ME Courses

IME 101. Introduction to Industrial and Manufacturing Engineering.

1 unit

Term Typically Offered: F

Introduction of major topics in industrial and manufacturing engineering such as data analysis, process improvement, operations research, product design, and supply chain management. Professional ethics, cheating and plagiarism. Resources for academic success. Career opportunities review. 1 laboratory.

IME 141. Manufacturing Processes: Net Shape.

1 unit

Term Typically Offered: F,W,SP,SU

Metal casting as a net shape process in manufacturing. Properties of molding materials and methods of casting. Introduction to rapid prototyping. Pattern and casting design principles. 1 laboratory.

IME 142. Manufacturing Processes: Materials Joining.

2 units

Term Typically Offered: F,W,SP,SU

Theory and application of metal cutting and welding processes. Includes shielded metal arc, flux cored arc, submerged arc, gas metal arc, gas tungsten arc, brazing, resistance, and oxy-acetylene processes. Bonding theory, joint design, codes and testing. Introduction to adhesive bonding. Open to all majors. 1 lecture, 1 laboratory.

IME 143. Manufacturing Processes: Material Removal.

2 units

Term Typically Offered: F, SP

Uses, capabilities, and theoretical and operational characteristics of lathe and milling machine tools, including conventional, automatic and numerical control. Cutting tool characteristics, machining parameters, quality control, and production methods. Design considerations for manufacturing. Introduction to robotics and automation. Open to all majors. 1 lecture, 1 laboratory.

IME 144. Introduction to Design and Manufacturing.

4 units

Term Typically Offered: F, W, SP

Supplemental review of visualization, sketching, and drafting fundamentals. Computer-aided solid modeling of parts and assemblies. Introduction to conventional machining processes on lathes and mills, computer numerical control, quality control, production methods, and design for manufacturing. Open to all majors. 2 lectures, 2 laboratories.

IME 145. Subtractive Manufacturing Processes for Mechanical Designs I.

1 unit

Term Typically Offered: W

Concurrent: ME 129.

Material removal manufacturing processes as related to mechanical design. Manual and computer-controlled (CNC) machining processes and equipment. Interpretation of engineering drawings, operation setup, process parameters, inspection of parts. Manufacturing of standard machine design features. Design for manufacturing and assembly (DFMA). Not open to students with credit in IME 143. 1 laboratory.

IME 146. Subtractive Manufacturing Processes for Mechanical Designs II.

1 unit

Term Typically Offered: SP

Prerequisite: IME 145. Concurrent: ME 130.

Material removal manufacturing processes for mechanical design. Fits and assignment of part tolerances. Machining and inspection of geometric dimensioning and tolerancing (GD&T). Teamwork for batch part production. Design for manufacturing and assembly (DFMA) concepts. Not open to students with credit in IME 143. 1 laboratory.

IME 156. Basic Electronics Manufacturing.

2 units

Term Typically Offered: F,W,SP,SU

Practical electronics manufacturing knowledge expanded through concepts such as CAD/CAM design, Design for Manufacture (DFM), documentation requirements, prototyping and production

planning. Hands-on techniques learned for project planning, soldering, automation, hand tool usage and production methods. 1 lecture, 1 laboratory.

IME 200. Special Problems for Undergraduates.

1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

IME 212. Introduction to Enterprise Analytics.

4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 232.

Using Big Data for decision making in Industrial Engineering. Data-driven solution design. Data acquisition and database queries. Cleaning, understanding, preprocessing, describing, and visualizing data. Analysis for insight. Storytelling and ethical considerations. 2 lectures, 2 laboratories.

IME 223. Process Improvement Fundamentals.

4 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 141. Recommended: IME 101.

Principles of work simplification and motion analysis. Recording of work flow and methods. Process improvement through work measurement and standards, time study, synthetic data, predetermined time systems and work sampling. Allowances and performance rating, productivity measures. Introduction to lean manufacturing principles. Client based project. 3 lectures, 1 laboratory.

IME 239. Industrial Costs and Controls.

3 units

Term Typically Offered: F, W, SP

Prerequisite: IME 223.

