Masters of Engineering with a Concentration in Advanced Safety Engineering and Management (M.Eng.)

Note that this program is totally online.

Website:	http://www.uab.edu/asem
Degree Offered:	MEng
Director:	Donald S. Burke, Ph.D.
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Instructors

The MEng-ASEM graduate program is taught by a team of practicing safety and health professionals with Dr. Donald Burke serving as overall Course Director. Practitioner-Scholars facilitate online discussions on key topics of interest in their industry sector and provide industry-specific case studies. Students participate in peer-to-peer learning activities discussing current topics of interest and real world experiences using online discussion boards.

Admission

Admission to the UAB MEng-ASEM program requires the following:

- 3.0 GPA on 4.0 scale
- Undergraduate degree from a nationally accredited school
- Experience in a safety profession

Applicants not satisfying the grade point average requirement and/or holding a degree from a nationally accredited school may receive admission on a provisional basis, subject to assessment and recommendation of the program director. To apply, visit the UAB Graduate School's website (uab.edu/graduate) and click the 'Apply Now' button.

Additional Information

Comments:	The ASEM program is totally online. There are no campus classes, meetings, or activities. Course delivery includes asynchronous and synchronous learning modes.
Entrance Tests:	None
Number of Recommendations Required:	Three (including one personal essay and two letters of recommendation, one of which must be from your current, direct supervisor)
Deadline for All Application Materials to be in the Graduate School Office:	Six weeks before term begins (see UAB academic calendar - https://www.uab.edu/students/academics/academic-calendar)
Application Submission Deadline for Entry Term(s):	Fall: August 1; Spring: December 1; Summer: Mayl 1

For detailed program information, contact:
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Master of Engineering with a concentration in Advanced Safety Engineering and Management

Students must earn a B or better in two attempts to meet graduation requirements.

Requirements		Hours
Required Courses		
ASEM 601	ASEM Seminar [1]	0
ASEM 610	Introduction to System Safety - Prevention through Design	3
ASEM 619	Capstone Project - Part 1	3
ASEM 620	Capstone Project - Part 2	3
Electives		**24**
ASEM 611	Hazard Analysis and Waste Elimination	
ASEM 612	Engineering Risk	
ASEM 613	Human Performance and Engineering Design	
ASEM 614	Engineering Ethics and Acceptable Risk	
ASEM 615	Leading through Climates of Change	
ASEM 616	Policy Issues in Prevention through Design	
ASEM 617	Crisis Leadership	
ASEM 626	Learning-Based Response to Organizational Accidents and Incidents	
ASEM 627	Communication in Safety Systems	
ASEM 628	Electrical Systems Safety	
ASEM 630	Machinery Safety Managment System	
ASEM 690	Special Topics in (Area) [2]	
ASEM 691	Individual Study in (Area) [2]	
Total Hours		**33**

1 Must be taken each semester
2 With Director approval; no more than 6 combined credit hours of ASEM 690 and ASEM 691 may be applied to the degree

Courses

ASEM 601. ASEM Seminar. 0 Hours.
Seminar focusing on student research and guest presentations of various topics of interest to safety and risk management engineers and safety professionals.

ASEM 610. Introduction to System Safety - Prevention through Design. 3 Hours.
Best practice in any business sector requires the pursuit of a triple bottom line - protecting people, planet, and profit. This course provides an overview of system safety in general and Prevention through Design in particular and explores their efficacy in helping companies achieve a bottom line that is socially, environmentally, and financially rewarding. Topics of inquiry include the processes of hazard analysis and risk assessment, the concept of "acceptable" risk, the safety decision hierarchy of controls, safety standards (the mandatory minimum vs. the voluntary best practice), safety as a cost control strategy, and the critical elements of a comprehensive, advanced safety program. Course content is presented within the framework of real-world case studies from a variety of industry sectors, including, but not limited to, manufacturing, utilities, and health care and includes several guest lectures by leaders in the profession. Students apply course content to their own business environment. Guest lecturers from diverse backgrounds will discuss their experiences in managing safety in the workplace. Live participation in a weekly 1.5 hour online forum is required. Course must be taken during the first semester.

