8	
TOTAL NUMBER NEEDED FOR DEGREE	45	

State of California
Memorandum

CAL POLY
SAN LUIS OBISPO

To: Steven Rein
Chair, Academic Senate

Date: June 5, 2014

From: Jeffrey D. Armstrong
President

Copies: K. Enz Finken
M. Pedersen
D. Larson
F. DePiero
R. Goel

Subject: Response to Academic Senate Resolution AS-785-14
Resolution on New Masters of Science Degree in Fire Protection Engineering

I am pleased to approve the above-entitled Academic Senate resolution. The proposal will now be sent to the Chancellor's Office for approval.

Please express my appreciation to the Academic Senate members for their attention to this important curricular matter