

Industrial and Systems Engineering

Shih-Ming Lee, *Chairperson and Associate Professor*

Alan L. Carsrud, *Clinical Professor*

Martha A. Centeno, *Program Director and Associate Professor*

Chin-Sheng Chen, *Professor*

Joe Chow, *Associate Professor*

Purushothaman Damodaran, *Assistant Professor*

Ronald Giachetti, *Associate Professor*

Khokiat Kengskool, *Associate Professor*

Kia Makki, *Professor*

Jin Kyu Park, *Assistant Professor*

Marc L. Resnick, *Associate Professor*

Mario Sanchez, *Lecturer and Advisor*

The ISE Department is committed to providing an excellent education to our students so that graduates of the BSISE program can function effectively as ISE professionals. Our graduates should be problem solvers, ethical professionals, independent learners, decision makers, and systems designers. Moreover, our students should have the people skills required to interact effectively in the workplace.

The department offers the following options at the Undergraduate level:

1. *Bachelor of Science degree in Industrial and Systems Engineering;*
2. *Combined Bachelor's and Master's degrees in Industrial and Systems Engineering;*
3. *Four ISE minors for non-majors*

Students interested in any of these ISE programs are encouraged to contact the undergraduate advisor Mr. Mario Sanchez at (305) 348-3723, or via email at sanchem@fiu.edu for curriculum details and specific study plan. Degree requirements may be changed during the course of study. Students should consult with the advisor how these changes may or may not affect them. Additional information regarding these programs can also be found on our web site: www.ise.fiu.edu.

Bachelor of Science in Industrial and Systems Engineering

Our BSISE graduates are expected to be problem solvers, ethical professionals, independent learners, decision makers, and systems designers. Moreover, they should have the people skills required to interact effectively in the workplace. Specifically, BSISE graduates should attain the following excellence throughout their careers:

1. Demonstrate abilities to design and integrate systems.
2. Be able to identify, analyze, and derive solutions to problems in the ISE enterprise.
3. Demonstrate decision-making abilities under uncertainty.
4. Demonstrate leadership, teamwork, and communication skills.
5. Understand and practice ethical, professional, and social responsibility
6. Commit to professional life-long learning.

As defined by the Institute of Industrial Engineers (IIE), Industrial Engineering is concerned with the design, improvement and installation of integrated systems of people, materials, information, equipment and energy. A major distinction between industrial engineering and other

branches of engineering is that the industrial engineer must consider not only the behavior of inanimate objects as they are governed by physical laws but also the behavior of people as they operate together in organizations, and as such it is often called the people oriented engineering discipline.

The BSISE program emphasizes areas of simulation and modeling, manufacturing systems, human factors/ergonomics, and engineering management. It is also soundly based in the traditional industrial engineering areas such as work measurement and simplification, probability and statistics, and facility and work place design.

The ISE Department encourages students to get practical industry experience via internships or co-ops at their junior and senior years. Credits for internships and co-ops, however, do not count towards the degree.

Degree Program Hours: 128

Common Prerequisites

CHM 1045	General Chemistry I
CHM 1045L	General Chemistry Lab I
EIN 3235	Evaluation of Engineering Data I
MAC 2311	Calculus I
MAC 2312	Calculus II
MAP 2302	Differential Equations
PHY 2048	Physics with Calculus I
PHY 2048L	General Physics Lab I
PHY 2049	Physics with Calculus II
PHY 2049L	General Physics Lab II

Lower Division Preparation

Lower division requirements include at least 60 hours of pre-engineering credits (see the Undergraduate Studies portion of this catalog for specific requirements.)

To qualify for admission into the upper division of the Industrial and Systems Engineering upper division program, students must have passed the CLAST and completed at least 60 semester hours of pre-engineering courses which include Calculus I & II, Differential Equations, Statistics, Chemistry I and Lab, Physics with Calculus I & II and Labs, 2 semesters of English and 2 other Gordon rule writing courses, and Engineering Graphics or CAD. A minimum grade of a "C" is required in all writing courses, all calculus courses, Differential Equations, both Physics classes and Chemistry. In addition, both transfer students and FIU Freshman must take a combination of social sciences and humanities that fulfill the state University Core Curriculum requirements and whose topics also complement the goals and objectives of the College of Engineering and Computing (including economic, environmental, political, and/or social issues. See the following suggested list of courses in Arts, Humanities with Writing and Social Inquires). Students who have not satisfactorily met the social science/humanities requirements may be required to take additional (advanced) humanities/social science course(s).

