

SENG - SAFETY ENGINEERING

SENG 601/CHEN 601 Laboratory Safety for Chemical Engineers

Credit 1. 1 Lecture Hour. Overview of hazards associated with chemical engineering research laboratories and the chemical process industry; causes and prevention of accidents, emergency procedures, safety codes, health effects of toxic substances and experimental design for safety. **Prerequisites:** Graduate classification. **Cross Listing:** CHEN 601/SENG 601.

SENG 640 Material Safety in Semiconductor Manufacturing

Credits 3. 3 Lecture Hours. In-depth understanding of hazardous materials commonly used in semiconductor manufacturing processes; focus on the significance of hazardous materials handling and the safe way to do it; safe handling practices, storage requirements, emergency response procedures, and regulatory compliance specific to hazardous materials in semiconductor facilities; modeling and management techniques for different consequences (e.g., toxicity, fire, and explosion). **Prerequisites:** Graduate classification.

SENG 641 Process Safety in Semiconductor Manufacturing

Credits 3. 3 Lecture Hours. Comprehensive understanding of chemical process safety principles and practices specifically tailored to the semiconductor manufacturing industry; overview of how to identify and mitigate hazards associated with chemical processes, develop emergency response plans, and gain insights into safety management systems within semiconductor facilities. **Prerequisites:** Graduate classification.

SENG 642 Vapor Phase Techniques for Semiconductor Manufacturing

Credits 3. 3 Lecture Hours. Comprehensive understanding of physical vapor deposition (PVD) and chemical vapor deposition (CVD) techniques and their crucial roles in semiconductor manufacturing; understanding of the principles, processes, and applications of PVD and CVD, with a specific focus on mass transport, heat transport, chemistry for CVD, epitaxy, vapor phase exchange, and CVD reactor design; topics include how to distinguish between PVD and CVD methods, effectively choose the most suitable CVD techniques for specific industrial applications, perform calculations related to mass transport, analyze heat transfer mechanisms, anticipate chemical reactions within deposition processes, apply epitaxial growth principles, optimize vapor phase exchange mechanisms, and engineer custom CVD reactor systems tailored to industry requirements; various aspects of semiconductor manufacturing, research, and development; exploration of the efficiency of film deposition processes, exert control over film characteristics, and actively contribute to the continuous advancement of semiconductor technology. **Prerequisites:** Graduate classification.

SENG 655/CHEN 655 Process Safety Engineering

Credits 3. 3 Lecture Hours. Applications of engineering principles to process hazards analysis including source and dispersion modeling, emergency relief systems, fire and explosion prevention and mitigation, hazard identification, risk assessment, process safety management, etc. **Prerequisite:** Graduate classification; approval of instructor. **Cross Listing:** CHEN 655/SENG 655.

SENG 660 Risk Engineering

Credits 3. 3 Lecture Hours. Fundamental concepts, techniques, and applications of risk assessment and risk management for engineering systems; current industry practices for risk assessment of industrial facilities using qualitative and quantitative approaches are demonstrated through exercises and case studies from diverse engineering fields. **Prerequisites:** Graduate classification. **Cross Listing:** CHEN 660 and ISEN 660.

SENG 665 Reliability Engineering

Credits 3. 3 Lecture Hours. Fundamental concepts, techniques and application of reliability engineering; reliability data collection and analysis; methods of modeling systems for reliability, availability and maintainability analysis; failure analysis and reliable system and safety instrumented system design; system reliability design analysis and application through case studies and/or projects. **Prerequisites:** Graduate classification.

SENG 670 Safety Management Systems

Credits 3. 3 Lecture Hours. Fundamentals concepts and principles of safety management; demonstration of practical application of management techniques to ensure safe operation of industrial processes; current safety management system standards and regulations. **Prerequisite:** Graduate classification or approval of instructor.

SENG 674 System Safety Engineering

Credits 3. 3 Lecture Hours. Current system safety engineering analysis techniques; failure mode and effect and fault tree analysis; engineering economic analysis is reviewed to develop skills for the safety engineer in presenting alternate solutions to management.

SENG 677 Consequence and Impact Analysis

Credits 3. 3 Lecture Hours. Theory of flammability, fire and combustion; fire and explosion models; modeling consequence scenarios using available commercial software; fire protection principles; fire protection equipment, design, analysis; automatic extinguishing systems; design project. **Prerequisites:** Graduate classification.

SENG 680 Fundamentals of Safety

Credits 3. 3 Lecture Hours. General concepts and techniques of safety engineering upon which more detailed and advanced applications may be based; applications of safety engineering principles to industrial and commercial systems; the concept of designing optimally safe systems. **Prerequisite:** Graduate classification or approval of instructor.

SENG 681 Seminar

Credit 1. 1 Other Hour. Formal presentations in industrial hygiene and safety engineering by students and professional industrial representatives.

SENG 684 Professional Internship

Credits 1 to 6. 1 to 6 Other Hours. Training under the supervision of practicing engineers in settings appropriate to the student's professional objectives. **Prerequisites:** Approval of chair of student's advisory committee and department head.

SENG 685 Directed Studies

Credits 1 to 12. 1 to 12 Other Hours. Investigation of topics not within the scope of thesis or dissertation research and not covered by other formal courses.

SENG 689 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of safety engineering and industrial hygiene. May be repeated for credit.

Prerequisite: Approval of instructor.

SENG 691 Research

Credits 1 to 23. 1 to 23 Other Hours. Research in industrial hygiene, safety engineering or related topics for thesis or dissertation.