Estimation of manufacturing costs for production planning, cost analysis, and cost control. Planning, budgeting, and control processes. Costs, accounting data and analysis of variances for managerial control, inventory valuation, and decision making. Techniques of pricing, cost estimating and cost reduction, and activity-based costing. 3 lectures.

IME 240. Additional Engineering Laboratory.

1-2 units

Term Typically Offered: TBD

Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

IME 244. Intermediate Design and Manufacturing.

2 units

Term Typically Offered: W

Prerequisite: IME 144. Corequisite: MATE 210 and MATE 215. Recommended: IME 141 and IME 142.

Advanced computer-aided part design with geometric dimensioning and tolerancing, assemblies, and prototyping techniques for metal, polymer, and composite components. Communication of design information to manufacturing. Hands-on experience with non-traditional manufacturing processes. Not open to students with credit in IME 140. 1 lecture, 1 laboratory.

IME 270. Selected Topics.

1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

IME 301. Operations Research I.

4 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 244.

Systems modeling methodology, mathematical model formulations, linear programming, graphical and simplex methods. Sensitivity analysis. Integer and binary programming. Transportation, transshipment, assignment, and other network optimization models. Computer applications. 3 lectures, 1 activity.

IME 303. Project Organization and Management.

4 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; IME 314 or IME 315.

Design and implementation of a major industrial/business systems project. Project planning considerations. Motivational and influence techniques used in project management. Scheduling techniques with risk assessment. Resource leveling and management under constraints. Reducing project duration. Monitoring progress with earned value analysis. Project audit and closure. Planning and implementation of a project. Application of project management software. 3 lectures, 1 laboratory.

IME 305. Operations Research II.

4 units

Term Typically Offered: F, W, SP

Prerequisite: IME 301; and STAT 312 or STAT 321.

Stochastic decision analysis. Utility models. Multi-criteria decision making models: Goal Programming and Analytic Hierarchy Process. Decision Biases. Markov processes and introduction to queuing models. Inventory models and analysis. Computer aided modeling and case studies. 3 lectures, 1 activity.

IME 312. Data Management and System Design.

4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 232.

Design and management of industrial databases and reporting systems. Relationships of financial accounting databases and production systems. Efficient data entry and reports, queries, macro function, and Internet based database applications. 3 lectures, 1 laboratory.

IME 314. Engineering Economics.

3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 241.

Economic analysis of engineering decisions. Determining rates of return on investments. Effects of inflation, depreciation and income taxes. Sensitivity, uncertainty, and risk analysis. Application of basic principles and tools of analysis using case studies. 3 lectures.

IME 315. Financial Decision Making for Engineers.

3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 142.

Develop business case for engineering projects. Investment evaluation using after-tax Net Present Value and Internal Rate of Return. Sensitivity analysis. Financial statements. Fully allocate costs. Use of spreadsheets. Application to personal finance. Critical examination of financial systems for decision making. Course may be offered in classroom-based or online format. 3 lectures.

IME 319. Human Factors Engineering.

3 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202, and junior standing.

Analysis of factors influencing the efficiency of human work. Data on the physical and mental capacities of persons, the physical environment, work organization, and the problem of aging. Design of machines, operations, human computer interface and work environment to match human capacities and limitations, including the handicapped. Multidisciplinary team project. 3 lectures.

IME 320. Human Factors and Technology.

4 units

Term Typically Offered: W

2020-21 or later: Upper-Div GE Area B

2019-20 or earlier catalog: GE Area B5, B6, or B7

Prerequisite: Junior standing; completion of GE Area A with grades of C- or better; and one course in GE Area B4 with a grade of C- or better (GE Area B1 for students on the 2019-20 or earlier catalogs). Recommended: STAT 217, STAT 218, or STAT 312.

Analysis of cognitive, sensory and physical limitations and capabilities of operators and users of technology, in working and living environments. Analysis of pertinent databases for a proactive approach to designing user-centered products, systems and work environment. 4 lectures. Fulfills GE Area Upper-Division B (GE Areas B5, B6, or B7 for students on the 2019-20 catalog).