Arts (3)

Choose 1 course:

CRW 2001	Intro to Creative Writing
MUH 1011	Music Appreciation
MUH 2016	Evolution of Jazz
THE 2000	Theatre Appreciation
TPP 2100	Intro to Acting

Humanities With Writing (6)*One must be historically-oriented (*):*

WOH 2001	World Civilization (*)
PHI 2600	Intro to Ethics

Social Inquiry*Foundations of Social Inquiry (3)*

Choose 1 Course:

ECO 2013	Principles of Macroeconomics
ECO 2023	Principles of Microeconomics
INP 2002	Intro Indus./Org. Psych.
SYG 2010	Social Problems
GEO 2000	Intro to Geography
INR 2001	Intro to Inter. Relations
INR 2002	Dynam. Of World Politics

Societies and Identities (3)

EGN 1033	Tech., Humans and Society
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Foreign Language Requirement

Students must meet the University Foreign Language Requirement. Refer to the appropriate sections in the Catalog's General Information for Admissions and the Office of the Registrar.

Upper Division Program

The program includes 21 semester hours of General Engineering courses, 48 semester hours of required Industrial Engineering courses, and 9 hours of technical electives. Students must satisfy all upper division program requirements in effect at the moment of acceptance into the upper division. Students are expected to complete all General Engineering courses by the end of their Junior year.

General Engineering: (21)

EEL 3003	Electrical Engineering I	3
EGN 3123	Computer Assisted Drawing	3
EGN 3311	Statics	3
EGN 3321	Dynamics	3
EGN 3343	Thermodynamics I	3
EGN 3365	Materials in Engineering	3
COP 3175	Visual BASIC	3

Industrial Engineering Core Courses: (48)

EIN 3354	Engineering Economy	3
EIN 3365	Facilities Planning	3
EIN 3390	Manufacturing Processes	2
EIN 3390L	Manufacturing Processes Lab	1
EIN 3331	Quality Control	3
EIN 3600	Industrial Automation	2
EIN 3600L	Industrial Automation Lab	1
ESI 4244	Evaluation of Engineering Data II	3
EIN 4116	Industrial Information Systems	3
EIN 4243	Human Factors in Engineering	2
EIN 4243L	Human Factors Lab	1
EIN 4314	Work Design	2
EIN 4314L	Work Design Lab	1
EIN 4334	Production Planning & Control	3
ESI 3161	Software Tools for ISE	3
ESI 3321	OR I Deterministic Models	3
ESI 4322	OR II Stochastic	3
ESI 3523	Simulation of Industrial Systems	2
ESI 3523L	Simulation of Industrial Systems Lab	1
ESI 4452	Project Management	3
ESI 4554	ISE Systems Design	3

Industrial Engineering Electives (9)

Choose 3 from this list. See advisor for additional choices.

EIN 4122	Industrial Marketing	3
EIN 4214	Safety in Engineering	3
EIN 4261	Industrial Hygiene	3
EIN 4326	Industrial Research and Development	3
EIN 4333	Productivity Planning	3
EIN 4387	Technology Assessment	3
EIN 4389	Technological Forecasting	3
EIN 4391	Concurrent Engineering	3
EIN 4395	Computer Integrated Manufacturing	3
EIN 4933	Special Topics	3
EIN 5106	Regulatory Aspects of Engineering	3
EIN 5226	Total Quality Management for Engineers	3
EIN 5249	Occupational Biomechanics	3
EIN 5256	Usability Engineering	3
EIN 5322	Engineering Management	3
EIN 5332	Quality Engineering	3
EIN 5346	Logistics Engineering	3
EIN 5359	Industrial Financial Decisions	3
EIN 5367	Production Systems	3
EIN 5605	Robotic Assembly Cells	3
ESI 5602	Engineering Data Representation and Modeling	3
ESI 5603	Advanced Software Tools	3

