

# COLLEGE OF ENGINEERING

Engineering Bldg. (192), Room 301  
Phone: 805.756.2131  
<https://engineering.calpoly.edu>

Dean: Amy Fleischer  
Interim Associate Dean: Eric Mehiel  
Associate Dean: Rakesh K. Goel

## Academic Programs

Program name	Program type
Aerospace Engineering	BS*, MS
Biomedical Engineering	BS, MS, Specialization
Civil and Environmental Engineering	MS
Civil Engineering	BS*
Computer Engineering	BS*
Computer Science	BS**, MS, Minor
Computing for Interactive Arts	Minor
Electrical Engineering	BS*, MS
Engineering	MS
Environmental Engineering	BS*
Fire Protection Engineering	MS
General Engineering	BS
Industrial Engineering	BS*, MS
Manufacturing Engineering	BS*
Materials Engineering	BS*
Mechanical Engineering	BS*, MS
Multidisciplinary Design	Minor
Software Engineering	BS*

## Joint Programs

Program name	Program type
Cross Disciplinary Studies Minor in Data Science	Minor
Engineering Management	MBA/MS
Environmental Studies	Minor
Liberal Arts & Engineering Studies	BA
Transportation Planning	MCRP/MS

## Graduate Certificate Programs

Program name	Program type
Fire Protection Engineering Applications	Certificate
Fire Protection Engineering Science	Certificate

\* Engineering programs accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org/>

\*\* BS Computer Science program accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org/>

Engineering and computer science programs at Cal Poly are strongly oriented toward preparing graduates for immediate entry into professional practice. Students declare their majors when they enter as freshmen, and they generally take at least one course in that major each quarter. This early introduction better motivates and prepares students to master the foundational mathematics, basic science, and engineering

science or computer science central to success in all the engineering disciplines.

The undergraduate bachelors of science engineering disciplines listed above provide the education needed for entry to the engineering profession and for continued academic work toward advanced degrees. Many of our graduates enter graduate programs at Cal Poly or other institutions. Cal Poly engineering and computer science graduates are highly desired by industry and find a variety of professional opportunities awaiting them, such as engineering design, computer hardware and software engineering, test and evaluation, systems analysis, modeling and simulation, manufacturing, applied research, development, sales and field engineering. Graduates pursue careers in a broad cross-section of industry, government agencies, public utilities, marketing groups, and educational institutions.

The College of Engineering is an internationally-recognized, premier undergraduate engineering college. Its mission is to provide an excellent Learn by Doing education and to graduate in-demand, Day One-ready professionals. The College vision is to transform students into world class, innovative and collaborative engineers to meet the challenges of the 21<sup>st</sup> century.

State-of-the-art facilities and laboratories form the core of Engineering's project-centered curriculum. Ranging from the Aircraft Design Lab to the Rotor Dynamics Laboratory, these facilities offer advanced technological systems that allow students to link theory with practice. College buildings also promote interdisciplinary project activities, including the Advanced Technology Laboratories, Bonderson Projects Center, and Engineering IV. With 19,000 square feet of space for individual and team-based projects, the Bonderson Center offers enriched opportunities for multidisciplinary projects and collaboration with industry. Engineering IV, a 104,000-square-foot building includes modern classrooms and laboratories for aerospace, mechanical, civil, environmental, industrial and manufacturing engineering programs.

## Engineering Student Services

Engineering South (40), Room 111  
Phone: 805.756.1461  
Director: Kim Marsalek

Engineering Student Services coordinates and provides support to foster retention and graduation. Through our Advising, Multicultural Engineering (MEP), International Exchange (IEP) and Tutoring Programs our staff provides individual and group advising sessions, workshops, and programs to guide and empower students through their undergraduate experience.

## Advising Center

Engineering South (40), Room 111  
Phone: 805.756.1461  
<https://eadvise.calpoly.edu>

Senior Academic Advisor: Dawn Sirois  
Academic Advisor: Ashlee Burt  
Academic Advisor: Greg Roldan  
Academic Advisor: Jamey Stamets  
Academic Advisor: Maria Zavala

The Advising Program within Engineering Student Services is dedicated to providing effective and comprehensive support to current undergraduate engineering students. Through individual and group advising sessions, workshops, programs, and technology, the staff helps

students understand university and college policies and procedures, such as, change of major, academic probation, and readmission. Advising's academic services promote student success and development while assisting students in navigating and interpreting the curricula to reach their academic goals.