IME 326. Engineering Test Design and Analysis.

4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 321 with a grade of C- or better.

Data gathering and statistical testing applied to industrial engineering and manufacturing fields. Experimental methods for product and process evaluation and comparisons; interpretation of engineering data. Engineering experimental design, linear and nonlinear regression, ANOVA, and multifactor ANOVA. Utilization of existing computer software. 4 lectures.

IME 327. Test Design and Analysis in Manufacturing Engineering.

4 units

Term Typically Offered: F, SP

Prerequisite: STAT 321 with a grade of C- or better or consent of instructor; or ME 236.

Sampling and descriptive statistics. Central limit theorem. Hypothesis testing for means and variances. Analysis of variance (ANOVA) and factorial design. Applications in engineering design, reliability manufacturing, and inspection. Design projects. 3 lectures, 1 laboratory.

IME 330. Fundamentals of Manufacturing Engineering.

4 units

Term Typically Offered: F, W

Prerequisite: IME 141 or ITP 341; IME 142; CE 204 or CE 208; MATE 210; MATE 215; IME 244 or ME 251 and IME 143 or IME 146.

Engineering analysis of manufacturing processes for casting, molding, forming, joining, and machining. Design for manufacturability and estimation of production costs. Process design strategies. Setup and operation of processing equipment; inspection methods. Field trip to manufacturing center. 3 lectures, 1 laboratory.

IME 331. Intermediate Metal Casting.

4 units

Term Typically Offered: W

Prerequisite: MATE 210; and IME 143, IME 144, or IME 146. Recommended: IME 141.

Foundry process advantages. Mold and core design. Tooling and patterns. Materials properties and selection. Design for casting principles. Modeling gating systems, solidification and defect analysis. 3 lectures, 1 laboratory.

IME 335. Computer-Aided Manufacturing I.

4 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 244; IME 244 or ME 251 and IME 143 or IME 146; and CSC 101, CSC 231, CSC 232 or CSC 234.

Use of the computer to communicate design information to manufacturing. Computer Numerical Control (CNC) programming. Use of CAD/CAM software. Overview of manufacturing systems in an automated environment, including cellular manufacturing and computer-aided process planning. 3 lectures, 1 laboratory.

IME 336. Computer-Aided Manufacturing II.

4 units

Term Typically Offered: W

Prerequisite: IME 335, ME 212, MATH 244, or consent of instructor.

Advanced Computer Numerical Control (CNC) programming and machine tool control. Machining center operation. Parametric representation of curves and surfaces. Computation of tool paths. Product and process design for CNC machining. CNC machine tool dynamics. Introduction to flexible manufacturing systems and robotics. Design and fabrication projects. 3 lectures, 1 laboratory.

IME 342. Manufacturing Systems Integration.

4 units

Term Typically Offered: W

Prerequisite: IME 223, MATH 241 and STAT 321.

Analysis and design tools for production planning and control of manufacturing systems, including mathematical modeling of operations and computer tools for simulation. Decision-making models for manufacturing systems. Overview of material requirements planning, inventory models and analysis, and facilities design. 3 lectures, 1 laboratory.

IME 356. Manufacturing Automation.

4 units

Term Typically Offered: F, W

Prerequisite: EE 321.

Computers in the factory automation environment. Basic control theory including feedback. Programming and use of programmable logic controllers (PLC), human-machine interface (HMI), and industrial control systems. Interfacing of electro-mechanical systems; analog and digital inputs, output; programmable controllers. Computer process control. 3 lectures, 1 laboratory.

IME 372. Applications of Enterprise Analytics.

4 units

Term Typically Offered: F, W, SP

Prerequisite: IME 212, IME 312, IME 326, MATH 244.

Applications of Big Data Analytics to solve enterprise problems with the emphasis on manufacturing organizations. Data clustering and classification algorithms. Applications of multiple, stepwise, and logistic regression methods. Over-fitting and regularization. Machine learning, neural networks, and Bayesian analysis. Healthcare analytics. 3 lectures, 1 laboratory.

