VISION رؤية 2030
المملكة العربية السعودية
KINGDOM OF SAUDI ARABIA

جامعة الحدود الشمالية
NORTHERN BORDER UNIVERSITY
كلية الهندسة

Northern Border University

College of Engineering

Department of Industrial Engineering

Program Name:

Master of Science in Safety Engineering and Risk Management

1445/1446 - 2024/2025

MASTER OF SCIENCE IN SAFETY ENGINEERING AND RISK MANAGEMENT

1. About the program

The Master of Science in Safety Engineering and Risk Management at Northern Border University is designed to equip students with advanced knowledge and skills in the field of safety engineering and risk management. This program emphasizes both theoretical and practical aspects, preparing graduates for various professional roles in safety and risk management across multiple industries.

Career Opportunities:

Graduates of this program are qualified for a variety of professions, including:

- **Safety Engineer/Manager/Consultant/Specialist**: Designing and implementing safety programs, conducting risk assessments, ensuring compliance with regulations in various industries.
- **Risk Analyst/Consultant/Specialist**: Identifying, assessing, and mitigating risks for organizations, projects, or within specific sectors.
- **Occupational Health and Safety Engineer/Manager/Consultant/Specialist**: Developing and enforcing workplace safety standards, conducting hazard analyses, and promoting health/wellbeing in industrial settings.
- **Emergency Management Consultant/Specialist**: Planning and coordinating responses to disasters, developing preparedness plans, and working with government agencies or NGOs.
- **Process Safety Engineer**: Analyzing and improving safety systems in chemical plants, refineries, and other facilities handling hazardous materials.
- **Quality Assurance/Control Specialist**: Focusing on the safety and reliability of products, processes, and systems.
- **Environmental Safety Consultant/Specialist**: Addressing environmental hazards, ensuring compliance with regulations, and developing sustainable safety practices.
- **Researcher/Academic**: Pursuing further studies (Ph.D.) or working in research institutions focused on safety and risk management.

Relevant Sectors:

Graduates can find employment in various sectors, such as:

- Manufacturing (heavy industries, automotive, etc.)
- Construction (large-scale infrastructure projects, building sites)
- Energy (oil and gas, power generation, renewable energy sectors)
- Transportation (aviation, shipping, logistics)
- Healthcare (hospitals, medical facilities, pharmaceutical industries)
- Government Agencies (regulatory bodies, emergency response organizations)
- Consulting Firms (providing risk management and safety expertise)
- Insurance (assessing risks for underwriting, developing safety protocols)

2. Program Mission

To produce skilled graduates in safety engineering and risk management who can analyze and design safety systems, manage risks, conduct research, and provide services to enhance community safety, environmental protection, and sustainable industrial development.

3. Program Goals

Goal 1: Develop graduates with advanced expertise in safety engineering and risk management, empowering them to protect people and assets.

Goal 2: Foster a research-driven approach to safety, enabling graduates to analyze problems, generate data-driven solutions, and contribute to new knowledge.

Goal 3: Prepare graduates to be safety leaders, capable of educating stakeholders, influencing workplace culture, and advocating for policies that enhance community well-being.

4. Program Learning Outcomes (PLOs)

Knowledge and Understanding:

- **K1**: Acquire and integrate advanced knowledge of mathematical, scientific, and technical principles with recent developments in safety engineering and risk management.

Skills:

- **S1**: Apply advanced mathematical, scientific, and technical knowledge to solve complex problems in safety engineering and risk management.
- **S2**: Design, evaluate and optimize safety systems, risk management processes, and safety programs to address specific needs specific to different contexts.
- **S3**: Develop and demonstrate high-level communication skills to effectively convey complex safety concepts and research findings to diverse stakeholders, using appropriate digital and ICT tools.
- **S4**: Utilize scientific reasoning, experiments, simulations, and data analysis to proactively identify hazards, assess risks, develop, and implement effective mitigation strategies to enhance safety in diverse engineering applications.

Values, Autonomy, and Responsibility:

- **V1**: Exhibit a strong commitment to ethical practices and professional standards, recognizing the broader impacts of safety and risk management decisions on global, economic, environmental, and societal levels.
- **V2**: Collaborate effectively as a team member or leader in diverse settings, demonstrating strong interpersonal, and conflict resolution skills to achieve common goals in safety engineering and risk management.
- **V3**: Demonstrate autonomy and leadership in safety and risk management through continuous learning, industry engagement, and contributions to the field.