ASEM 611. Hazard Analysis and Waste Elimination. 3 Hours.
Hazards have the potential to cause harm to people, planet, and profits. Hazard analysis is a process that begins with the identification of a hazard and proceeds into an estimate of the severity of harm or damage that could result if the potential is realized and a hazard-related incident occurs (ASSE TR-Z790.001 – 2009). This course examines engineering techniques utilized to systematically and logically identify and analyze hazards in the workplace. These techniques include preliminary hazard list (PHL), preliminary hazard analysis (PHA), system hazard analysis (SHA), subsystem hazard analysis (SSHA) and others. Students work in teams to use these techniques to retrospectively analyze a real-world disaster.
Prerequisites: ASEM 610 [Min Grade: B]

ASEM 612. Engineering Risk. 3 Hours.
Engineering risk is defined both quantitatively and qualitatively as an estimate of the probability that a hazard-related incident will occur and of the severity of harm or damage that could result. This course provides students with tools to assess and reduce safety risks in their own company. These tools include risk assessment matrices, probabilistic risk assessment (PRA) measures, including event tree analysis, fault tree analysis, and other prevention through design concepts. The role of a structured, formalized decision analysis process in preventing serious injuries and fatalities is also explored. Students engage in a risk mitigation decision analysis project, which is specific to their company and/or business sector. Guest lecturers from diverse industries discuss their experiences in assessing and managing risk. Live participation in a weekly 1.5 hour online forum is required.
Prerequisites: ASEM 610 [Min Grade: B]

ASEM 613. Human Performance and Engineering Design. 3 Hours.
Companies can miss important opportunities to eliminate waste if they rely primarily on training to prevent human error. This course explores the historical perspective on human error and serious injury. The course material will provide a solid understanding of the principles of occupational biomechanics and human tolerance to injury with focus on human anthropometry and mechanical work capacity. This course also includes studies of human reliability, static analysis of systems in equilibrium and mechanical systems, design and performance. Due to the quantity of back related injuries and related lost time in the workplace, back pain and injury is studied along with the effect of vibration on the human body. Real-world case studies provide for application of the engineering hierarchy of controls: hazard elimination, hazard substitution, engineering controls, warnings, administrative behavior controls, and personal protective equipment. The course also examines the design aspects of ergonomics, the biomechanical engineering basis of injury prevention, and the long term economic consequences of seemingly minor injuries. In semester projects, students perform incident investigations using biomechanical and other data. After gathering and analyzing data to determine injury causation, they will identify and re-design error-provocative environments in their own workplaces. Guest lecturers from diverse backgrounds will discuss their experiences with human performance and/or biomechanics. Live participation in a weekly 1.5 hour online forum is required.
Prerequisites: ASEM 610 [Min Grade: B]

ASEM 614. Engineering Ethics and Acceptable Risk. 3 Hours.
This course explores the economic, social, and political consequences of safety risk and considers provocative real world dilemmas: What is acceptable risk? Are the fundamental canons of engineering ethics contrary to the concept of acceptable risk? What is the worth of human life? Students will conduct critical reviews of corporate safety and ethics policies from market leaders in all major industries as well as their own company. Real-world case studies provide the framework for exercises in resolving conflicts of interest and avoiding the dilemma of "whistle blowing." Guest lecturers from diverse backgrounds will discuss their experiences with ethics in the workplace. Live participation in a weekly 1.5 hour online forum is required.
Prerequisites: ASEM 610 [Min Grade: B](Can be taken Concurrently)

ASEM 615. Leading through Climates of Change. 3 Hours.
All progressive companies are moving toward greater sustainability - protecting people, planet, and profits. To guide their companies through these changes and integrate safety into the priorities at the executive level, safety engineers and professionals must have strong leadership skills. This course explores engineering leadership best practices, including the eight steps of transformational leadership - creating a sense of urgency, creating a guiding coalition, developing a vision and strategies, communicating the vision, empowering broad-based action, generating short term wins, consolidating gains and anchoring the culture. This course also explores the concept of Resilience Engineering and helps students understand the impacts of socio-technical risks. Guest lecturers from diverse industries discuss their experiences in managing change in today's global business environment. Live participation in a weekly 1.5 hour online forum is required.
Prerequisites: ASEM 610 [Min Grade: B]