IME 400. Special Problems for Advanced Undergraduates.

1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limit to 4 units.

IME 401. Sales Engineering.

2 units

Term Typically Offered: F, SP

Prerequisite: Senior standing in engineering.

Concepts and principles of engineering in sales. Role of the professional engineer in the analysis, design, development, production, and final application of a product or system required by the buyer. 2 seminars.

IME 403. Software Product Management.

4 units

Term Typically Offered: W

Prerequisite: Senior standing; CSC/CPE 101, CSC 231, or CSC 232.

Product Manager role for software products. Software technologies and domain knowledge. Managing performance metrics, product features, and engineering requirements. Analysis of user data. Marketing, business planning, and product launch. Course may be offered in classroom-based or online format. 4 lectures.

IME 408. Systems Engineering.

3 units

Term Typically Offered: TBD

Prerequisite: CSC 232.

Systems, subsystems, static, dynamic, closed and open systems. Systems design requirements. Performance measures. Process control modeling and analysis, transform methods, linear systems analysis, digital, adaptive and steady state optimal control. Optimal search strategies. Manufacturing, maintenance, replacement and engineering applications. 3 lectures.

IME 409. Economic Decision Systems.

3 units

Term Typically Offered: TBD

Prerequisite: IME 239 and IME 314, or IME 315; and IME 305.

Economic evaluation of information for complex decisions. Analysis of risks and uncertainties. Bayes theory and models. Decision theory, sequential decisions, and value of information applied to financial evaluation and control. Major project justification procedures. 3 lectures.

IME 410. Production Planning and Control Systems.

4 units

Term Typically Offered: F, W, SP

Prerequisite: IME 342 or IME 305.

Building blocks of manufacturing resource planning (MRP II). Demand forecasting, production planning, master scheduling development. BOM and inventory files. MRP computations and operational challenges. Capacity analysis and production control in push and pull systems. Enterprise Resource Planning (ERP). Principles of JIT and lean manufacturing. Not open to students with credit in IME 580. 3 lectures, 1 laboratory.

IME 415. Service Enterprises Engineering and Management.

4 units

Term Typically Offered: SP, SU

Prerequisite: IME 305 or IME 342.

Analysis, design, and control of service enterprises. Topics include workforce planning, customer queueing, service facility location, yield management, and call center management. Case studies from the entertainment, retailing, and financial sectors, among others. Course may be offered in classroom-based or online format. 4 lectures.

IME 416. Automation of Industrial Systems.

3 units

Term Typically Offered: SP

Prerequisite: IME 356, ME 305 or equivalent.

Automation in manufacturing and warehousing. Economic selection of automation systems. Projects in automation. 2 lectures, 1 laboratory.

IME 417. Supply Chain and Logistics Management.

4 units

Term Typically Offered: F, W, SP

Prerequisite: IME 342 or IME 410.

Overview of key logistics and supply chain management concepts. Models and solution methods for the design, control, operation, and management of supply chains. Techniques that are used to analyze supply chains. Team projects in partnership with industry sponsors. Course may be offered in classroom-based or online format. 4 lectures.

IME 418. Product-Process Design.

4 units

Term Typically Offered: F

Prerequisite: Senior standing in engineering or graduate standing. Recommended: IME 450.

Innovative new product design and creative development process. Design for manufacturability. Study of constraints for prototyping, designing, testing, processing, quality, and customer satisfaction. Life-cycle analysis. Examination of relevant environmental and ethical issues. Design projects using real world problems. 3 lectures, 1 laboratory.

IME 420. Simulation.

4 units

Term Typically Offered: F, W, SP

Prerequisite: IME 305; IME 326 or IME 327; or graduate standing.

Queueing systems. Design and analysis of production and service systems using the simulation technique. System modeling. Random number and function generators, programming, and characteristics of simulation languages. Design projects using real world problems. 3 lectures, 1 laboratory.

IME 421. Engineering Management.

3 units

Term Typically Offered: TBD

Prerequisite: PSY 201 or PSY 202; junior standing. Recommended: IME 314 or IME 315.

