FIRE PROTECTION ENGINEERING MAJOR

Program Director: Peter Sunderland, Ph.D.

Fire Protection Engineering is concerned with the applications of scientific and technical principles to the understanding, mitigation, and suppression of fire. This includes the effects of fire on people, on structures, on commodities, on the environment, and on operations. The identification of fire hazards and their risk, relative to the cost of protection, is an important aspect of fire safety design.

The fire protection engineering student receives a fundamental engineering education involving the subjects of mathematics, physics, and chemistry. The program builds on other core engineering subjects of material science, fluid mechanics, thermodynamics and heat transfer with emphasis on principles and phenomena related to fire. Fluid mechanics includes applications to sprinkler design, suppression systems, and smoke movement. Heat transfer introduces the student to principles of heat conduction, heat convection, thermal radiation, evaporation of liquid fuels and pyrolysis of solid fuels. The subject of combustion is introduced involving premixed and diffusion flames, ignition and flame spread, and burning processes. Laboratory experience is gained by collecting, viewing, and analyzing data obtained in standard fire tests and measurements.

Design procedures are emphasized for systems involving alarm, detection, suppression, smoke control, and building safety requirements. The background and application of codes and standards are studied to prepare the student for practice in the field. System concepts of fire safety and methods of analysis are presented. A senior capstone design project is included in a course that allows students who are nearing graduation to integrate the knowledge and skills they have acquired in their program and apply them to develop fire protection solutions to complex, yet practical, challenges.

There is an option to complete fire protection engineering major requirements (ENFP courses only) online (students should be aware that department policies apply). Please visit this website (https://fpe.umd.edu/undergraduate/degrees/bachelor-science/) (https://fpe.umd.edu/undergraduate/degrees/bachelor-science) for more information.

The Bachelor of Science degree in Fire Protection Engineering degree program at the University of Maryland is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the General Criteria and Program Criteria for Fire Protection and Similarly Named Engineering Programs.

Program Educational Objectives

The educational objectives of the undergraduate program in Fire Protection Engineering are to produce graduates who:

1. Apply the skills and knowledge attained to practice engineering and/or perform research in the field of fire protection engineering;
2. Continuously improve their skills, e.g., with continuing education, professional licensure/certification, or a graduate degree;
3. Demonstrate their dedication to the protection and enhancement of public safety, health, and welfare, and the environment; and
4. Uphold and advocate for ethical professional behavior.

The practice of fire protection engineering has developed from the implementation and interpretation of codes and standards directed at fire safety. These safety codes contain technical information and prescriptions derived from experience and research. Research has also led to quantitative methods to assess aspects of fire and fire safety. Thus, fire protection engineers need to be versed in the current technical requirements for fire safety and in the scientific principles that underlie fire and its interactions.

Student Learning Outcomes

Students graduating from the Department of Fire Protection Engineering will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. An ability to communicate effectively with a range of audiences
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

REQUIREMENTS (AT COLLEGE PARK)

In general, the fire protection engineering curriculum is designed to give the student a grounding in the science and practice of fire safety. The field touches on many disciplines and its scientific basis is expanding. It is an engineering discipline that is still growing, and offers a variety of excellent career opportunities. These cover a wide spectrum involving safety assessment reviews, hazards analysis and research, loss prevention, regulatory issues, and the development of new technologies and products for fire detection, alarm, mitigation and suppression.

Course	Title	Credits
CHEM135	General Chemistry for Engineers	3
MATH140	Calculus I	4
MATH141	Calculus II	4
MATH241	Calculus III	4
or MATH240	Introduction to Linear Algebra	
MATH246	Differential Equations for Scientists and Engineers	3
PHYS161	General Physics: Mechanics and Particle Dynamics	3
PHYS260	General Physics: Electricity, Magnetism and Thermodynamics	3
PHYS261	General Physics: Mechanics, Vibrations, Waves, Heat (Laboratory)	1

ENES100	Introduction to Engineering Design	3
ENES102	Mechanics I	3
ENES220	Mechanics II	3
ENES221	Dynamics	3
ENES232	Thermodynamics	3
ENGL101	Academic Writing (General Education FSAW)	3
Professional Writing (General Education FSPW)		3
General Education Requirements [1]		18
ENFP201	Numerical Methods with MatLab	3
ENFP250	Introduction to Life Safety Analysis	3
ENFP300	Fire Protection Fluid Mechanics	3
ENFP310	Water Based Fire Protection Systems Design	3
ENFP312	Heat and Mass Transfer	3
ENFP350	Professional Development Seminar	1
ENFP405	Structural Fire Protection	3
ENFP410	Special Hazard Suppression Systems	3
ENFP411	Risk-Informed Performance Based Design	3
ENFP413	Human Response to Fire	3
ENFP415	Fire Dynamics	3
ENFP420	Fire Assessment Methods and Laboratory	4
ENFP425	Enclosure Fire Modeling	3
ENFP426	Computational Methods in Fire Protection	3
ENFP440	Smoke Management and Fire Alarm Systems	3
Technical Electives [2]		12
Total Credits		**120**

