Industrial Engineering (INEG)

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Industrial Engineering Website (http://www.ineg.uark.edu/)

The mission of the industrial engineering department at the University of Arkansas is to be a nationally competitive, student-centered industrial engineering program serving Arkansas and the world through undergraduate and graduate studies and leading-edge research programs.

Industrial engineers are concerned with improving organized activity. The physical arrangement of people, equipment, and material significantly influences the effectiveness of any organization – whether the organization is industrial, governmental, or commercial.

Today's industrial engineers develop applications of new processing automation and control technology; install data processing systems, performance measures and standards, job evaluation and wage and salary programs; research new products and product applications; devise ways to improve productivity through application of technology and human factors; select operating processes and methods to accomplish a given task using proper tools and equipment; design facilities, management systems, operations procedures, storage systems; improve allocation of resources, planning and control systems for distribution of goods and services, production, inventory, quality and plant maintenance; enhance plant environment and the quality of working life; evaluate reliability and quality performance; implement office systems, procedures, and policies; analyze complex business problems through operations research; conduct long-range organization studies, plant location surveys, system effectiveness studies; and study potential markets for goods and services, raw material sources, labor supply, energy resources, financing and taxes.

Industrial engineers integrate engineering skills with mathematics and computer science tools, providing systematic ways to maximize productivity and quality while minimizing time and cost.

Completion of the degree requirements provides graduates with the following learning outcomes:

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- An ability to communicate effectively with a range of audiences
- An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The goal of the Industrial Engineering Undergraduate Program at the University of Arkansas is to prepare men and women for professional careers and graduate studies in Industrial Engineering. We provide a foundation in mathematics, science, humanities and social sciences, engineering science, and engineering design to produce Industrial Engineers with the intellectual, technical, and professional competence to develop, implement, and manage industrial engineering solutions to complex problems in industry, government, and society.

The program's objectives have been developed to address the needs of the industrial engineering constituencies and to be consistent with and supportive of the department's mission and programmatic goals. The IE program educational objectives represent and describe the expected accomplishments of graduates resulting from participation within the program within the first few years after graduation. The program's objectives have been developed to address the needs of departmental constituencies and to be consistent with and support the mission and programmatic goals.

Within 3-5 years of graduation, graduates of the U of A undergraduate program in industrial engineering will have:

1. Successfully applied core industrial engineering knowledge and skills for industrial or public sector organizations.
2. Successfully pursued advanced professional degrees, graduate studies in industrial engineering, professional training, or engineering certification.
3. Demonstrated professional and intellectual growth as managers and leaders in industrial engineering, society, and their communities.

Requirements for B.S. in Industrial Engineering

The total graduation requirement in industrial engineering is 123 hours. For further information please visit the departmental website (http://www.ineg.uark.edu/).

Technical Electives

The purpose of technical electives is to provide students with the opportunity to expand their education along lines of particular interest to them. Each student is responsible for their technical elective program. Students may seek specific advice on technical elective selections from their advisor. Courses satisfying technical elective requirements cannot fulfill more than one B.S.I.E. requirement.

A minimum of 12 credit hours from the approved technical elective course list must be taken to satisfy technical elective requirements for the B.S.I.E. At least 6 of these 12 credit hours must be chosen from INEG and/or OPAN courses. No more than 3 of these credits may be based in individual/ independent study, no more than 4 of these credits may be based in honors thesis (honors thesis courses offered by our department include: INEG 400VH, INEG 3812H, and INEG 4812H), and no more than 3 of these credits may be based in cooperative education.

Approved Technical Elective Course List

1. Any BENG, BIOL, BMEG, CHEG, CHEM, CVEG, CSCE, ELEG, GNEG, INEG, MATH, MEEG, OPAN, and PHYS course that is at the 3000-level or above is approved.

Exceptions are:

- CVEG 4513 is not approved.
- GNEG 3801 is not approved.
- GNEG 3811 is approved only if the student has completed at least three semesters of GNEG 3811.
- INEG 3313 is not approved.
- MATH 3013 and MATH 3133 are not approved.
- PHYS 3603 is not approved.

2. Students may count one of MATH 2574 and MATH 2584 as a technical elective.

3. Courses at the 3000-level or above that are explicitly listed (not part of a blanket statement like "… 3000-to- 4000-level …") in the Catalog of Studies under Minors for Non-Business Students (http://catalog.uark.edu/undergraduatecatalog/collegesandschools/sammwaltoncollegeofbusiness/minors/) are approved.

Exception:

- ISYS 3393 is not approved if the student is also seeking technical elective credit for INEG 4683.

4. Courses at the 3000-level or above that are explicitly listed on the Sustainability Minor Courses (https://sustainability.uark.edu/academics/minor.php) website under Natural, Managed, or Built Systems are approved.

5. Courses at the 3000-level or above that are explicitly listed in the Catalog of Studies in the Analytics group for the Data Analytics Minor (http://catalog.uark.edu/undergraduatecatalog/collegesandschools/collegeofengineering/dataanalytics/) are approved.