Suggested Program Schedule for the BSISE**First Semester: (15)**

SLS 1501	Freshman Experience Seminar	1
ENC 1101	Freshman Composition	3
MAC 2311	Calculus I	4
CHM 1045	General Chemistry I	3
CHM 1045L	General Chemistry I Lab	1
Arts		3

(see suggested list under Lower Division Preparation)

Second Semester: (16)

ENC 1102	Literary Analysis	3
MAC 2312	Calculus II	4
COP 3175	Visual BASIC	3
Humanities with Writing - Historically Oriented		3
Social Inquiry – Foundations		3

(see suggested list under Lower Division Preparation)

Suggested Summer Term: (9)

EGN 3123	Computer Assisted Drawing	3
Social Inquiry: Societies & Identities		3
Humanities		3

(see suggested list under Lower Division Preparation)

Third Semester: (14)

PHY 2048	Physics with Calculus I	4
PHY 2048L	General Physics Lab I	1
EGN 3365	Materials in Engineering	3
EIN 3235	Evaluation of Engineering Data I	3
EIN 3354	Engineering Economy	3

Fourth Semester: (14)

MAP 2302	Differential Equations	3
PHY 2049	Physics with Calculus II	4
PHY 2049L	Physics with Calculus II Lab	1
EGN 3311	Statics	3
ESI 3161	Software Tools for ISE	3

Fifth Semester: (15)

EGN 3321	Dynamics	3
EGN 3343	Thermodynamics	3
EIN 3331	Quality Control	3
EIN 4314	Work Design	2

EIN 4314L	Work Design Lab	1
ESI 3321	OR I Deterministic Models	3
Sixth Semester: (15)		
EIN 3365	Facility Planning and Materials Handling	3
EIN 3390	Manufacturing Process	2
EIN 3390L	Manufacturing Process Lab	1
EIN 3600	Industrial Automation	2
EIN 3600L	Industrial Automation Lab	1
EIN 4243	Human Factors	2
EIN 4243L	Human Factors Lab	1
ESI 4322	OR II Stochastic	3

Suggested Summer Term: (9)

Summer internship recommended

Seventh Semester: (15)

EIN 4116	Industrial Information Systems	3
EIN 4334	Production Planning and Control	3
ESI 3523	Simulation Models of Industrial System	2
ESI 3523L	Simulation Models Lab	1
ESI 4452	Project Management Systems Design	3
IE Elective I		3

Eighth Semester: (15)

EEL 3003	Electrical Engineering I	3
ESI 4554	ISE Systems Design	3
IE Elective II		3
IE Elective III		3
IE Elective IV		3

Combined BS/MS Program

Students who have completed a minimum of 90 hours towards their BS degree and have earned at least a 3.3 GPA on both overall and upper division courses may, upon recommendation from three ISE faculty members, apply to the department to enroll in the combined BS/MS program. Students enrolled in the program may count up to 9 credit hours of ISE graduate courses as credits for both the BS ISE electives and the MS degree. The BS/MS (3 +2) Program has been designed to be a continuous program. Students in 3 + 2 programs will apply for graduation with the BS and MS at the same time. Students will receive a BS degree and a MS degree on the same date, after requirements for both are completed. The student's advisor will insure that appropriate forms are completed, and that students do not apply for BS degree graduation until both BS and MS requirements are finished. Upon the completion of BS degree requirements, students can elect to permanently leave the combined program at any time and earn only the BS degree. Once the BS is granted, students will have the same access requirements to regular graduate programs as any other student. However, the combined MS degree would not be available to those who elect to leave the combined program.

Admission into the combined program does not automatically qualify the students for admission into the MS degree program. To enroll in the MS degree program, the students must apply to the graduate school and meet all graduate admission requirements.

The ISE Department encourages students to get practical industry experience via internships or co-ops at their junior and senior level. Credits for internships and co-ops do not count towards the degree.

Minors for Non-ISE Majors

In addition to the Bachelor's of Science degree, the Industrial and Systems Engineering Department offers

several minors at the baccalaureate level, for non-majors, in Engineering Management, Human Factors Engineering, Manufacturing Systems Engineering, and Operations Research.

For admission to the minor, students need (1) To be fully admitted to their major; (2) To have a GPA ≥ 2.5 .