ASEM 616. Policy Issues in Prevention through Design. 3 Hours.
This course provides an overview of best practices in four major policy areas: (1) cost-benefit analysis; (2) corporate culture and the "HR Department"; (3) standards, codes, and regulations; and (4) strategic alliance development. Case studies are used to illuminate both the role of engineers and other safety professionals in shaping public policy on the local, national and international levels and the ethical challenges they encounter. The significance of an organization's corporate culture in developing and implementing advanced safety management plans is also explored. Students conduct "gap analyses" of their company's policies by comparing them to best practices and identifying unintended consequences of poor safety policy in their own business and industry sector. Students will engage in discussion board posts on contemporary policy issues and participate in exercises related to federal rulemaking. Guest lecturers from diverse backgrounds will discuss their experiences with policy issues. Live participation in a weekly 1.5 hour online forum is required.
Prerequisites: ASEM 610 [Min Grade: B]

ASEM 617. Crisis Leadership. 3 Hours.
Leadership requires more than the predication, control, and management of the vast network of influences that make up our work, especially in times of crisis. By its nature, a crisis is an unpredicted event that requires sensemaking and innovation to go beyond immediate recovery, to step forward into learning. We can only do this when we value, trust, and communicate with the people in our systems. This course will explore why complex adaptive systems are different and may be understood and influenced by leadership at all levels before, during, or after a crisis. Students will assess their own organizational culture through the artifacts, espoused values, and deep assumptions and learn to shape these through relationships, sensemaking, and divergent thinking. This course includes two-week long learning modules based on a combination of written discussion boards that emphasize academic rigor, small group dialogues, network mindmapping, and dynamic online Zoom classes with the professors.
Prerequisites: ASEM 610 [Min Grade: B]

ASEM 619. Capstone Project - Part 1. 3 Hours.
Bringing to bear the competencies acquired through the program, students develop a proposal, outline, schedule and rough draft of a comprehensive, advanced safety engineering and management plan for their business unit/specialty area that is consistent with the ANSI/AIHA Z10-2005, Occupational Health and Safety Management Systems standard. Judicious selection of the Capstone topic and of projects throughout the ASEM curriculum allows students to build on and use earlier course products to support their Capstone report. Live participation in a quarterly 1.25 hour online forum is required. Must be taken during the penultimate or final semester.
Prerequisites: ASEM 610 [Min Grade: B] and ASEM 611 [Min Grade: B] and ASEM 612 [Min Grade: B] and ASEM 613 [Min Grade: B] and ASEM 614 [Min Grade: B] and ASEM 615 [Min Grade: B] and ASEM 616 [Min Grade: B] and ASEM 617 [Min Grade: B] and ASEM 618 [Min Grade: B] and ASEM 628 [Min Grade: B](Can be taken Concurrently)

ASEM 620. Capstone Project - Part 2. 3 Hours.
Students complete the development of their comprehensive, advanced safety engineering and management (ASEM) plan, including background information of the project, an ASEM plan (management and employee participation, planning, implementation and operation, evaluation and corrective action and management review), and rollout strategy. Students must submit completed report with detailed attachments, and orally present project highlights to the class in a live online classroom setting. Live participation in a quarterly 1.25 hour online forum is required.
Prerequisites: ASEM 610 [Min Grade: B] and ASEM 611 [Min Grade: B] and ASEM 612 [Min Grade: B] and ASEM 613 [Min Grade: B] and ASEM 614 [Min Grade: B] and ASEM 615 [Min Grade: B] and ASEM 616 [Min Grade: B] and ASEM 617 [Min Grade: B] and ASEM 618 [Min Grade: B] and ASEM 628 [Min Grade: B](Can be taken Concurrently)