### **Multicultural Engineering Program (MEP)**

Engineering South (40), Room 115  
Phone: 805.756.1433  
<https://mep.calpoly.edu>

Coordinator: Jackie Duerr  
MEP Advisor: Meghan Palasweski

The Multicultural Engineering Program (MEP) within Engineering Student Services is an academic support program designed to recruit, retain and graduate a diverse population of students, especially groups which continue to remain the most underrepresented in engineering. This includes but is not limited to aspiring College of Engineering students who are first in their family to earn a baccalaureate degree, or from family backgrounds of limited financial resources and less educational opportunities. MEP leverages a strong support network to build an academic community and provide the necessary bridges for students' academic and professional success.

### **International Exchange Program (IEP)**

Engineering South (40), Room 111  
Phone: 805.756.1461  
<https://eadvise.calpoly.edu/iep>

IEP Advisor: Maria Zavala

The College of Engineering has established exchange agreements with reputable engineering overseas universities. These exchange program differ from other study abroad programs, in that they offer students the opportunity to attend overseas universities with an engineering focus, while paying Cal Poly tuition. The partner universities have been specifically selected by the College for their innovative technology and engineering coursework. Most of our partner universities guarantee on-campus housing and offer courses in English, making it easier for our students to take coursework to meet their degree requirements. Participation brings many lasting benefits that enhance students' educational, personal and professional life. Students typically return with improved communication skills, a better understanding of other cultures, a global engineering perspective, and a more marketable resume for industry. The current list of partner universities is located at: <https://eadvise.calpoly.edu/iep>.

### **Tutoring Program**

Engineering South (40), Room 113  
Engineering Bldg. (192), Room 133  
Phone: 805.756.1461  
<https://eadvise.calpoly.edu/tutoring/>

Engineering Student Services offers tutoring in two different locations. The Engineering Student Services lab (Building 40 Room 113) offers assistance in engineering, math and science courses. The Engineering Mechanics Success Center (Building 192 Room 133) offers assistance in statics, dynamics, strength of materials and thermodynamics. The tutors are trained to assist students in material based on each student's unique

learning style to help the student excel on their own. The current tutoring schedule is located at: <https://eadvise.calpoly.edu/tutoring/>.

## **Women's Engineering Program (WEP)**

Engineering South (13), Room 216  
Phone: 805.756.2350  
<http://wep.calpoly.edu>

Director: Helene Finger

The mission of the Women's Engineering Program (WEP) is to recruit and retain women engineering and computer science students by focusing on outreach, on-campus support and professional preparation objectives. To meet these objectives, WEP works closely with the Society of Women Engineers (SWE) Cal Poly student section, one of the top student sections in the nation, in supporting a variety of programs directed at pre-college, undergraduate and graduate students.

Outreach activities are directed at students from kindergarten through community college. These programs are designed to encourage pre-university women and girls to consider engineering as a career choice. Outreach recruitment activities include: Building an Engineer workshops, High School Shadow an Engineering Student day, Girl Scout Engineering Badge day, robotics competitions, elementary school workshops, and career fairs.

The Women's Engineering Program provides on-campus support to Cal Poly women engineering students through a variety of academic, leadership and social activities. These activities help students connect to their peers while concurrently assisting them in achieving their educational goals.

On-campus support activities include: scholarships, academic counseling and referrals, pre-registration counseling, big sibling program, test files, SWE meetings, social events, and community service activities.

Professional preparation activities are designed to prepare students for a productive career by facilitating networking with professionals and corporations. Professional preparation activities include: Evening With Industry banquet, Team Tech national design competition, Industry Tours, Resume Book, bi-weekly industry presentations and corporate information sessions.

## **Graduate Programs**

### **MS Engineering**

#### **General Characteristics**

The Master of Science degree program in Engineering has the following goals:

- Provide an empowering terminal professional degree for students who intend to become practicing engineers, retaining the strong laboratory emphasis and industrial interaction found in the BS curriculum.
- Provide preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree.
- Provide job-entry education for the more complex and evolving interdisciplinary areas of engineering, such as research and development, innovative design, systems analysis and design, bio-engineering, biomedical engineering, manufacturing, mechatronics, and engineering management.
- Update and upgrade opportunities for practicing engineers.