Industrial and Systems Engineering students are not eligible for these minors. Students are expected to meet all prerequisites for the required courses.

Minor in Engineering Management

The minor requires 18 credit hours consisting of the following courses:

EIN 3354	Engineering Economy
EIN 4104	Introduction to Engineering Management
EIN 4328	Introduction to Engineering Entrepreneurship
EIN 4220	Introduction to Total Quality Management
ESI 3314	Generic Models I
ESI 4452	Project Management Systems Design

Minor in Human Factors Engineering

The minor requires 18 credit hours consisting of the following courses:

EIN 3235	Evaluation of Engineering Data or Equivalent
EIN 4314&L	Work Design and Industrial Ergonomics and Lab
EIN 4243&L	Human Factors Engineering and Lab
EIN 4xxx	Introduction to Usability Engineering
EIN 4106	Fundamental of Engineering Regulations
EIN 4261	Industrial Hygiene
	or
EIN 4214	Safety Engineering

Minor in Manufacturing Systems Engineering

The minor requires 18 credit hours consisting of the following courses:

EIN 3365	Materials in Engineering
EIN 3390&L	Manufacturing Processes and Lab
EIN 3331	Quality Control
EIN 3600&L	Industrial Automation and Lab
EIN 4334	Production Planning and Control
ESI 3314	Generic Models I

Minor in Operations Research

The minor requires 18 credit hours consisting of the following courses:

EIN 3235	Evaluation of Engineering Data or Equivalent
EIN 3354	Engineering Economy
EIN 4334	Production Planning and Control
ESI 3314	Generic Models I
ESI 3523&L	Simulation Models of Industrial Systems and Lab
ESI 4315	Generic Models II

Course Descriptions**Definition of Prefix**

EIN - Engineering General; EIN - Engineering: Industrial; ESI - Engineering Systems Industrial.

F-Fall semester offering; S-Spring semester offering; SS-Summer semester offering.

EGN 3123 Computer Assisted Drawing and Design (3). Application of computer assisted design technology to product design, feasibility study and production drawing. (F,SS)

EGN 5435 Product Modeling (3). Life cycle product data, geometry and form features, product information models and modeling techniques, product modeling systems, and product data standards. Prerequisites: EGN 3123 or equivalent.

EIN 1396C Basic Industrial Shop and Manufacturing Practices (3). Fundamentals of basic capabilities and requirements for a modern shop or industrial manufacturing facilities. Rudiments of safety requirements, wood technology, metal technology and plastic technology.

EIN 2100 Introduction to Industrial and Systems Engineering (1). A historic review of ISE origins, definition of role, functions and contributions of the IE in industry. Professional development opportunities. Practice communication skills. Seminars.

EIN 3118 Introduction to Engineering Software Applications (3). Hands-on experience with software packages such as Autocad, MS Word, Excel, PowerPoint, Access, Windows XP, and industrial applications of the Internet. Prerequisite: High school students in dual enrollment programs.

EIN 3235 Evaluation of Engineering Data I (3). Analysis of industrial data and subsequent characterization of industrial processes. Prerequisite: MAC 2312. (F,S,SS)

EIN 3331 Quality Control (3). Modern concepts for managing the quality function of industry to maximize customer satisfaction at minimum quality cost. The economics of quality, process control, organization, quality improvement, and vendor quality. Prerequisite: EIN 3235. (S,SS)

EIN 3354 Engineering Economy (3). Basic methods of engineering economic analysis including equivalence, value measurement, interest relationships and decision support theory and techniques as applied to capital projects. (F,S,SS)

EIN 3365 Facilities Planning and Materials Handling (3). Application of methods and work measurement principles to the design of work stations. Integration of work stations with storage and material handling systems to optimize productivity. Prerequisites: EGN 3123 and ESI 3321. (F)

EIN 3390 Manufacturing Processes (2). Study of interrelationships among materials, design and processing and their impact on workplace design, productivity and process analysis. Prerequisite: EGN 3365. Corequisite: EIN 3390L. (F,S,SS)

EIN 3390L Manufacturing Processes Laboratory (1). Experiments are conducted using the machines, equipment and tools in the laboratory to provide students with hands-on experience on product design, process planning, fabrication and quality assurance. Corequisite: EIN 3390. (Lab fees assessed). (F,S,SS)