5. Curriculum

Curriculum structure

Requirements	Number of Courses	Credit Hours
Required Courses	**7**	**20**
Elective Courses	**3**	**6**
Research Thesis	**1**	**6**
Total	**10**	**32**

Program Courses:

Level	Course Code	Course Title	Type	Prerequisites	Credit Hours
1	IE621	Safety Engineering and Management	Required	None	3
	IE622	Environmental and Occupational Health Management	Required	None	3
	IE631	Risk Analysis and Management	Required	None	3
2	IE623	Process Safety Engineering	Required	IE621, IE631	3
	IE624	Fire Safety Engineering	Required	IE621, IE631	3
	IE632	Resilience and Crisis Management	Required	IE621, IE631	3
3	IE711	Safety Regulations and Compliance	Required	IE621, IE631	2
	Elective 1	Elective Course 1	Elective	IE621, IE631	3
	Elective 2	Elective Course 2	Elective	IE621, IE631	3
4	IE791	Research Thesis	Required	Completion of 16 CH, one elective course, Departmental Approval	6

Elective Courses (to select any two):

Level	Course Code	Course Title	Prerequisite Courses	Credit Hours
3	IE712	Safety Technology and Innovation	IE621, IE631	3
3	IE731	Decision Support in Risk Management	IE621, IE631	3
3	IE741	Construction Safety Management	IE621, IE631	3
3	IE742	Cybersecurity Risk Management	IE621, IE631	3
3	IE743	Financial Risk Management	IE621, IE631	3
3	IE744	Healthcare Systems Safety	IE621, IE631	3
3	IE745	Supply Chain and Logistics Risk Management	IE621, IE631	3
3	IE746	Transportation Systems Safety	IE621, IE631	3

6. Thesis and Its Requirements

Registration Requirements:

- Completion of at least 50% of coursework (16 credits) and one elective course.
- Approval from the department.

Thesis Proposal:

- **Problem Statement and Significance**: Clearly articulate the specific research problem or gap in knowledge the thesis aims to address. Explain why this problem is relevant and significant within the field of safety engineering and risk management.
- **Literature Review**: Demonstrate a comprehensive understanding of existing research on the chosen topic. Identify key studies, synthesize their findings, and highlight where the proposed thesis will build upon or fill gaps within the current knowledge base.
- **Research Objectives/Questions**: State the specific goals or research questions that the thesis will seek to answer.
- **Methodology**: Provide a detailed plan outlining research design, data collection methods, data analysis techniques, and how the chosen methods will effectively address the research objectives.

- **Timeline**: Present a realistic timeline with achievable milestones, including target dates for proposal approval, data collection, analysis phases, thesis writing, and final submission.
- **Expected Outcomes/Contributions**: Describe the potential new knowledge, insights, or solutions that the thesis research is expected to generate. Explain how the findings will contribute to the field of safety engineering and risk management.

Thesis Defense:

- **Public Presentation**: The student delivers a formal presentation summarizing the research problem, methodology, key findings, results, conclusions, and contributions to the field.
- **Question & Answer Session**: Committee members pose challenging questions to test the student's depth of knowledge, critical thinking skills, and ability to defend their research.
- **Private Deliberation**: The committee convenes privately to thoroughly discuss the student's work and performance during the defense.
- **Outcome Announcement**: The defense committee assesses the thesis and defense performance based on problem significance, knowledge of the field, research rigor, contributions, thesis quality, and defense performance.

BRIEF COURSE DESCRIPTIONS

A - REQUIRED COURSES		CR
1	**IE621 Safety Engineering and Management**	3
	Description: This foundational course covers the principles, concepts, and practices essential for ensuring safety in various industrial and workplace environments. Topics include hazard identification, risk assessment, safety regulations and standards, safety management systems, incident investigation, emergency preparedness, and the cultivation of a safety culture. **Objectives**: • Understand the fundamental principles of safety engineering. • Develop skills in hazard identification and risk assessment. • Learn to design and implement effective safety management systems. • Gain knowledge of safety regulations and standards.	
2	**IE622 Environmental and Occupational Health Management**	3
	Description: This course explores the interrelationships between environmental health and occupational safety. It covers topics such as environmental hazard assessment, occupational health risks, regulatory frameworks, and best practices in managing health and safety in the workplace. **Objectives**: • Analyze environmental and occupational health hazards. • Implement strategies for managing health risks in the workplace. • Understand regulatory requirements and compliance.	
3	**IE631 Risk Analysis and Management**	3
	Description: This course focuses on the methodologies and tools used in risk analysis and management. Students will learn about risk assessment techniques, quantitative and qualitative risk analysis, risk mitigation strategies, and the application of risk management principles in various industries. **Objectives**: • Master techniques for conducting risk assessments. • Apply risk analysis tools to real-world scenarios. • Develop comprehensive risk management plans.	