Theory and principles for manufacturing, service, and non-profit organizations. Competitive advantage. Strategic planning and operations management for organizations and teams in a rapidly changing, diverse environment. Engineering management concepts, including effective ethical, sustainable, and inclusive leadership practices. Team-based projects and cases. 3 seminars.

IME 424. Industrial Engineering in Healthcare.

4 units

Term Typically Offered: SP

Prerequisite: IME 223.

Industrial engineering applications in healthcare industry. Background on healthcare reform. Simulation, operations research, supply chain, facility engineering, process improvement case studies. Emerging topics in industrial engineers in healthcare, change management, patient flow, Lean Six Sigma, nursing, patient safety, and decision-making. 4 lectures.

IME 428. Engineering Metrology.

4 units

Term Typically Offered: TBD

Prerequisite: IME 143, IME 144, or IME 146; and IME 326, IME 327, IME 503, or STAT 312.

Measurement of attributes and variables; standards, accuracy and precision; mechanical, electronic and optical/laser measurement systems. Contact and non-contact measurement; straightness, flatness and squareness; GDT (Geometric Dimensioning and Tolerancing); CMM (Coordinate Measurement Machines); surface roughness; metrology for electronic products. 3 lectures, 1 laboratory.

IME 429. Ergonomics Laboratory.

1 unit

Term Typically Offered: F, W, SP

Prerequisite: IME 319; and IME 326 or IME 327.

Investigation of various physiological, sensory, and cognitive capabilities and limitations of people in work and living environments through laboratory data collection, design of experiments and statistical analysis. 1 laboratory.

IME 430. Quality Engineering.

4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: IME 326, IME 327, IME 503, STAT 302, or STAT 312.

Quality history and philosophies. Cost of quality. Quality control tools. Statistical control charts for variables and attributes. Process capability. Measurement system analysis. Acceptance sampling. Reliability and life testing methods. Quality improvement tools: Quality Function Deployment, Failure Modes and Effects Analysis, Six Sigma, quality standards and systems. Course may be offered in classroom-based or online format. 4 lectures.

IME 432. Additive Manufacturing.

4 units

Term Typically Offered: W, SP

Prerequisite: IME 144 or ME 251; and MATE 210. Recommended: IME 330.

Engineering principles, materials, equipment, design for manufacturing, process flow, post processing, and applications of additive manufacturing processes, including: photopolymerization, powder bed fusion, extrusion, direct energy deposition, printing, binder jetting, and sheet lamination. Process selection, environment considerations, safety, and cost analysis for manufacturing. 3 lectures, 1 laboratory.

IME 435. Reliability for Design and Testing.

3 units

Term Typically Offered: TBD

Prerequisite: IME 326, IME 327, IME 503 or STAT 312.

Reliability concepts and mathematical models, mechanical device reliability, electrical device reliability, systems reliability and maintainability, reliability data, assurance program elements. Not open to students with credit in IME 542. Course may be offered in classroom-based or online format. 3 lectures.

IME 441. Engineering Supervision I.

1 unit

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Theory and principles of supervision. Application of fundamental concepts and techniques of supervision provided by assignment in engineering laboratories. 1 laboratory each.

IME 442. Engineering Supervision II.

1 unit

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Theory and principles of supervision. Application of fundamental concepts and techniques of supervision provided by assignment in engineering laboratories. 1 laboratory each.

IME 443. Facilities Planning and Design.

4 units

Term Typically Offered: F, W, SP

Prerequisite: IME 144; IME 223; IME 314 or IME 315; and IME 305 or IME 342. Recommended: IME 319 and IME 420.

Design concepts and input requirements in planning and design of new or renovation of existing manufacturing systems. Product, process, and flow and activity analysis techniques. Flow lines and buffering techniques. Computer-aided layout design and evaluation. Design of handling systems. Math models of location problems. Multidisciplinary team project. 3 lectures, 1 laboratory.

IME 450. Manufacturing Process and Tool Engineering.

4 units

Term Typically Offered: SP

Prerequisite: MATH 244, IME 330. Recommended: IME 335.