- Allow graduates to maintain currency in their fields.

To meet the above goals, and to prepare graduates to become effective professionals and leaders, the MS program has the following learning outcomes;

1. Technical competency;
2. Effective communication skills;
3. Awareness of the impacts of technology on society and the environment;
4. Understanding the ethics and responsible professional conduct;
5. Strong interpersonal and teamwork skills;
6. Appreciation of the need for life-long learning;
7. Leadership/planning/decision-making skills;
8. Critical thinking/complex problem-solving skills.

A number of these desired learning outcomes are similar to some of the ABET program outcomes ("A through K") that guide the accreditation process for our undergraduate degree programs. One expects that persons entering our graduate programs, whether or not from an undergraduate engineering program, would already possess many of these attributes to a significant degree. The graduate education would be expected to provide substantial enhancement. Consequently, the learning outcomes for the graduate programs build on the foundation of undergraduate engineering education while taking a more advanced focus appropriate for graduate-level study.

## Prerequisites

For admission as a classified graduate student, an applicant should hold a bachelor's degree in engineering or a closely related field with a minimum grade point average of 2.5 in the last 90 quarter units (60 semester units) attempted. Some programs impose higher GPA requirements. Applicants for most graduate engineering programs are required to submit scores for the General Test of the Graduate Record Examination. An applicant who meets program standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing. Contact the individual program graduate coordinator for details.

## Program of Study

Each graduate student must prepare a formal study plan with his or her advisor early in the program, usually before the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 23 of which must be at the 500 level) with a specialization in one of the following areas: Biochemical Engineering, Bioengineering, Biomedical Engineering, Integrated Technology Management, Materials Engineering, Water Engineering, or another individualized course of study.

## Requirements

The broad curriculum requirements for the Master of Science degree in Engineering are:

1. a number of required units in the field of specialization, in many cases supplemented by analytical and technical breadth requirements;
2. additional units taken as advisor-approved electives;
3. at least 23 units of the 45 unit program at the 500 level;

4. at least 32 units taken "in residence."

In some specializations, two culminating requirement options are available: a thesis/project option, which requires coursework and an up-to-9 unit thesis or project with oral defense; or a non-thesis/project option, which involves additional coursework and a comprehensive examination. The non-thesis option is normally allowed only for students who have completed a senior project or have had significant prior engineering project experience.

The College of Engineering offers two joint programs: in conjunction with the Orfalea College of Business, the MS Engineering Management (<http://catalog.calpoly.edu/collegesandprograms/interdisciplinaryprograms/mbamsengineering>); and with the College of Architecture and Environmental Design (City and Regional Planning Department), the MCRP/MS Engineering, with a specialization in Transportation Planning (<http://catalog.calpoly.edu/collegesandprograms/interdisciplinaryprograms/mcrpmsengineeringtransportationplanning>).

### MS Engineering, Specialization in Bioengineering

**NOTE: Applications to the Bioengineering Specialization are not currently being accepted. Contact the College of Engineering for further information.**

### MS Engineering, Specialization in Biomedical Engineering

**NOTE: Applications to the Biomedical Specialization are not currently being accepted. Contact the College of Engineering for further information.**

### MS Engineering, Specialization in Integrated Technology Management

The Master of Science in Engineering with a specialization in Integrated Technology Management is designed as a terminal degree program with a professional focus. Its objectives are to provide the student greater breadth and depth of technical knowledge and to help the student practice communication, leadership, and project management skills.

The program has flexible curriculum allowing the student a wide choice in course selection. A student can choose technical elective courses from the Industrial and Manufacturing Engineering department as well as outside the department. Flexibility is emphasized so that the student and his/her advisor can structure a degree plan tailored to the individual needs of the student. Only letter-graded courses count toward satisfying the total unit requirement for the degree. Courses on a credit/no credit basis are not allowed in the formal study plan. No audit credits are permitted.

The program does not require a thesis. A student is required to complete a project in which he/she typically works in industry and applies engineering knowledge and methods to solve a practical complex problem. The student is required to document his/her project with a final report, which will be reviewed by the project advisor in the Industrial and Manufacturing Engineering department.