EIN 3600 Industrial Automation (2). Basic concepts of industrial automation and robotics. Performance characteristics, criteria for use, planning, selection, and implementation of computer automated equipment. Open to non-majors. Prerequisite: ESI 3161. Corequisite: EIN 3600L. (F)

EIN 3600L Industrial Automation Lab (1). Experiments in the use of CNC machines and robots demonstrating performance characteristics of CNC equipment and robotic arms. Corequisite: EIN 3600. (Lab fees assessed). (F)

EIN 3949 Industrial Engineering Co-Op (1-3). Entry level work experience as an Industrial Engineering intern. Jointly supervised by IE and Industry personnel. Written report required. Student must obtain approval from IE faculty and sign up for course before starting work. Prerequisite: Approval of advisor. (F,S,SS)

EIN 4102 Collective Bargaining in Industrial Systems (3). A comprehensive study of collective bargaining with emphasis upon the private sector. Included will be negotiations and scope of contracts, day-to-day contract administration, and major bargaining issues. Prerequisite: Senior Standing (SS)

EIN 4103 Fundamentals of Engineering Regulation (3). A survey of the legal and regulatory requirements encountered by engineers. Included will be patents, antitrust, safety environmental, compliance, labor laws, product liability and global issues. Prerequisite: Senior standing.

EIN 4104 Introduction to Engineering Management (3). Organization of engineering systems including production and service organizations. Inputs of human skills, capital, technology, and managerial activities to produce useful products and services. Prerequisite: Permission of advisor.

EIN 4116 Industrial Information Systems (3). The integration of information flows and data bases with the production planning and control systems into productive and manageable systems. Prerequisite: Programming language. (S)

EIN 4122 Industrial Marketing (3). The performance of business activity that directs the flow of goods and services from producer to industrial user. Covers new product development, marketing research, sales engineering, pricing, distribution, and promotion. (F)

EIN 4214 Safety in Engineering (3). Introduces occupational safety and health hazards associated with mechanical systems, materials handling, electrical systems, and chemical processes. Illustrates controls through engineering revision, safeguarding, and personal protective equipment. Emphasis placed on recognition, evaluation and control of occupational safety and health hazards. Prerequisites: EIN 4314 or permission of the instructor. (S)

EIN 4220 Introduction to Total Quality Management (3). Fundamentals of TQM and its historical development. Integration of QC and management tools, QFD, Benchmarking for scientific management. Prerequisite: Permission of advisor.

EIN 4243 Human Factors Engineering (2). Examination of the ways to fit jobs and objects better to the nature and

capacity of the human being. Lectures will review man's performance capability, singly and in groups, in interacting with his work environment. Stresses the practical application of human factors principles. Prerequisite: EIN 4314. Corequisite: EIN 4243L. (F)

EIN 4243L Human Factors in Engineering and Design Laboratory (1). Experiments are conducted which measure human factors indicators and differences by age, sex, and race, as well as physiological and anatomical differences. Corequisite: EIN 4243. (Lab fees assessed). (F)

EIN 4261 Industrial Hygiene (3). A continuation of Safety in Industry. An introduction to OSHA regulations on health hazards. Noise, radiation, and dust problems in industry. Special hazards with solvents, asbestos, lead, silica, and other chemicals. OSHA compliance procedures. Prerequisite: Senior standing. (S)

EIN 4314 Work Design and Industrial Ergonomics (2). The analysis, design, and maintenance of work methods. Study of time standards, including Pre-Determined time standards and statistical work sampling. Prerequisites: EGN 3123, EIN 3235 or equivalent. Corequisite: EIN 4314L. (S)

EIN 4314L Work Design and Industrial Ergonomics Laboratory (1). Experiments in the different Work Design techniques including Performance Sampling, Time Studies, Pre-Determined Time Systems and Workplace Design. Corequisite: EIN 4314. (Lab fees assessed). (S)

EIN 4326 Industrial Research and Development (3). Research and development for new product strategies, technological assessment, patent and product liability, and sales engineering. An independent study product will be required by each student. Prerequisite: Senior status.

