INDUST/MANUFCTRNG ENGRG (IME)

IME-564 Ethics and Practice of Engineering 4 Credits
Prerequisites: None
Minimum Class Standing: Senior
The professional and ethical consideration of an engineer in contemporary society is covered in this course. Discussions include the code of ethics for engineers, case studies on conflict of interest, team, engineering/management responsibilities, environmental considerations and professional registration. This class requires live weekly discussion.
Lecture: 4, Lab 0, Other 0

IME-601 IME Principles for Mobility Systems 4 Credits
Prerequisites: None
This graduate level course is designed to introduce the fundamental principles of industrial and manufacturing engineering that are required for application in mobility systems for students with non-IME degrees. Topics include: product and process design, work design, production systems, quality/six sigma, and management/leadership. Approximately two weeks are devoted to each topic illustrated in the context of specific applications in mobility systems. Case studies with specific applications of IME in mobility systems will be assigned.
Lecture: 4, Lab 0, Other 0

IME-603 Numerical Control Machining 4 Credits
Prerequisites: None
The fundamentals of computer numerical control (CNC) programming and computer-aided manufacturing (CAM) are introduced in this course. The fundamental theoretical and operational concepts of machining are also presented. The course focuses on the programming of cutting operations; tool materials, selection, and uses. Significant topics include: G-code programming, Introduction to CAM software, Taylor's tool life model, Criteria for tool selection, and the Orthogonal Cutting Model. Laboratories use CNC machine tools for programming and cutting, and are designed to illustrate theoretical concepts and methods for solving practical engineering machining problems.
Lecture: 3, Lab 2, Other 0

IME-608 Industrial Robotics 4 Credits
Prerequisites: None
Basic concepts of robotic system theory and applications are presented. Human and robotic system interface with diverse real environments are discussed. Human and robotic safety is stressed. Advantages, limitations, business case justifications of investment and benefits of robotic systems for LEAN and quality operations are emphasized. Flexible manufacturing operations, Work cell design, cycle time, work path, end-effectors, collaborative robots are covered. Robotic computer model simulation is included in the course. Hands on Labs are included. Graduate students analyze more in-depth applications of robotic systems, simulations and current industry applications. Students may not receive credit for both IME-408 and IME-608.
Lecture: 3, Lab 2, Other 0

IME-622 Simulation 4 Credits
Prerequisites: None
An understanding and need for simulation in practice will be developed. The course will focus on basic and advanced concepts in simulation including comparing the simulated results with analytical results, and successfully develop simulation models useful in production/manufacturing, supply chains, transportation, and other areas related to Industrial and Manufacturing Engineering. Simulation package such as ARENA will be integrated and used throughout the course. Graduate students will create advanced digital simulation models. Students may not receive credit for both IME-422 and IME-622.
Lecture: 4, Lab 0, Other 0

IME-652 Production System Design 4 Credits
Prerequisites: None
Students gain an understanding of the decision-making tools necessary to design value in the global supply chain from concept to customer. Quantitative methods are employed to aid the decision-making process of demand forecasting and enterprise planning for the purpose of increased profit and value to stakeholders. Basic concepts in strategy, forecasting, demand planning, inventory control and value stream mapping will be taught and utilized to enable the decision-making process to be based on quantitative metrics. Graduate students will be required to do additional projects/assignments related to supply chain management. Students may not receive credit for both IME-452 and IME-652.
Lecture: 4, Lab 0, Other 0

IME-653 Tools for Managing the Supply Chain 4 Credits
Prerequisites: IME-652
Students gain an understanding of the decision-making process required to design and manage the global supply chain. This course covers basic principles of supply chain management and provides techniques used to analyze various aspects of logistics systems. Key concepts such as warehousing, distribution, facility location planning, probabilistic project management, and resource scheduling are examined as an integral part of modern business. The course addresses insights, concepts, and practical tools that are important for the effective management of the supply chain. Graduate students will be required to do additional projects/assignments related to supply chain management. Students may not receive credit for both IME-453 and IME-653.
Lecture: 4, Lab 0, Other 0

IME-654 Enterprise Resource Planning 4 Credits
Prerequisites: None
An understanding of the integrated approach to enterprise planning and its evolution from MRP I and MRP II is provided in this course. It describes the core structure of ERP systems and highlights the characteristics of emerging ERP based organizations. Various ERP tools and techniques are described and compared. The fundamental success factors in moving from traditional business functions to an integrated process-based ERP environment are introduced.
Lecture: 3, Lab 0, Other 1

IME-656 Engineering for Healthcare Systems 4 Credits
Prerequisites: None
This course examines the technical structure of the healthcare delivery system and the role that industrial and systems engineering (ISE) plays in its design and improvement. Included will be how healthcare systems work in hospitals, medical offices, clinics and other healthcare organizations. Traditional ISE methods for improving quality, patient safety, and employee productivity and satisfaction will be presented within a systematic application of value chain engineering designed to produce lean processes.
Lecture: 3, Lab 0, Other 1

