INDUSTRIAL ENGINEERING (IEEN)

IEEN 5311 Linear and Nonlinear Programming
3 Semester Credit Hours (3 Lecture Hours)
This course introduces the fundamentals of linear and nonlinear optimization theory and methods. This course is a major part of the toolbox of the applied mathematician, and more broadly, of researchers in quantitative sciences including economics, data science, machine learning, and quantitative social sciences. The course provides an introduction to linear programming and convex optimization. Topics include unconstrained and constrained optimization, linear and quadratic programming, Lagrange and conic duality theory, interior-point algorithms and theory, Lagrangian relaxation, generalized programming, and semi-definite programming.
Prerequisite: ENGR 5302.

IEEN 5312 Modeling and Simulation
3 Semester Credit Hours (3 Lecture Hours)
Students learn simulation theory, learn modeling and analysis techniques that can be applied to the design, operation, and evaluation of complex systems, and apply them to real problems.

IEEN 5313 Optimization
3 Semester Credit Hours (3 Lecture Hours)
This course focuses on problem formulation, software technologies and analytical methods for optimization serving as an introduction to a wide variety of optimization problems and techniques including dynamic programming, network flows, integer programming, heuristic approaches, Markov chains, game theory, and decision analysis. This course provides tools to formulate engineering problems as the optimization of some function under some set of constraints. As such operations research is a quantitative discipline that deals with the application of advanced analytical methods to help make better decisions. This course employs techniques from other mathematical sciences, such as mathematical modeling, statistical analysis, and mathematical optimization and provides optimal or near-optimal solutions to complex decision-making problems. (Cross-listed with CEEN 5322 Optimization.)
Prerequisite: ENGR 5302.

IEEN 5321 Human Factors
3 Semester Credit Hours (3 Lecture Hours)
Introduction to the basic concepts and principles of human factors to demonstrate and apply a broad knowledge of various modern industrial engineering methods and tools associated with designing systems in manufacturing and other related fields. Apply engineering design methods to represent, integrate and solve problems, including the ability to recognize problem context and integrate knowledge and skills appropriate sources.

IEEN 5322 Ergonomics and Safety Engineering
3 Semester Credit Hours (3 Lecture Hours)
This course covers occupational safety in the manufacturing environment and the use of ergonomic principles to recognize, evaluate, and control workplace conditions that cause or contribute to employee safety and productivity issues. Topics cover Occupational Safety and Health Administration (OSHA) safety guidelines including electrical, chemical, and hazardous material safety. Ergonomic considerations to include repetitive motion, plant layout, and machine design and industrial safety awareness, accident cost and prevention, and workman's compensation issues are discussed.
Prerequisite: IEEN 5321.

IEEN 5331 Quality Control
3 Semester Credit Hours (3 Lecture Hours)
This course provides the knowledge and techniques required to improve product quality and process efficiency by identifying and measuring production process variability which, if not successfully addressed, leads to inconsistent product quality, costly wastage, non-standardization and other reliability and productivity problems. This course introduces basic quality management concepts and definitions and builds on that knowledge to explore Statistical Process Control (SPC) based quality improvement techniques as a means to diagnose, reduce, and eliminate causes of variation and to assist in process improvement, production control, production planning, and decision making. A brief review of the fundamentals of statistics and probability and their applications in quality management is provided, and various measurement and control techniques -- for example, charts for variables and attributes, are presented.
Prerequisite: IEEN 5321.

IEEN 5332 Supply Chain Management
3 Semester Credit Hours (3 Lecture Hours)
In this course, students develop the ability to conceptualize, design, and implement supply chains aligned with product, market, and customer characteristics. Business competition is now between supply networks rather than individual corporations. Managing the flow of products, information, and revenue across supply chains differentiates the ability of supply networks to fulfill customer needs. Students develop the ability to evaluate how information flows can substitute for the stock of physical resources, such as inventory, and why such systems succeed or fail. They assess how internet technologies, dynamic markets, and globalization are impacting supply chain strategies and practices, including logistics, digital coordination of decisions and resources, inventory and risk management, procurement and supply contracting, product and process design, and revenue management.

IEEN 5333 Manufacturing Process Engineering
3 Semester Credit Hours (3 Lecture Hours)
Theory and application of the design of modern manufacturing facilities. Facility location and layout; materials handling practice and systems, manufacturing systems layout, and warehouse operations. Automated systems. Total process analysis; optimization and economics of manufacturing systems.
Prerequisite: IEEN 5321.