EIN 4328 Introduction to Engineering Entrepreneurship (3). Fundamentals of engineering entrepreneurship; entrepreneurial process, identification of opportunities, starting and managing the venture, and development of business plans.

EIN 4333 Productivity Planning (3). The improvement of productivity as a functional activity of the enterprise. Productivity definitions, measurement, methodologies, and reporting systems. Prerequisites: EIN 4314, ESI 3161, and statistics.

EIN 4334 Production Planning and Control (3). Production systems, demand forecasting, capacity planning, master production planning, material requirements planning, shop floor control, and assembly line balancing. Prerequisites: EIN 3354 and ESI 3321. (S)

EIN 4387 Technology Assessment (3). Development of systematic efforts to anticipate impacts on society that may occur when a technology is introduced, extended, or modified. Prerequisites: Senior standing in Engineering, ESI 3161 and Statistics.

EIN 4389 Technological Forecasting (3). Emphasis on forecasting future trends and specific developments in the area of capabilities and needs. Prerequisites: Senior standing in Engineering, and EIN 4334.

EIN 4391 Concurrent Engineering (3). Overview of product and process design. Principles of design for

manufacturing. Manufacturability evaluation methods. Computer aided design for manufacturing techniques and strategies. Prerequisites: EIN 3600 and EIN 3390.

EIN 4395 Computer Integrated Manufacturing (3). The integration of computer aided design and computer aided manufacturing. Development of a common data base for design and manufacturing. Developments of flexible manufacturing systems. Prerequisites: EIN 3600 and ESI 3523.

EIN 4440 Introduction to Technology Entrepreneurship (3). An introduction to theories, concepts, and practices of entrepreneurship. Students will produce feasibility analyses, learn to develop and analyze new ventures, and be introduced to business plans.

EIN 4441 Engineering Business Plan Development (3). This course is designed to help students develop an effective implementation plan for a new business venture. Prerequisites: GEB 4113 or EIN 4440.

EIN 4933 Special Topics in Industrial Engineering (2-3). Permits in-depth study in areas relating to specific student interests, recent advances, and problems in industrial technology or systems. Prerequisites: Senior standing, consent of faculty advisor and approval of department chairman.

EIN 4941 Undergraduate Industrial and Systems Engineering Internship (1). To provide undergraduate students with work experience under approved industrial supervision. Prerequisite: Department chairperson's approval.

EIN 4949 Co-op Work Experience (1-3). Practical Co-op work experience under approved industrial supervision. Written report required at the conclusion of the work assignment. Prerequisite: Permission of department chairperson.

EIN 5106 Regulatory Aspects of Engineering (3). A survey of the legal and regulatory requirements encountered by engineers. Included OSH Act, NIOSH, ADA, EEOC, Worker's Compensation and Product Liability. (SS)

EIN 5160 Management of Innovation and Technology (3). The course provides an integrated view of management of technology. The combination of theory and practice addresses the challenges of globalization, time compression, and technology integration. Prerequisite: Permission of instructor.

EIN 5226 Total Quality Management for Engineers (3). Fundamentals of TQM and its historical development. Integration of QC and management tools, QFD, benchmarking, experimental design for scientific management. (F,S)

EIN 5249 Occupational Biomechanics (3). Study of the theoretical fundamentals for the mechanics of the body. The link system of the body and kinematic aspects of body movement including applications of biomechanics to work systems. Prerequisites: EIN 4314 Work Design and Industrial Ergonomics or equivalent. (S)

EIN 5256 Usability Engineering (3). The usability aspects of software systems design and testing. The theory of interface design for usability and the methods

and techniques for designing and testing technology interfaces. Prerequisite: Permission of Instructor.

EIN 5322 Engineering Management (3). Organization of engineering systems including production and service organizations. Inputs of human skills, capital, technology, and managerial activities to produce useful products and services. (F,S)

EIN 5332 Quality Engineering (3). This course examines quality control from an engineering standpoint. It covers ways to meet the challenge of designing high-quality products and processes at low cost. Prerequisites: EIN 3331 or equivalent. (S)

EIN 5346 Logistics Engineering (3). Concepts and tools for effective design and management of supply chain systems. Includes logistics strategies, inventory management, customer service, supply chain integration and logistics network design. Prerequisite: Consent of Instructor.