### MS Engineering, Specialization in Water Engineering

## MS Fire Protection Engineering

### General Characteristics

The profession of Fire Protection Engineering is directed toward the identification, analysis and mitigation of fire hazards and risks across a broad spectrum of applications, including buildings, consumer products,

industrial processes, transportation vehicles, infrastructure facilities and the wildland-urban interface.

The Master of Science in Fire Protection Engineering prepares individuals to assess and reduce the potential for property and human loss from fire in these and other settings. Students learn to analyze how buildings are used, how fires start, how fires grow, and how fire and smoke affect people, buildings and property. Fire protection engineers use the latest engineering and construction technologies to:

1. Design systems that control fires, alert people to danger and provide means for escape;
2. Evaluate buildings to identify fire risks of and the means to prevent or mitigate them;
3. Conduct fire safety research on consumer products and construction materials; and
4. Investigate fires to discover how fires start, how they spread, why protective measures fail, and how those measures could be designed more effectively.

To meet these program goals, the fire protection engineering curriculum requires that students successfully complete a total of 45 units including a fire protection engineering project as the culminating experience (FPE 596). The culminating experience will be innovative and require independent thinking. Typically, the students will perform a detailed fire and life safety evaluation of a selected building, the preparation of a comprehensive report documenting the results of this evaluation and the presentation of their analysis and findings in an oral defense to a review committee. Other innovative culminating experiences of similar scope and complexity may be submitted for approval.

## Program Goals

The Fire Protection Engineering program is designed to build on the skills, knowledge, and broad engineering principles students acquire in an undergraduate engineering program. The required and elective courses composing the Master of Science 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. Upon completion of this program, students should possess the necessary knowledge and skills to pursue professional certification and licensure in the fire protection engineering discipline. Furthermore, the program addresses unique fire challenges faced by California and other western states, including wildland-urban interface fires and post-earthquake fires. Upon completing the requirements for a Master of Science degree in Fire Protection Engineering, students should be able to:

- 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.
- 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.
- 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.
- Understand 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.

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

## Prerequisites

For admission as a classified graduate student, an applicant should hold a bachelor's degree in engineering or a closely related field from a regionally accredited institution, college, or university. An undergraduate grade point average of 3.0 is required. On occasion, where other credentials are exceptionally strong, a GPA in the 2.5-3.0 range may be accepted.

## Tuition and Fees

As a special session program through Extended Education, the MS Fire Protection Engineering program is administratively and academically completely self-supporting. As such, the program carries a separate tuition and fee schedule. Please refer to <http://www.fpe.calpoly.edu/financial/index.html> for the current cost of the program.

## MS Engineering Management

MS Engineering Management is a concurrent degree that includes courses in the MBA program and the MS Engineering program with a specialization in Integrated Technology Management. It is a cooperative effort between the Orfalea College of Business and the Cal Poly College of Engineering (Industrial and Manufacturing Engineering Department). Please see MS Engineering Management (<http://catalog.calpoly.edu/collegesandprograms/interdisciplinaryprograms/mbamsengineering>) for more information.

## MCRP/MS Engineering, Specialization in Transportation Planning

The The MCRP/MS Engineering with Specialization in Transportation Planning (<http://catalog.calpoly.edu/collegesandprograms/interdisciplinaryprograms/mcrpmsengineeringtransportationplanning>) is a joint interdisciplinary program between the College of Engineering and the City and Regional Planning Department of the College of Architecture and Environmental Design. Participation in the program requires enrollment in both Colleges. Participants successfully completing the program are awarded both the MCRP and the MS in Engineering, each with a Specialization in Transportation Planning.

## Graduate Certificate Programs Fire Protection Engineering Applications

### General Characteristics

The courses offered in the Fire Protection Engineering Applications graduate certificate program will prepare students for a specialized career in fire protection engineering. Students completing the certificate program will be prepared for careers in:

- Consulting/Design Engineering Firms
- Fire Equipment and Systems Manufacturers

- Hospitals and Health Care Facilities
- Insurance Industry
- Research and Testing Laboratories
- Fire Departments
- Government

### Program Goals

Upon completing the requirements for the graduate certificate, students should be able to:

1. 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.
2. Understand 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.
3. Design fire detection and alarm systems, fire suppression systems, structural fire protection systems, and egress systems to achieve specified performance objectives.

To meet these program goals, the fire protection engineering applications curriculum requires that students successfully complete a total of 16 units.