IME-660 Design for Manufacture and Assembly 4 Credits
Prerequisites: IME-601
A study of the current methodologies associated with product design for manufacture and assembly. Topics include DFMA overview, Design for Function, Design for Assembly Principles, BDI-DFA Manual Methodology, Creative Concept Development, and Concept Selection Methodologies. Note: Students who have taken IME-474, Design for Manufacture or its equivalent are not eligible to enroll in this course but must substitute another engineering course approved by their faculty advisors.
Lecture: 3, Lab 0, Other 1

IME-662 Ergonomics 4 Credits
Prerequisites: None
Human factors and ergonomics concepts for design of work. Topics include functional anatomy, bio-mechanical analysis of physical work, work physiology, manual material handling, cumulative trauma disorders, hand tool design, and human factors related to applied job design. Graduate students will create and analyze additional, in-depth job simulations using industry-current software tools. Students may not receive credit for both IME-462 and IME-662.
Lecture: 3, Lab 2, Other 0

IME-663 Safety & Human Factors 4 Credits
Prerequisites: None
An introduction to occupational safety; including injury statistics, mandatory and voluntary specification and performance regulations, standards, and guidelines. Electrical, machine, fire and life safety, confined spaces, and fall hazards (among others) are discussed in the context of traditional safety and human factors engineering. Students apply systems safety analysis methods in real-world hazard analysis and control projects. Graduate students will be required to research and present to the class safety strategy and policy trends related to new technology disruption and how engineers and policy makers will approach safety for these systems in the future. Students may not receive credit for both IME-463 and IME-663.
Lecture: 4, Lab 0, Other 0

IME-665 Human-Computer Interaction and Interface Design 4 Credits
Prerequisites: None
New technology is increasingly being integrated into our minute-to-minute lives. This multidisciplinary course provides theoretical and practical skills that are needed to design, develop, and evaluate human interaction with computer and machine interfaces and virtual environments. Course topics are anchored around fundamentals of physical and cognitive human capabilities and their relationship to product design and testing. Example topics include human psychological and physical capabilities, cognition and models of interaction, heuristic evaluation. Rapid prototyping, usability testing, experimental evaluation of input devices and peripherals, haptics, virtual and augmented reality, and brain interfaces. Topics are reinforced through readings, guest lectures, hands-on experimentation and evaluation, current research trends, and a term design project. Graduate students will supplement course content by investigating and presenting late-breaking research findings and trends in the area of new technology HCI/HMI design. Students may not receive credit for both IME-465 and IME-665.
Lecture: 4, Lab 0, Other 0

IME-671 Quality Assurance 4 Credits
Prerequisites: None
The basics of modern methods of quality control and improvement that are used in the manufacturing and service industries are covered in this course. It includes quality philosophy and fundamentals, statistical methods of quality improvement, concept of variation and its reduction, statistical process control, acceptance sampling, designed experiments in quality improvements, and quality in the service sector. Deming's quality concepts will also be discussed. Graduate students will research additional industry-current quality methods. Students may not receive credit for both IME-471 and IME-671.
Lecture: 4, Lab 0, Other 0

IME-672 Reliability & Maintainability 4 Credits
Prerequisites: None
Basic knowledge and skills of reliability techniques that can be used by practicing engineers is provided in this course. The primary emphasis is on the problem of quantifying reliability in product design and testing. The topics include reliability definition and concepts, life testing and data analysis, system reliability models, and repairable systems reliability. Accelerated life testing will also be discussed. Graduate students will create a detailed analysis and report of a model dealing with reliability and maintainability. Students may not receive credit for both IME-472 and IME-672.
Lecture: 4, Lab 0, Other 0

IME-676 Lean Six Sigma 4 Credits
Prerequisites: None
Techniques to maximize production efficiency and to maintain control over each step in the process are examined in this course. The structured problem-solving methodology DMAIC (Define-Measure-Analyze-Improve-Control) will provide the framework for the course. Graduate students will research additional industry-current Lean Six Sigma methods. Students may not receive credit for both IME-476 and IME-676.
Lecture: 4, Lab 0, Other 0

IME-680 Computer Integrated Manufacturing 4 Credits
Prerequisites: IME-601
CIM is defined with current terminology and recent concepts. It includes the relationships among the three major functions - design, manufacturing and business. CIM examples, obstacles to development and future trends are covered. Flexible manufacturing is highlighted. Key components of CIM are explored with special emphasis on robotic automation and control through interaction with the environment, CAD-CAM link with numerical control, computer supervisory control, process planning and quality assurance. Concurrent Engineering will be used in process and product quality selection. Lean manufacturing principles will be applied. Communication and networking, the artery of CIM, will be studied in the context of data compatibility and hierarchical control. Manufacturing analysis tools will be used to plan and implement a CIM system.
Lecture: 3, Lab 0, Other 1