### INDUSTRIAL ENGINEERING (IE)

Subject-area course lists indicate courses currently active for offering at the University of Louisville. Not all courses are scheduled in any given academic term. For class offerings in a specific semester, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm).

500-level courses generally are included in both the undergraduate- and graduate-level course listings; however, specific course/section offerings may vary between semesters. Students are responsible for ensuring that they enroll in courses that are applicable to their particular academic programs.

#### Course Fees

Some courses may carry fees beyond the standard tuition costs to cover additional support or materials. Program-, subject- and course-specific fee information can be found on the Office of the Bursar website (http://louisville.edu/bursar/tuitionfee).

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**IE 515. Operations Research Methods**

**Term Typically Offered:** Fall Only  
**Prerequisite(s):** ENGR 330  
**Description:** Formulation and solution of basic models in operations research. Topics to be covered include applications of linear, integer and nonlinear programming; transportation and assignment problems, and network flows models.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 516. Stochastic Operations Research**

**Term Typically Offered:** Spring Only  
**Prerequisite(s):** IE 360 or equivalent.  
**Description:** A selection of the probabilistic topics of operations research are included: queuing, renewal and Markov processes, simulation, decision analysis.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 525. Project Management**

**Term Typically Offered:** Fall, Spring, Summer  
**Prerequisite(s):** Admission in IE or EM program or instructor permission.  
**Description:** Use of CPM, PERT, precedence diagramming, resource allocation heuristics, and other techniques for planning, managing, and controlling engineering projects involving research and development, production, maintenance, and construction. Computer procedures and codes for analyzing complex project networks will be covered.  
**Note:** Cross-listed with EM 525.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 540. Robots and Manufacturing Automation**

**Term Typically Offered:** Fall, Spring, Summer  
**Prerequisite(s):** IE 360.  
**Description:** Computer aided manufacturing; robot programming, implementation, application, and computer control; research trends; social impacts.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 541. Simulation**

**Term Typically Offered:** Fall Only  
**Prerequisite(s):** IE 240, IE 250, and IE 360.

**Description:** The use of discrete event simulation to analyze systems. Topics include Monte Carlo techniques, sampling from and identifying stochastic distributions, estimating performance measures from simulation outputs, validation methods, and SIMIO simulation language. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 542. Experimental Design in Engineering**

**Term Typically Offered:** Spring, Summer  
**Prerequisite(s):** IE 240, IE 250, and IE 360.

**Description:** Formulation and solution of basic models in experimental design. The course starts by teaching students to simplify and extend code generated by Excel's macro recorder and then builds on that basis towards developing applications that analyze information and enhance decision making.  
**Note:** Cross-listed with CECS 563.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 543. Introduction to Human Factors Engineering and Ergonomics**

**Term Typically Offered:** Fall Only  
**Description:** The main goal of this course is to introduce students to the study of human cognitive and physical abilities and limitations, and application of that knowledge to engineering design. This course will demonstrate how the application of the human factors and ergonomics principles can improve the design of systems involving the interaction of humans with tools, technology, and the work environment.  
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)
IE 581. Advanced Topics in Human Factors Engineering 3 Units
Term Typically Offered: Fall, Spring, Summer
Prerequisite(s): IE 580.
Description: The main goal of this course is to learn and apply advanced methods in human factors engineering, as well as newer models, theories, and frameworks related to the field.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

IE 585. Usability Engineering 3 Units
Term Typically Offered: Spring Only
Description: This course exposes students to the constructs of usability, usefulness, user-centered design, and user-experience (UX) and their relation to engineering design. The course covers an interactive evaluation-centered user experience (UX) lifecycle as a template intended to be instantiated in many different ways to match the constraints of a particular development project. The UX lifecycle, sketching, conceptual design, and formative UX evaluation.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

IE 590. Special Topics in Industrial Engineering 1-6 Units
Term Typically Offered: Fall, Spring
Description: A theoretical and/or experimental investigation of an industrial engineering design topic.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

IE 600. Additive Manufacturing Processes 3 Units
Prerequisite(s): IE 320 or Graduate Standing.
Description: This course introduces students to additive manufacturing, also known as rapid prototyping or 3D printing, processes. An overview of all additive manufacturing processes is provided. Projects are used to develop in-depth knowledge in key applications of additive manufacturing. Design project gives students an opportunity to apply their knowledge to the design and/or re-design of a component.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

IE 601. Additive Manufacturing Structure Design 3 Units
Description: This course focuses on the overview of design issues in additive manufacturing (AM), including the design of structures, materials and processes. The students are expected to gain in-depth understanding of the design issues with current AM technologies. Hands-on projects will be assigned that gives the students the opportunity of understanding the design issues and applying the knowledge to the design of functional parts and assemblies.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

IE 602. Graduate Internship in Industrial Engineering 2 Units
Grading Basis: Pass/Fail
Prerequisite(s): Instructor Permission required.
Description: Supervised professional experience in industry at the graduate level. This course provides the structure and focus for the graduate intern field assignment to ensure that the assignment is appropriate and consistent with the intern’s graduate course of study and professional development. May be repeated for credit.
Course Attribute(s): CBL - This course includes Community-Based Learning (CBL). Students will engage in a community experience or project with an external partner in order to enhance understanding and application of academic content.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