Engineering design of fixtures and tools for manufacturing processes. Interpretation of engineering design specifications. Analysis of cost, quality, productivity, and safety in tool design. Mechanical analysis of tool design. Detailed process design for net shape production and component design for manufacture. Process and tool design projects. 3 lectures, 1 laboratory.

IME 451. Radio Frequency Identification and Sensing System Design.

4 units

Term Typically Offered: TBD

Prerequisite: EE 201 or IME 156 or ITP 150.

Radio frequency identification (RFID) and its role in asset and inventory management, facility access, payment transaction systems, and other applications. RFID and the Industrial Internet of Things (IIOT). Physics and types of RFID and other sensing devices. Economic analysis. Multidisciplinary project teams design RFID systems for real-world applications. 2 lectures, 2 laboratories.

IME 456. The Industrial Internet of Things.

4 units

Term Typically Offered: SP

Prerequisite: IME 156, EE 143, or EE 145; and IME 212, CSC 365, or DATA 301.

Project-based introduction to internet-enabled device technologies for industrial applications. Sensor setup; data collection, storage, and analysis for real-time control and decision-making; internet communications standards and protocols; ethics and security issues. Applications such as asset tracking, machine maintenance, smart buildings. Course may be offered in classroom-based or online format. 3 lectures, 1 laboratory.

IME 457. Advanced Electronic Manufacturing.

4 units

Term Typically Offered: TBD

Prerequisite: IME 156 or EE 143 or EE 201.

Design and fabrication of commercial electronic products; PCB layout design, bill of material analysis and component purchasing, production planning and scheduling, programming automated surface-mount assembly line, marketing of products. Multidisciplinary project teams exposed to real-world challenges of electronics manufacturers. 2 lectures, 2 laboratories.

IME 458. Microelectronics and Electronics Packaging.

4 units

Term Typically Offered: TBD

Prerequisite: EE 112 or EE 113 or EE 201. Recommended: MATE 210.

Materials, processes, and reliability of microelectronics and electronics packaging, surface mount assembly and printed circuit board fabrication. Organic substrates and ceramic substrates. Mechanical design, thermal, and electrical considerations in electronic packaging. Design for manufacturability. Overview of optoelectronics packaging and other emerging technologies in microelectronics and electronic packaging. Project on design and manufacture of an electronic device. 3 lectures, 1 laboratory. Crosslisted as CPE 488/IME 458/MATE 458.

IME 460. Introduction to Value Chain Analysis.

3 units

Term Typically Offered: SP

Prerequisite: IME 223 or ITP 303; and senior standing.

Introduction to value chain concepts and their application to the analysis and improvement of business operations. Application of lean principles to optimize the value chain. 3 lectures.

IME 470. Selected Advanced Topics.

1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

IME 471. Selected Advanced Laboratory.

1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

IME 481. Senior Design Project I.

2 units

Term Typically Offered: F, W

Prerequisite: IME 326 or IME 327; IME 314 or IME 315. Corequisite: IME 301 or IME 330; IME 342 or IME 420. Recommended: IME 303; IME 410 or IME 418; and IME 430; completion of all IME 300-level coursework.

Culminating design project typical of problems in professional practice. Individual or group projects involving system design, modeling, analysis and testing. Problem definition, planning, scheduling, literature review, conceptual and alternative designs. Develop business case for communication and formal reports documenting project methodology. Professional ethics. Field trip may be required. 1 lecture, 1 laboratory.

IME 482. Senior Design Project II.

2 units

Term Typically Offered: W, SP

Prerequisite: IME 481. Recommended: IME 417; IME 429, IME 443 or IME 450.

Continuation of IME 481. Involves research methodology: project design, analysis, implementation, and/or testing. Project results documented in thesis-like formal reports suitable for reference library and formal oral presentations. Professional ethics. Field trip may be required. 1 lecture, 1 laboratory.

IME 483. Senior Design Project III.

2 units

Term Typically Offered: F, SP

Prerequisite: IME 482.