EIN 5359 Industrial Financial Decisions (3). The use of financial techniques and data in planning, controlling and coordinating industrial activities. This course will familiarize the student with accounting concepts and analytical methods. Prerequisite: EIN 3354. (SS)

EIN 5367 Design of Production Systems (3). The design of an industrial enterprise including feasibility, plant layout, equipment specifications, auxiliary services, economics and scheduling. Prerequisite: EIN 3365.

EIN 5392 Design and Implementation of Discrete Manufacturing Systems (3). Methodology and techniques for design, planning and implementation of discrete production systems including process/machine selections, material handling and inspection technologies, cell control, etc. Prerequisites: Graduate or seniors with EIN 3365, EIN 3390, and ESI 3523 or equivalent.

EIN 5605 Robotic Assembly Cell (3). Concepts of robot manipulation and sensing, part design for robotic assembly, planning manipulator trajectories, machine vision, robot programming language, cell control, and material transfer. Prerequisite: EIN 3600.

ESI 3161 Software Tools for ISE (3). Basic concepts of microprocessors; an overview of computer architecture, local area networks, micromainframe linking, and operating systems as they apply to industrial systems.

ESI 3321 Operations Research I: Deterministic Models (3). Modeling principles with emphasis on linear programming and extensions. The simplex procedure and its application through computer software packages. The analysis and interpretation of results in decision making. Prerequisites: MAC 2312, permission of the instructor. (F)

ESI 3523 Simulation Models of Industrial Systems (2). Simulation methodology, design of simulation experiments, implementation of simulation effort through computer software. Application to the solution of industrial and service system problems. Prerequisites: CGS 2423 or equivalent, ESI 3161, ESI 3321 and EIN 3235 or equivalent. Corequisite: ESI 3523L. (S)

ESI 3523L Simulation Models of Industrial System Laboratory (1). Simulation Modeling on a microcomputer. Analyze and validate design models using both a general

purpose programming language and a special-purpose simulation language. Corequisite: ESI 3523. (S)

ESI 4244 Evaluation of Engineering Data II (3). Application of statistical analysis in engineering practice, design of engineering experiments, and decision making. Study of prediction, tolerance intervals. Use of computer tools. Prerequisites: EIN 3235 or equivalent.

ESI 4317 Computer Algorithms for Operations Research (3). Discussion and implementation of a collection of computer algorithms essential for the O.R. researcher and consultant. This collection of algorithms includes both deterministic and stochastic models. Computer exercises. Prerequisites: ESI 3321 or equivalent. (S)

ESI 4322 Operations Research II: Stochastic Models (3). Modeling principles with emphasis on applications of Markov Chains, queuing models, systems reliability, Bayesian decision analysis. Prerequisites: ESI 3321, EIN 3235 or equivalent. (S)

ESI 4452 Project Management Systems Design (3). Project planning, scheduling and control using activity network logic. System development techniques and strategies. Prerequisite: Permission of the instructor. (F)

ESI 4554 ISE Systems Design (3). To integrate all prior ISE required courses into a cohesive and consistent professional philosophy. Prerequisite: Permission of instructor. (S)

ESI 4556 Industrial and Systems Engineering in the Office (3). Paperwork reduction, overhead and expense cost containment, and white collar productivity through office automation and systems analysis.

ESI 5522 Simulation Models of Engineering Systems (3). Simulation Methodology; design and implementation of models of engineering systems using computer software; case studies. Prerequisites: STA 3033 or EIN 3235 or equivalent and COP 3175 or equivalent.

ESI 5456 Productivity Management in the Global Organization (3). Analysis of productivity management strategies. Major issues in performance and productivity management, domestic and global outsourcing, international labor standards and trade policies. Prerequisites: EIN 4214 or equivalent.

ESI 5602 Engineering Data Representation and Modeling (3). The course will cover the life cycle of designing, developing, and implementing engineering database systems by applying the IDEFLx methodology. Prerequisite: Permission of Instructor.

ESI 5603 Advanced Software Tools for ISE (3). Algorithms and principles to integrate heterogeneous tools. Principles of XML, ASP, and other tools. Development of programming projects.