ASEM 626. Learning-Based Response to Organizational Accidents and Incidents. 3 Hours.
Accident investigations are an inevitable part of most industries, yet most analysis is based on models that were developed many decades – or even a century ago. In our current world, not everything fits into a specific model – this is especially true of human factors in complex systems. Current research indicates that 80% of accidents are attributed to human error. Yet few tools or processes are designed to make sense of the human contribution to accidents and incidents. When we look at human involvement, we find that actions and decisions are consequences of conditions extant in the system, and are not, themselves, causes of the event. The goal of this course is to discover the importance of dedicating time and resources to understanding why humans are integral to complex systems. Students will benefit from learning both the theory and practical application of accident/incident analysis, including new ideas that expand the ability of organizations to learn from events. Approached examined or introduces are consistent with modern advances in event learning and accident prevention. Students will explore the history of accident investigation, it's influence on culture, the importance of context in the evaluation of human actions, the inclusion of complex narratives in reports, and how to present their findings to leadership and the field. Overall, students should come away with a more practical ability to help their organization learn from events. The course structure is focused on case study analysis, peer to peer learning and research. Questions are designed to challenge current understanding of the human contribution to accidents and why actions or decisions made sense to those involved at the time.

ASEM 627. Communication in Safety Systems. 3 Hours.
Communication plays a powerful role in creating safety in the work environment. Effective language increases communication and can lead to individual and organizational learning during safety training, real-time work, and post-mission analysis. However, the meaning of our language is not constant – it changes based on the experience of the worker, the context of the event, and the culture that surrounds the work environment. Language can become ineffective, or even damaging, when meanings differ or go unchallenged. This can occur when definitions are assumed, linguistic shortcuts are taken, or when language bias demands a singular interpretation. Engineers work with mechanical systems, which can be defined by a specific language: e.g. binary oppositions, like turning a switch 'on' or 'off'. However, engineers also work with other people and must take human factors into account, including effective communication. This is the case with safety specialists, who help create the system architecture and develop practical training for workers in risk and safety. These specialists may be expected to participate in accident investigations or incident reviews, which can be unintentionally biased by the language used, which lead away from learning opportunities.

ASEM 628. Electrical Systems Safety. 3 Hours.
There is a subset of occupational hazards characterized as low frequency, but with very high consequence (potential for catastrophic loss, fatality or permanent disabling injury). A mishap involving unintentional exposure or contact with electrical energy is one of the low frequency/high consequence exposures. We live in an electrical world, with electrical hazards embedded in nearly every aspect of daily living – at home, at work, in public places, and in recreational activities. This course explores hazards, risks and context of electrical mishaps coupled with a systems safety engineering approach to manage the risks. Course content is presented within the framework of real-world case studies from a variety of industry sectors, including, but not limited to, manufacturing, utilities, and health care and includes several guest lectures by leaders in the profession. Students apply course content to their own business environment. Live participation in a weekly 1.5 hour online forum is required.
Prerequisites: ASEM 610 [Min Grade: B]

ASEM 630. Machinery Safety Managment System. 3 Hours.
Safeguarding technology and requirements have come a long way since the Industrial Revolution. Despite this progress, the lack of machine guarding has continuously been named on OSHA'S top most-cited violations. The goal of this course is to equip the student with working knowledge of machinery safety and to develop an ANSI Z10 safety management system so that safety is incorporated into the equipment lifecycle. Students will evaluate their current machine management systems to evaluate obstacles, best practices, and solutions to further gain knowledge in machinery technology and management. Students will gain an understanding of hazard identification, task-based risk assessment, utilizing the hierarchy of control to select risk reduction measures, verifying selected safeguards to mitigate risks to a tolerable level, and ensuring that the process is documented, maintained, and audited. Students will demonstrate their knowledge through evaluating their current machine safety program system gaps, conducting a task-based risk assessment, and developing a Machinery Safety Management System outline to be used at their site or within a company.
Prerequisites: ASEM 610 [Min Grade: B]

ASEM 640. Introduction to Model-based Safety Assessments. 3 Hours.
This course provides students an introduction to model-based engineering and methods to assess holistic safety risks in their own company. These tools include requirements development, functional decomposition, design architecture, probabilistic risk assessment (PRA) measures, including, failure mode effects and criticality analysis (FMECA), fault tree analysis (FTA), and other safety engineering concepts. The role of a structured, formalized model-based engineering process, used to identify and mitigate hazards, is explored. Students engage in a rigorous model-based safety analysis project.
Prerequisites: ASEM 610 [Min Grade: B] or ASEM 611 [Min Grade: B] or ASEM 612 [Min Grade: B]

ASEM 690. Special Topics in (Area). 1-6 Hour.
Special Topics.

ASEM 691. Individual Study in (Area). 1-6 Hour.
Individual study.