

GRADUATE CERTIFICATE IN FORENSIC ENGINEERING
Course Requirements (15 hours)

Eligibility:

- Current Masters or PhD student in Engineering OR; Current JD student pursuing the JD/M.Eng. program; OR a student holding a graduate level degree from an accredited institution.
- Minimum GPA of 3.0

Background:

The Graduate Forensic Engineering Certificate is designed to be a flexible plan that allows students the opportunity to study engineering and its effect on product safety, welfare, and the laws governing the practice of engineering in society. Students are encouraged to develop a study plan in particular areas of interest and to communicate regularly with program advisor. Students must complete 6 hours of required courses as well as 6 hours of engineering courses from an approved list engineering elective courses. In addition to the 12 hours of coursework, an independent final study project must be developed, approved and completed (3 hours). The independent study project must include a real-world forensic engineering investigation including submission of a technical report and an oral presentation to the program advisor (Dr. Rasty).

Required Courses:

ME 6330	Advanced Topics in Mechanical Engineering: “Legal Aspects of Forensic Science & Engineering”
ME5342	Fracture & Failure Analysis
ME 6331	Theoretical Studies (Capstone Project)

Three courses or six hours of engineering elective credits from the following list:

<u>Course</u>	<u>Title</u>	<u>Course</u>	<u>Title</u>
ME 5327	Advanced Heat Transfer	IE 5307	Loss Assessment and Control
ME 5339	Transmission Electron Microscopy	IE 5309	Human Factors in Engineering Design
ME 5352	Probabilistic Design	IE 5319	Risk Modeling and Assessment
ME 5361	Engineering Biomechanics		
CE 5321	Advanced Soil Engineering		
CE 5323	Advanced Foundation Engineering		
CE 5329	Advanced Design of Bridge Structure		
CE 5348	Wind Engineering		
ECE 5366	Testing of Digital Systems		
ECE 5367	Image Processing		
IE 5301	Ergonomics & Design		
IE 5302	Bayesian Analysis for Human Decision		
IE 5304	Occupational Biomechanics		
IE 5305	Cognitive Engineering		
IE 5306	Safety Engineering		

Courses may be completed in ANY order. All elective courses are three credit hour courses.

Graduate Advisor:

Dr. Jahan Rasty, Professor of Mechanical Engineering
 Jahan.rasty@ttu.edu

COURSE DESCRIPTIONS

Course Number*	Course Name**	Description of Course
ME 5342*	Advanced Concepts in Failure Analysis & Forensic Engineering	Engineering aspects of failure. Failure mechanisms and related environmental factors. Principles of fracture mechanics and fractography. Techniques for failure analysis and prevention.
ME 6330*	Advanced Topics in Mechanical Engineering: "Legal Aspect of Forensic Science & Engineering"	Expose students to new and advanced technology pertaining to topics in the mechanical engineering field with the most current research information available.
ME 6331*	Theoretical Studies (Capstone Project)	This is the program's capstone project consisting of a Real-World Forensic Engineering investigation, which will be tackled by students under the direct supervision of the program advisor (Dr. J. Rasty). Students can select their project topic from a pre-approved list of projects developed by the program advisor, or alternatively, propose their own project topic subject to approval by the program advisor. The scope of work in capstone projects must be substantial enough to result in a conference or journal paper (co-authored by student and program advisor) in a forensic engineering or related publication. Students must prepare and submit the conference or journal paper prior to receiving their certificate. All approved projects must include the elements of scientific process, namely, research and data gathering, development of hypothesis, testing and/or analysis of hypothesis, and conclusions. All projects require preparation of a formal report and oral presentation to program advisor for final approval.
ME 5327	Advanced Heat Transfer	Advanced topics in conduction, convection, and radiation heat transfer.
ME 5339	Transmission Electron Microscopy	Introductory course in theory and practical use of the transmission electron microscope (TEM) as a research tool. Provides background information for designing research protocols and using instrumentation for recording and analyzing images.
ME 5352	Probabilistic Design	Application of probabilistic approaches in engineering design. Techniques for the quantification of uncertainty and risk inherent in mechanical systems.
CE 5321	Advanced Soil Engineering I	Introduction to physio-chemical properties of soils; soil structure; classification; permeability; principle of effective stress; stress-deformation; advanced consolidation theory; secondary consolidation; field instrumentation.
CE 5323	Advanced Foundation Engineering	Advanced foundation engineering, theory and practice, bearing capacity, settlement analysis, piles and pile groups, drilled piers, wave equation analysis.
CE 5329	Advanced Design of Bridge Structures	Advanced structural design of highway/railway/guideway bridges using the LRFD design method.
CE5348	Wind Engineering	
ECE 5366	Testing of Digital Systems	High level test synthesis, fault modeling and diagnosis, design for test, built-in self test, test code generation and applications.
ECE 5367	Image Processing	Imaging fundamentals. Linear operators in spatial and spatial frequency domains. Image enhancements and restoration techniques. Analysis and coding of images.

IE 5301	Ergonomics & Design	Functional anatomy and physiology of the musculoskeletal system and their applications in work design. Introduction to work physiology, kinesiology, and anthropometry and their applications.
IE 5302	Bayesian Analysis for Human Decision	Emphasizes the human decision making process under uncertainty. Topics include subjectivity probability, satisfying principle, signal detection theory, cross-entropy, discriminant analysis, Bayesian casual structures, and data envelopment analysis.
IE 5304	Occupational Biomechanics	Historical developments and theoretical fundamentals of body mechanics. The body link system and kinematic and kinetic aspect of body movement. Application to work systems.
IE 5305	Cognitive Engineering	Implications of human perceptual, cognitive, and psycho-motor capabilities for the design of systems for effective human use and control.
IE 5306	Safety Engineering	Loss prevention principles, practice, and regulations; accident factors, models, costs, and analysis; systems safety; product safety; safety and health related work place hazards.
IE 5307	Loss Assessment and Control	Advanced topics in worker safety and health; hazard recognition and analysis; system safety techniques and applications; loss assessment and control.
IE 5309	Human Factors in Engineering Design	Introduction to human factor issues in the design of human-machine systems. Design of workstations, controls, and displays, human computer interfaces, and the environment in industrial systems.
IE 5319	Risk Modeling and Assessment	Probabilistic risk models; probability distributions for risk modeling; input data for risk modeling; low probability events; risk modeling software; and analysis of risk modeling results

*denotes required courses

**all courses are three credit hour courses