## Fire Protection Engineering Science

### General Characteristics

The courses offered in the Fire Protection Engineering Science graduate certificate program will prepare students for a specialized career in fire protection engineering. Students completing the certificate program will be prepared for careers in:

- Forensic Investigations;
- Nuclear Fire Safety;
- Fire Science Research (R&D facility, Testing Lab, etc.)
- Government
- Fire Departments

### Program Goals

Upon completing the requirements for the graduate certificate, students should be able to:

1. Apply concepts associated with the thermal sciences, including thermodynamics, fluid mechanics, and heat transfer, to the analysis of fire protection engineering problems.
2. 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.
3. 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.

To meet these program goals, the fire protection engineering science curriculum requires that students successfully complete a total of 16 units.

## Fire Protection Engineering Science & Fire Protection Engineering Applications Tuition and Fees

As a special session programs through Extended Education, the MS Fire Protection Engineering program and Fire Protection Engineering graduate certificate are administratively and academically completely self-supporting. As such, the programs carry a separate tuition and fee schedule. Please refer to <http://www.fpe.calpoly.edu/financial/index.html> for the current cost of the program.

## Blended BS + MS Engineering Program

The blended program provides motivated students with an accelerated route to the MS Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Students who matriculate from an ABET accredited BS program into this blended program have an additional requirement for their thesis. ABET requires that curricula include a major design experience, to ensure that students are ready for engineering practice. The experience should build on prior coursework, and should incorporate engineering standards and constraints. Hence, students matriculating from an ABET accredited program must have a master's thesis that includes this major design experience in order to complete their undergraduate degree requirements.

### Eligibility for Blended BS+MS Engineering

Students majoring in BS General Engineering, BS Computer Engineering, BS Manufacturing Engineering, and BS Materials Engineering may be eligible to pursue the blended program toward the MS Engineering with a specialization in Bioengineering, Biomedical Engineering, or Integrated Technology Management. They may also be able to pursue blended programs incorporating other MS degrees or specializations in the College of Engineering.

In addition, students in departments with their own master's degrees may be able to pursue masters degrees in other areas, or the MS Engineering degree via the blended program, based on agreements between their bachelors granting program and their target masters program.

Participation in the program is based on prior academic performance and other measures of professional promise. Students are selected by a faculty committee, chosen on the basis of the student's area of interest.

### Program of Study

Some programs allow students to complete a capstone experience that integrates the senior project with the graduate thesis. This arrangement also increases the possibilities for industrial interaction in students' professional programs.

The blended program may allow students to earn graduate credit for several senior electives, effectively decreasing the summed unit requirements for both degrees. Requirements concerning shared units vary by degree program. Contact the program graduate coordinator for details.

### Other Blended Programs

Blended BS+MS programs are also available in Aerospace Engineering (<http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/aerospaceengineering>), Biomedical Engineering

(<http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/biomedicalengineering>), Civil and Environmental Engineering (<http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/civilenvironmentalengineering>), Computer Science and Software Engineering (<http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/computersciencesoftwareengineering>), Electrical Engineering (<http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/electricalengineering>), Industrial Engineering (<http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/industrialmanufacturingengineering>), and Mechanical Engineering (<http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/mechanicalengineering>). Additional information about these programs may be obtained from the individual departments.

## FPE Courses

### FPE 500. Individual Study. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of graduate coordinator and supervising faculty member.

Advanced study planned and completed under the direction of a member of the program faculty. Open only to graduate students in the FPE program who have demonstrated ability to do independent work. FPE 500 must be taken as a 4-unit class when substituting for a required course in the FPE program.

### FPE 501. Fundamental Thermal Sciences. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Introduction to the thermal sciences, including thermodynamics, fluid dynamics and heat transfer, as they relate to fire protection engineering. Includes 1st and 2nd laws of thermodynamics, conservation relations, hydrostatics, internal and external flows, and heat transfer by conduction, convection and radiation. 4 lectures.

### FPE 502. Fire Dynamics. 4 units

Term Typically Offered: W

Prerequisite: FPE 501 or consent of instructor.

First exposure to fire dynamics phenomena. Includes fundamental fire and combustion topics such as thermodynamics of combustion, fire chemistry, premixed and diffusion flames, ignition, burning of liquids and solids, heat release rates, flame spread and fire plumes. 4 lectures.