IE 610. Foundations of Optimization I 3 Units
Prerequisite(s): IE 515.
Description: Formulation and solution of applicable optimization models for linear, integer, and network problems. Efficient algorithmic methods and use of computer modeling languages and systems.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

IE 611. Discrete Optimization 3 Units
Prerequisite(s): IE 515.
Description: A study of the techniques and applications of discrete optimization, especially as related to integer and dynamic programming.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

IE 614. Foundations of Optimization II 3 Units
Prerequisite(s): ENGR 330 and IE 610.
Description: Formulation and solution of applicable optimization models for nonlinear, stochastic programming, robust optimization and convex problems. Efficient algorithmic methods and use of computer modeling languages and systems.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

IE 621. Facilities Planning 3 Units
Description: Techniques for planning and design of facilities found in both manufacturing and service industries. Emphasis is placed on location, layout and analysis of facilities, material handling systems, warehouses, and logistic operations.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

IE 630. Advanced Production Systems Design 3 Units
Prerequisite(s): IE 421, IE 425, IE 430.
Description: This course is organized around the principles of Lean Manufacturing Engineering. Topics include lean manufacturing, including value, value stream, flow, pull and continuous improvement. Improvement and efficiency are facilitated through a study of factory dynamics, the influence of variability, and "Push and Pull" production systems.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)
IE 631. Advanced Quality Control  
**Description:** Advanced techniques for quality improvement and process control are investigated; these include advanced techniques of SPC, trouble shooting and diagnostics and Taguchi methods of experimental design.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 634. Case Studies in Production and Industrial Engineering**  
**Prerequisite(s):** IE 425, IE 515, IE 541.  
**Description:** Case studies illustrate the application of industrial engineering techniques to the design of production systems, the control of construction projects, and health care delivery systems.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 640. Applied Systems Analysis**  
**Prerequisite(s):** IE 360, IE 370, IE 515.  
**Description:** Problem formulation, data collection, alternative design generation, design evaluation, specification, and implementation for large scale systems.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 642. Statistical Methodology in Simulation**  
**Prerequisite(s):** IE 360 and IE 541.  
**Description:** Discrete simulation modeling, input probability distributions, random variate generation, output data analysis, validation, variance reduction, experimental design and optimization.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 643. Analysis for Decision Making**  
**Prerequisite(s):** IE 360 and IE 515.  
**Description:** The role of decision analysis in design; techniques for multicriteria decision analysis; systematic creativity in design.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 650. Material Flow Systems Design**  
**Prerequisite(s):** IE 515.  
**Description:** Material handling and equipment concepts; computerized plant layout; problem formulation; requirements definition; queuing; location analysis; conveyor theory; simulation; developing and evaluating alternative systems; systems implementation.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 657. Models for Design and Analysis of Logistical Systems**  
**Prerequisite(s):** IE 425, IE 515.  
**Description:** This modeling oriented course for the design, analysis and operation of logistical systems includes topics such as inventory control, transportation, distribution network design, and supply chain management. Both deterministic as well as stochastic models are studied.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 660. Reliability and Maintainability**  
**Prerequisite(s):** IE 360.  
**Description:** Design, development, and test techniques required to assure the reliability and maintainability of new systems. Design of maintenance programs for new and existing systems.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 670. Advanced Engineering Economy**  
**Prerequisite(s):** IE 370.  
**Description:** Inflation; cost of capital; revenue requirements; uncertainty and risk; propagation of errors; Hillier's results; simulation; capital budgeting.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 690. Master of Science Thesis in Industrial Engineering**  
**Grading Basis:** Pass/Fail  
**Prerequisite(s):** Department Chair permission required.  
**Description:** Research on MS thesis project. Grade shall be deferred by the major professor until evaluation of the thesis by the student's committee. Grade on pass-fail basis by the examining committee.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 693. Independent Study in Industrial Engineering**  
**Grading Basis:** 1-12 Units  
**Description:** Opportunity for the student, under the supervision of a sponsoring faculty member, to pursue individualized study related to research or practice that is not included in regular courses in the curriculum.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 694. Advanced Topics in IE**  
**Grading Basis:** 1-6 Units  
**Prerequisite(s):** Consent of instructor.  
**Description:** An advanced course in Industrial Engineering topics not covered by regularly scheduled courses.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 697. MEng Thesis in Industrial Engineering**  
**Grading Basis:** 1-8 Units  
**Description:** A candidate for the Master of Engineering degree, specializing in the field of industrial engineering, is required to perform a study, design, or investigation under the direction of a faculty member. A written thesis is required to be presented orally and submitted to the faculty for approval.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

**IE 699. Industrial Engineering Master's Degree Project**  
**Prerequisite(s):** Instructor permission required.  
**Description:** The Industrial Engineering MEng or MS student carries out an engineering project under the supervision of a faculty mentor. Prepares an acceptable written report, and presents a seminar on the project.

**Note:** Cross-listed with EM 699.

For class offerings for a specific term, refer to the Schedule of Classes.[http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm](http://htmlacess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)
IE 700. Dissertation Research in Industrial Engineering 1-18 Units

Grading Basis: Pass/Fail

Prerequisite(s): Department Chair permission required.

Description: Research on dissertation project. Grade will be deferred by the major professor until evaluation of the dissertation by the student's committee. Graded on a Pass/Fail basis by the examining committee.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)