Continuation and completion of project from IME 482. Focus on testing and experimentation of implemented design project. Evaluation of project sustainability and impacts of societal, organizational, economic, and environmental nature. Project results and recommendations summarized and presented in formal reports suitable for reference library and formal oral presentations. Field trip may be required. 1 lecture, 1 laboratory.

IME 495. Cooperative Education Experience.

4-12 units

Term Typically Offered: F,W,SP,SU

CR/NC

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

IME 500. Individual Study.

1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair and supervising faculty member.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to students who have demonstrated ability to do independent work.

IME 503. Applied Statistical Methods in Engineering.

4 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Application of important statistical distributions in engineering and management. Coverage of sampling distributions and their roles in design of experiments. Applications of hypothesis testing, ANOVA, analysis of covariance, multiple and nonlinear regressions in industry and service systems. Introduction to nonparametric analysis. 3 lectures, 1 laboratory.

IME 507. Graduate Seminar.

2 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Seminars in industrial engineering, integrated technology management, and engineering management by researchers and practitioners from academia and industry. Preparation for conducting research. Presentation of student research projects. Overview of graduate education requirements. Ethics issues in research. 1 seminar, 1 laboratory.

IME 510. Systems Engineering I.

4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Project management. Scheduling and budgeting. Queuing theory. Process control and life-cycle cost analysis. Contracts and negotiation. 4 lectures.

IME 511. Systems Engineering II.

4 units

Term Typically Offered: TBD

Prerequisite: IME 510, graduate standing or consent of instructor.

Risk management. Design strategies to meet system/mission requirements. Design for supportability, manufacturability, reliability, etc. Quality function development and quality control concepts. 4 lectures.

IME 520. Advanced Information Systems for Operations.

4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor. Recommended: IME 410.

Advanced information systems (IS) applications in manufacturing and service operations. Introduction of common IS applications, such as manufacturing execution systems; reporting systems; capacity planning systems; scheduling systems; and customer inquiry systems. Industry-specific analysis of IS requirements and availability. 4 seminars.

IME 527. Design of Experiments.

4 units

Term Typically Offered: W

Prerequisite: IME 326 or IME 327 or IME 503 or STAT 312.

Experimental design principles. Comparative experiments for population parameters. ANOVA and randomized block design. Factorial designs, the 2^k factorial designs, and factorial designs with blocks. Fractional factorial designs. Response surface methodology. Fitting regression models.

Design projects using real world problems. Substantial use of statistical software. 3 lectures, 1 laboratory.

IME 535. Change Management for Engineering Leaders.

4 units

Term Typically Offered: SP

Prerequisite: Graduate standing.

Engineering change processes, configuration management, implementation in project management, cultural change, change models, and personal change. Processes used in reacting and managing changes. Learning through discussion and applications which might include conflict, emotion and differing opinions. 4 lectures.

IME 541. Advanced Operations Research.

4 units

Term Typically Offered: SP

Prerequisite: Graduate standing and consent of instructor.

Operations Research approach to model building. Linear programming and sensitivity analysis. Network flow models. Integer programming, large scale linear programming. Goal programming and multi-attribute decision making. Dynamic programming. Nonlinear programming and search methods. Applications in model building and computer solutions in planning, resource allocation, scheduling, and other industrial and service operations. 3 lectures, 1 laboratory.

IME 542. Applied Reliability Engineering.

4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing. Recommended: IME 326 or IME 327 or IME 503 or STAT 312.

Reliability terminology and bathtub curve. Failure distributions: Exponential, Lognormal, and Weibull. Probability plotting. Reliability of systems. Maintainability and availability. Reliability in design; Load-strength analysis; Failure modes and effects analysis; Fault tree analysis. Reliability testing; Reliability management. Not open to students with credit in IME 435. 3 lectures, 1 laboratory.

IME 543. Applied Human Factors.

4 units

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor. Recommended: IME 326 or IME 327 or IME 503.

Human factors/ergonomics analysis and evaluation of automation, mobile communication technology, and interface design for Internet websites. Usability analysis of current hardware/software products with an emphasis on a user-centric design approach. Team-based projects. 3 seminars, 1 laboratory.