### FPE 503. Flammability Assessment Methods. 4 units

Term Typically Offered: SP

Prerequisite: FPE 502.

Characterization of flammability properties of gaseous, liquid and solid materials. Fire test methods for evaluating flammability properties of materials and burning characteristics of products. Overview of regulatory requirements for restricting the flammability of products and materials used in buildings. 4 lectures.

### FPE 504. Fire Modeling. 4 units

Term Typically Offered: SU

Prerequisite: FPE 502, FPE 503.

Fire modeling techniques for fire safety assessment. Application of various engineering correlations and computer-based fire models, including zone models and computational fluid dynamics models, to representative fire problems. 4 lectures.

### FPE 521. Egress Analysis and Design. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Regulatory requirements for egress systems in buildings, including occupancy classifications, occupant loads, means of egress components and exit capacities. Introduction to human behavior in fire and to methods for calculating people movement under emergency conditions, including computer-based evacuation models. 4 lectures.

### FPE 522. Fire Detection, Alarm and Communication Systems. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Analysis of the operating characteristics of fire detection devices and alarm notification appliances. Introduction to modern fire alarm systems and components. Introduction to mass communication systems. Current installation and approval standards. 4 lectures.

### FPE 523. Water-based Fire Suppression. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing.

Analysis and design of water-based fire suppression systems, including water supply analysis and hydraulic calculations. Overview and design considerations for automatic sprinkler, water spray, water mist and foam suppression systems. Typical contemporary installations and current installation and approval standards. 4 lectures.

### FPE 524. Structural Fire Protection. 4 units

Term Typically Offered: SU

Prerequisite: Graduate standing or consent of instructor.

Regulation and analysis procedures for structural components of wood, steel, concrete, composites. Structural capabilities, modifications under fire induced exposures. Calculation methods for predicting fire resistance of structural components. Definition of types of building construction. 4 lectures.

### FPE 551. Fire Safety Regulation and Management. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Use of model building and fire codes, administrative regulation, retrospective codes, performance-based codes, and risk-based regulation to manage fire safety. Identification and application of different fire risk management tools and techniques. 4 lectures.

### FPE 552. Smoke Management and Special Hazards. 4 units

Term Typically Offered: W

Prerequisite: FPE 502 and FPE 504.

Analysis and design of smoke management systems. Assessment of smoke hazards. Identification of special hazards. Analysis and design of fire suppression systems used for fire control of special hazards, including gaseous and chemical agents and systems. 4 lectures.

**FPE 554. Forensic Fire Analysis. 4 units**

Term Typically Offered: SP

Prerequisite: Consent of graduate coordinator and instructor.

Recommended: FPE 504.

Introduction to the processes of fire investigation and reconstruction. Engineering analysis of structural and wildland fires. Identification of failure mechanisms in fire safety systems. Case studies of actual fire incidents to address and reinforce concepts related to different types of system and performance failures. 4 lectures.

**FPE 555. Fire Protection Management in the Wildland-Urban Interface (WUI). 4 units**

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor. Recommended: LA/NR 318 and NR 340.

Social, economic, political, and technological issues affecting fire management in urbanized landscapes where fire continues its ecological role. Fire risk analysis; needs assessment, legislative codes, standards and policies; liability issues; evacuation; incident response planning. 3 lectures, 1 laboratory.

**FPE 556. Advanced Heat Transfer III. 4 units**

Term Typically Offered: TBD

Prerequisite: ME 347 or FPE 502; and ME 350.

Advanced principles of heat transfer. Classical solution techniques to problems in radiation with applications related to the role of radiation heat transfer in the development of fire in buildings. 4 lectures.

Crosslisted as FPE/ME 556.

**FPE 596. Culminating Experience in Fire Protection Engineering. 1-5 units**

Term Typically Offered: W, SP

Prerequisite: FPE 504, advanced graduate standing, completion of, or concurrent enrollment in, engineering courses in program, and consent of instructor.

Performance of comprehensive fire and life safety evaluations of buildings and other structures. Communication of the results and findings of such evaluations in written report and by oral presentation. Conducted under supervision of faculty.

**FPE 599. Design Thesis. 1-9 units**

Term Typically Offered: TBD

Prerequisite: Consent of graduate coordinator and graduate standing.

Each individual will be assigned a thesis project for solution under faculty supervision as a requirement for the master's degree, culminating in a written thesis.