MIE 1714 Failure Analysis- Course Description

Engineering is supposed to ensure success. This is achieved through predictive modelling based on application of Physical Laws, prototyping to verify designs and good data. This work can apply to every field of endeavor, for Success is the absence of Failure.

The course focuses on the Theory of Failure Analysis and how it directs engineering activity: design, research, quality systems, continuous improvement, innovation, new knowledge creation, systemic failure, and business management.

Specific attention is paid to preventive failure analysis and using industry recognized tools to achieve this. All advanced industries are governed by quality systems, with Failure Analysis as their foundation. However, failure analysis is poorly understood with the effect being that most designs, processes, project plans, etc. are based on too much intuition, ego, and “this should work”.

This lack of understanding and emphasis only comes to light during rearward-looking root cause investigation of Failures (minor or catastrophic, financial or life loss) where the question is asked, “Where was this considered in the risk assessment (failure analysis)?” The performance and value of engineers can be greatly increased if they understand how their engineering knowledge fits into the preventive failure analysis paradigm.

Students who successfully complete this course will see any plan (design, project, process, procedure, business plan)through the paradigm of failure analysis, to ensure its success. They will be able to complete a process flow, use the standardized Failure Mode Effect Analysis (FMEA) tool to complete formal, highly effective failure analysis, and to evaluate existing controls and develop more effective controls. Ultimately, students will be able to apply and scale the methodology from the most focused technical process detail to the broadest long-term business plan…and never again rely on “should”.

Class #1 Introduction to the Theory of Failure Analysis
Class #2: Industry Quality Systems Overview
Class #3: The Failure Mode Effect Analysis (FMEA)- Overview & Process Flow
Class #4: FMEA- Controls, Preventive and Detection
Class #5: FMEA- Process FMEA
Class #6: FMEA- Design FMEA
Class #7: FMEA Midterm Exam
Class #8: Midterm Take Up & Individual Failure Analysis Project Introduction
Class #9: Use of FMEA by Engineers in Organizations
Class #10: Failure Analysis in Non-Traditional Industries- Healthcare, Software, HR, Project Management
Class #11: Failure Analysis in Research, Knowledge Creation, and Innovation
Class #12: Review, Final Exam Prep

Class #13: Final Exam