1. Please see the General Education webpage (https://gened.umd.edu/) for a full list of General Education requirements, including those not covered by major requirements.
2. Technical electives are chosen in consultation with the academic advisor but must include the following:
   - at least 3 credits of: MATH400+ or STAT 400+;
   - at least 3 credits of: ENFP 400+; and
   - at least 6 credits of: Engineering coursework 300+, CHEM 400+, CMSC400+, MATH400+, or PHYS 400+.

REQUIREMENTS (ONLINE)

In general, the fire protection engineering curriculum is designed to give the student a grounding in the science and practice of fire fire safety. The field touches on many disciplines and its scientific basis is expanding. It is an engineering discipline that is still growing, and offers a variety of excellent career opportunities. These cover a wide spectrum involving safety assessment reviews, hazards analysis and research, loss prevention, regulatory issues, prevention and the development of new technologies and products for fire detection, alarm, mitigation and suppression.

Students should work with a fire protection engineering advisor to determine an institution at which they can pursue degree requirements. Please visit this website (https://fpe.umd.edu/undergraduate/degrees/bachelor-science/) for more information.

Course	Title	Credits
Requirements Available at College Park or through Prior Learning Credit		
CHEM135	General Chemistry for Engineers	3
MATH140	Calculus I	4
MATH141	Calculus II	4
MATH241	Calculus III	4
or MATH240	Introduction to Linear Algebra	
MATH246	Differential Equations for Scientists and Engineers	3
PHYS161	General Physics: Mechanics and Particle Dynamics	3
PHYS260	General Physics: Electricity, Magnetism and Thermodynamics	3
PHYS261	General Physics: Mechanics, Vibrations, Waves, Heat (Laboratory)	1
ENES100	Introduction to Engineering Design	3
ENES102	Mechanics I	3
ENES220	Mechanics II	3
ENES221	Dynamics	3
ENES232	Thermodynamics	3
ENGL101	Academic Writing (General Education FSAW)	3
General Education Requirements [1]		18
Technical Electives [2]		12
Requirements Available Online (Beginning Fall 2025). [3]		
Professional Writing (General Education FSPW)		3
ENFP201	Numerical Methods with MatLab	3
ENFP250	Introduction to Life Safety Analysis	3
ENFP300	Fire Protection Fluid Mechanics	3
ENFP310	Water Based Fire Protection Systems Design	3
ENFP312	Heat and Mass Transfer	3
ENFP350	Professional Development Seminar	1
ENFP405	Structural Fire Protection	3
ENFP410	Special Hazard Suppression Systems	3
ENFP411	Risk-Informed Performance Based Design	3
ENFP413	Human Response to Fire	3
ENFP415	Fire Dynamics	3
ENFP420	Fire Assessment Methods and Laboratory	4
ENFP425	Enclosure Fire Modeling	3
ENFP426	Computational Methods in Fire Protection	3
ENFP440	Smoke Management and Fire Alarm Systems	3
Total Credits		**120**

1. Please see the General Education webpage (https://gened.umd.edu/) for a full list of General Education requirements, including those not covered by major requirements.
2. Technical electives are chosen in consultation with the academic advisor but must include the following:
   - at least 3 credits of: MATH400+ or STAT 400+;
   - at least 3 credits of: ENFP 400+; and
   - at least 6 credits of: Engineering coursework 300+, CHEM 400+, CMSC400+, MATH400+, or PHYS 400+.
3. Check the latest information (https://fpe.umd.edu/undergraduate/degrees/bachelor-science/) for which courses are available online.

GRADUATION PLANS

Click here (https://eng.umd.edu/advising/four-year-plans/) for roadmaps for graduation plans in the A. James Clark School of Engineering.

Additional information on developing a graduation plan can be found on the following pages:

- http://4yearplans.umd.edu
- the Student Academic Success-Degree Completion Policy (https://academiccatalog.umd.edu/undergraduate/registration-academic-requirements-regulations/academic-advising/#success) section of this catalog