IME 544. Advanced Topics in Engineering Economy.

4 units

Term Typically Offered: W

Prerequisite: Graduate standing. Recommended: Undergraduate course in engineering economy.

Review of interest calculations and comparison of economic alternatives. Replacement analysis. Capital planning and budgeting. Mathematical programming and capital budgeting. Utility theory. Decision making under risk and uncertainty. Application of simulation in risk modeling. Benefit-cost analysis. Multi-attribute decision making. Analytic hierarchy process. 3 lectures, 1 activity.

IME 545. Advanced Topics in Simulation.

4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing. Recommended: IME 420.

Validation of simulation models. Statistical techniques for variance reduction. Experimental design and optimization. Comparison of attributes of simulation languages. Review of current manufacturing and service industry applications. Case studies. 3 lectures, 1 laboratory.

IME 546. Large-Scale Optimization.

4 units

Term Typically Offered: SP

Prerequisite: IME 301 or graduate standing. Recommended: DATA 301 or IME 212.

Large-scale network, assignment and scheduling problems. Data reduction and aggregation techniques. Distributed optimization. Constructive solution techniques. Model relaxations. Improvement heuristics. Multi-start and randomized algorithms. 3 lectures, 1 laboratory.

IME 549. Network Analysis and Optimization.

4 units

Term Typically Offered: W

Prerequisite: IME 212 or DATA 301; and IME 301 or IME 305; and graduate standing or consent of instructor.

Basic network concepts, topologies, and applications. Representation and visualization. Social networks, relationship types, and data collection. Analysis metrics including cohesion, centrality, subgroups, and equivalence. Survivable networks. Network manipulation and design. Cost-optimized network computation including trees and cycles. 3 lectures, 1 laboratory.

IME 556. Technological Project Management.

4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Projects in industrial organizations and enterprises. Emerging technologies and project management. Relationship to strategic plans and managing change in organizations. Formulating, selecting, structuring, and planning projects. Project organization and control. Overcoming barriers. Application of project management software. 3 seminars, 1 laboratory.

IME 565. Predictive Data Analytics for Engineers.

4 units

Term Typically Offered: F

Prerequisite: IME 372 or DATA 301 and graduate standing; or consent of instructor. Recommended: IME 326, MATH 206, or MATH 244; and STAT 302 or STAT 312.

Applications of predictive data analytics to enhance the performance of engineering systems, processes, and products. Data processing, analysis, and visualization. Supervised and unsupervised learning. Ensemble learning, random forests, support vector machines, neural networks, and clustering. Model biases and data ethics. 3 lectures, 1 laboratory.

IME 570. Selected Advanced Topics.

1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors. Topic lists will be provided with class schedule outlines. 1 to 4 seminars.

IME 571. Selected Advanced Laboratory.

1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

IME 577. Engineering Entrepreneurship.

4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

The special requirements of entrepreneurship in a high-tech environment. Guest lectures, focused seminar topics, a business plan project, and case studies provide the tools to evaluate and pursue technology-based business opportunities. 4 lectures.

IME 580. Manufacturing Systems.

4 units

Term Typically Offered: SP

Prerequisite: Graduate standing.

Modern approaches in production and inventory planning and control to support large-scale manufacturing systems, material requirements planning (MRP I), manufacturing resource planning

(MRP II), and just-in-time (JIT) manufacturing systems. Enterprise resource planning (ERP) and integration with financials. Information requirements, operational issues, and policy matters. Not open if credit in IME 410. Course may be offered in classroom-based or online format. 4 seminars.

IME 596. Graduate Project/Internship.

1-5 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Integrative learning experience through internship and project. Focus on a significant industrial or research problem in an engineering field. Project involves student(s), faculty, and sponsoring representative(s) in a collaborative learning environment, and culminates in a comprehensive written report. Total credit limited to 5 units.

IME 599. Thesis.

1-9 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Systematic study of a significant problem under faculty supervision. Both a written thesis and an oral defense are required. Total credit limited to 9 units.