4	**IE623 Process Safety Engineering**	3
	Description: This course delves into the principles and practices of process safety engineering. It covers the analysis and improvement of safety systems in chemical plants, refineries, and other facilities handling hazardous materials. **Objectives**: • Understand the fundamentals of process safety. • Analyze safety systems in process industries. • Implement safety improvements in hazardous environments.	
5	**IE624 Fire Safety Engineering**	**3**
	Description: This course provides in-depth knowledge of fire safety engineering principles. Topics include fire dynamics, fire prevention, detection and suppression systems, building codes, and fire safety management. **Objectives**: • Learn the science of fire dynamics and behavior. • Design effective fire prevention and suppression systems. • Understand and apply fire safety regulations and codes.	
6	**IE632 Resilience and Crisis Management**	**3**
	Description: This course addresses strategies for enhancing resilience and managing crises in industrial and community settings. Students will explore crisis preparedness, response planning, and the development of resilient systems and infrastructures. **Objectives**: • Develop crisis management and response plans. • Enhance the resilience of systems and infrastructures. • Implement best practices in crisis management.	
7	**IE711 Safety Regulations and Compliance**	**2**
	Description: This course covers the regulatory environment of safety engineering and risk management. It includes the study of international, national, and local safety regulations, compliance requirements, and the role of safety professionals in regulatory adherence. **Objectives**: • Understand key safety regulations and compliance requirements. • Develop strategies for achieving regulatory compliance. • Learn the role of safety professionals in ensuring adherence to safety standards.	

B	**ELECTIVE COURSES:**	CR
1	**IE712 Safety Technology and Innovation**	**3**
	Description: This course explores the latest advancements and innovations in safety technology. It covers emerging technologies such as IoT for safety monitoring, advanced protective equipment, automation in safety processes, and innovative methodologies for hazard prevention and mitigation. **Objectives**: • Understand the role of emerging technologies in enhancing safety. • Evaluate the effectiveness of new safety technologies. • Develop skills to integrate innovative safety solutions into existing systems.	
2	**IE731 Decision Support in Risk Management**	**3**
	Description: This course focuses on the application of decision support systems (DSS) in risk management. It includes the study of DSS frameworks, risk assessment models, and decision-making tools that aid in identifying, evaluating, and mitigating risks. **Objectives**: • Master the use of decision support systems in risk management. • Apply DSS tools to real-world risk scenarios. • Develop comprehensive risk mitigation strategies using DSS frameworks.	
3	**IE741 Construction Safety Management**	**3**
	Description: This course addresses safety management practices specific to the construction industry. Topics include safety regulations, hazard identification, risk assessment, safety training programs, and the development of safety management plans for construction projects. **Objectives**: • Understand safety regulations and standards in the construction industry. • Develop effective safety management plans for construction projects. • Implement training programs to enhance construction site safety.	

4	**IE742 Cybersecurity Risk Management**	3
	Description: This course explores the principles and practices of managing cybersecurity risks. It covers threat identification, risk assessment, cybersecurity frameworks, and strategies to protect information systems and critical infrastructure. **Objectives**: • Identify and assess cybersecurity threats and vulnerabilities. • Apply cybersecurity frameworks to manage risks. • Develop strategies to protect information systems and critical infrastructure.	
5	**IE743 Financial Risk Management**	3
	Description: This course covers techniques for managing financial risks in various sectors. Topics include financial risk assessment, portfolio management, risk mitigation strategies, and the use of financial instruments to hedge against risks. **Objectives**: • Understand the principles of financial risk management. • Apply risk assessment techniques to financial portfolios. • Develop strategies to mitigate financial risks using financial instruments.	
6	**IE744 Healthcare Systems Safety**	3
	Description: This course focuses on ensuring safety in healthcare environments. It includes topics such as patient safety, healthcare regulations, risk management in healthcare settings, and the development of safety programs for healthcare facilities. **Objectives**: • Understand the regulatory requirements for healthcare safety. • Develop and implement safety programs in healthcare settings. • Evaluate and mitigate risks to patient and staff safety.	
7	**IE745 Supply Chain and Logistics Risk Management**	3
	Description: This course addresses risk management in supply chain and logistics operations. Topics include supply chain vulnerabilities, risk assessment methods, supply chain continuity planning, and strategies to enhance the resilience of supply chains. **Objectives**: • Identify and assess risks in supply chain and logistics operations. • Develop continuity plans to mitigate supply chain disruptions. • Implement strategies to enhance supply chain resilience.	

8	**IE746 Transportation Systems Safety**	**3**
	Description: This course explores safety management in transportation systems. It covers topics such as transportation safety regulations, risk assessment in transportation, safety technologies for transportation systems, and the development of safety management programs. **Objectives**: • Understand safety regulations for transportation systems. • Conduct risk assessments for transportation operations. • Develop and implement safety management programs for transportation systems.	