MANUFACTURING ENGINEERING (MFGE)

MFGE 285. INTRODUCTION TO INDUSTRIAL AND MANUFACTURING ENGINEERING. (3 Credits)
Introduction to selected topics in industrial and manufacturing engineering, including history and philosophy, product design and manufacturing cycle, integrated role of engineering and business, and multi-objective nature of organizations. Surveys of selected design problems in resource allocation, operations and quality management, and production engineering. CROSSLISTED as IE 285.
Prerequisites: IE 112 (may be taken concurrently) with C or better or FOR 112 (may be taken concurrently) with C or better
Equivalent to: IE 285

MFGE 336. PRODUCTION ENGINEERING. (4 Credits)
Provides a general understanding of the production engineering function within industry and the means by which to achieve tight tolerances through machining. Geometric dimensioning and tolerancing, fixture and gage design, and fundamentals of metal cutting mechanics are introduced, and their interactions are explored. Lec/lab.
Prerequisites: (ENGR 213 with C or better or ENGR 213H with C or better) and ENGR 248 [C] and (ENGR 321 [C] or ENGR 321H [C] or MATS 321 [C] or MATS 321H [C]) and ME 250 [C]
Equivalent to: IE 336

MFGE 337. MATERIALS AND MANUFACTURING PROCESSES. (4 Credits)
Introduces mechanical manufacturing methods by which materials are economically shaped into valuable products. The overall goal is to develop an understanding of how the functionality, shape, materials, cost and sustainability of a product influence manufacturing process selection and design. Lec/lab.
Prerequisites: (ENGR 321 with C or better or ENGR 321H with C or better) and ENGR 248 [C] and (ENGR 321 [C] or ENGR 321H [C] or MATS 321 [C] or MATS 321H [C] and ME 250 [C]
Equivalent to: IE 337

MFGE 436. LEAN MANUFACTURING SYSTEMS ENGINEERING. (4 Credits)
The planning, evaluation, deployment, and integration of lean manufacturing theory and methods. Examines manufacturing processes/equipment and systems, e.g., planning/control, product design, supply chain resource management. Lec/lab.
Prerequisites: ENGR 390 with C or better or ENGR 391 with C or better
Equivalent to: IE 436

MFGE 437. COMPUTER CONTROL OF MANUFACTURING PROCESSES. (4 Credits)
Introduces fundamental knowledge in the automation of manufacturing systems and processes. Automated manufacturing system design and operations—computer numerical control (CNC) technology; NC part programming; sensors and actuators, their modeling and dynamic simulation; feedback motion delivery systems design and tuning; programmable logic controls (PLC) for industrial control systems, and path planning for numerical controlled (NC) machinery. Lec/lab.
Prerequisites: (ME 317 with C or better or ME 317H with C or better or MFGE 336 with C or better) and (ENGR 212 [C] or ENGR 212H [C])
Equivalent to: IE 437

MFGE 438. COMPOSITES MANUFACTURING. (4 Credits)
Introduction to fiber-reinforced composite materials and their applications. Topics include matrices and reinforcement; open and closed molding processes; filament winding, quality, testing, damage assessment; basics of factory operations and sustainability of composites. Students will complete laboratory projects using fiber-reinforced laminates. Lec/lab.
Prerequisites: ENGR 213 with C or better or ENGR 213H with C or better

MFGE 499. SPECIAL TOPICS. (0-5 Credits)
This course is repeatabe for 99 credits.

MFGE 507. SEMINAR. (1-16 Credits)
Graded P/N.
This course is repeatable for 16 credits.

MFGE 511. PRECISION MACHINE DESIGN. (3 Credits)
Tolerance analysis and application in design/manufacturing practice, principles of machine design and computational analysis of errors in machine design, sensor mounting and sensor calibration, machine level error budget with geometric and thermal errors, structural design of joints and supports, deterministic damping, exact constraint design for flexures and couplings, bearing systems design, motion and power system design for machine tools. CROSSLISTED as ME 511.
Equivalent to: ME 511
Recommended: An understanding of mechanical component design and solid mechanics.

MFGE 531. MICROMANUFACTURING. (4 Credits)
Introduction to microsystem platforms, scaling laws and size effects in micromanufacturing techniques with an emphasis on microchannel arrays, microchannel lamination and micro-scale characterization. Lec/lab.
Equivalent to: IE 531

MFGE 535. INDUSTRIAL SUSTAINABILITY ANALYSIS. (3 Credits)
Students are exposed to the role of business and engineering in the design and implementation of sustainable industrial systems. Drivers, metrics, and analysis concepts, methods, and tools are introduced. Students incorporate business and engineering considerations in making product, manufacturing process, and supply chain design considerations.

MFGE 536. LEAN MANUFACTURING SYSTEMS ENGINEERING. (4 Credits)
The planning, evaluation, deployment, and integration of lean manufacturing theory and methods. Examines manufacturing processes/equipment and systems, e.g., planning/control, product design, supply chain resource management. Lec/lab.
Equivalent to: IE 536

MFGE 537. COMPUTER CONTROL OF MANUFACTURING PROCESSES. (4 Credits)
Introduces fundamental knowledge in the automation of manufacturing systems and processes. Automated manufacturing system design and operation—computer numerical control (CNC) technology; NC part programming; sensors and actuators, their modeling and dynamic simulation; feedback motion delivery systems design and tuning; programmable logic controls (PLC) for industrial control systems, and path planning for numerical controlled (NC) machinery. Lec/lab.
Prerequisites: (ME 317 with C or better or ME 317H with C or better or MFGE 336 with C or better) and (ENGR 212 [C] or ENGR 212H [C])
Equivalent to: IE 437

MFGE 538. COMPOSITES MANUFACTURING. (4 Credits)
Introduction to fiber-reinforced composite materials and their applications. Topics include matrices and reinforcement; open and closed molding processes; filament winding, quality, testing, damage assessment; basics of factory operations and sustainability of composites. Students will complete laboratory projects using fiber-reinforced laminates. Lec/lab.
Recommended: (ENGR 213 or ENGR 213H)

MFGE 551. ADDITIVE MANUFACTURING. (3 Credits)
Introduces basic principles and process physics for additive manufacturing as compared with subtractive manufacturing. Various processes in AM (extrusion, jetting, photopolymerization, powder bed fusion, direct energy deposition and sheet lamination) and laser AM are discussed. Materials selection in AM (metals, polymers, ceramics and composites), powder metallurgy and metallurgical phenomena in additive manufacturing will be covered.
MFGE 599. SPECIAL TOPICS. (0-5 Credits)
This course is repeatable for 99 credits.