6. Additional approved courses are EXSC 3153, EXSC 3353, and HNRC 4013H.

Industrial Engineering B.S.I.E. Eight-Semester Degree Program

The following section contains the list of courses required for the Bachelor of Science in Industrial Engineering degree and a suggested sequence. Not all courses are offered every semester, so students who deviate from the suggested sequence must pay careful attention to course scheduling and course prerequisites. Students wishing to follow the eight-semester degree plan should see the Eight-Semester Degree Policy (http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/) in the Academic Regulations chapter for university requirements of the program.

Students are required to complete 40 hours of upper division courses (3000-4000 level). It is recommended that students consult with their adviser when making course selections.

First Year	Units	
	Fall	Spring
GNEG 1111 Introduction to Engineering I	1	
MATH 2554 Calculus I (ACTS Equivalency = MATH 2405) (Satisfies General Education Outcome 2.1)[1]	4	
CHEM 1103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture)	3	
ENGL 1013 Composition I (ACTS Equivalency = ENGL 1013) (Satisfies General Education Outcome 1.1)[1]	3	
Select one of the following courses to satisfy General Education Outcome 4.2:[1]	3	
HIST 2013 History of the American People, 1877 to Present (ACTS Equivalency = HIST 2123)		
HIST 2003 History of the American People to 1877 (ACTS Equivalency = HIST 2113)		
PLSC 2003 American National Government (ACTS Equivalency = PLSC 2003)		
GNEG 1121 Introduction to Engineering II		1
MATH 2564 Calculus II (ACTS Equivalency = MATH 2505)		4
ENGL 1033 Technical Composition II (ACTS Equivalency = ENGL 1023) (Satisfies General Education Outcome 1.2)[1, 2]		3
BIOL 1543/1541L or CHEM 1123/1121L or GEOS 1113/1111L or PHYS 2074		4
PHYS 2054 University Physics I (ACTS Equivalency = PHYS 2034) (Satisfies General Education Outcome 3.4)[1]		4
Year Total:	14	16

Second Year	Units	
	Fall	Spring
INEG 2001 Industrial Engineering Seminar	1	
INEG 2103 Introduction to Industrial Engineering	3	
INEG 2214 Computing Methods for Industrial Engineers I	4	
INEG 2314 Statistics for Industrial Engineers I	4	
Math Elective: Choose one of the following	3	
MATH 2574 Calculus III (ACTS Equivalency = MATH 2603)		
MATH 2574C Calculus III		
MATH 2574H Honors Calculus III		
MATH 2584C Elementary Differential Equations		
MATH 2584H Honors Elementary Differential Equations		
MATH 2603 Discrete Mathematics		
MATH 3083 Linear Algebra		
INEG 2223 Computing Methods for Industrial Engineers II		3
INEG 2323 Probability and Stochastic Processes for Industrial Engineers		3
INEG 2413 Engineering Economic Analysis		3

INEG 2613 Introduction to Operations Research		3
ACCT 2403 Accounting Fundamentals for Planning and Control		3
Year Total:	15	15

Third Year	Units	
	Fall	Spring
INEG 3333 Statistics for Industrial Engineers II	3	
INEG 3443 Project Management	3	
INEG 3543 Facility Logistics	3	
INEG 3624 Simulation	4	
Select one of the following two options to satisfy General Education Outcome 3.3:[1]	3	
ECON 2143 Basic Economics: Theory and Practice		
or		
ECON 2013 Principles of Macroeconomics (ACTS Equivalency = ECON 2103) & ECON 2023 Principles of Microeconomics (ACTS Equivalency = ECON 2203)		
INEG 3553 Production Planning and Control		3
INEG 3533 Transportation Logistics		3
INEG 3714 Work Methods and Ergonomics		4
INEG 3833 Introduction to Database Concepts for Industrial Engineers		3
Social Science Elective - Choose a course that satisfies General Education Outcomes 3.3 and 4.1.[1]		3
Year Total:	16	16

Fourth Year	Units	
	Fall	Spring
INEG 4433 Systems Engineering and Management	3	
INEG 4913 Industrial Engineering Capstone Experience I	3	
Two Technical Electives	6	
Social Sciences Elective - Choose a course that satisfies General Education Outcome 3.3.[1]	3	
INEG 4924 Industrial Engineering Capstone Experience II (Satisfies General Education Outcome 6.1)[1]		4
Two Technical Electives		6
Fine Arts Elective - Choose a course that satisfies General Education Outcome 3.1.[1]		3
Humanities Elective - Choose a course that satisfies General Education Outcomes 3.2 and 5.1.[1]		3
Year Total:	15	16

Total Units in Sequence:	**123**

[1] Students must complete the State Minimum Core requirements (https://nam03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fnextcatalog.uark.edu%2Fundergraduatecatalog%2Fgened%2Fstateminimum%2F&data=02%7C01%7Cagriffin%40uark.edu%7Ce4e632415f9b49eda9bf08d7f5c20b91%7C79c742c4e61c4fa5be89a3cb566a80d1%7C0%7C0%7C637248086069611524&sdata=4bJ2Oob83N8KfTkGD%2F1XG8924jwOx8pTlw8lWNAGp0s%3D&reserved=0) as outlined in the Catalog of Studies. The courses that meet the state minimum core also fulfill many of the university's General Education requirements (https://nam03.safelinks.protection.outlook.com/?url=https%3A%2F%2Fnextcatalog.uark.edu%2Fundergraduatecatalog%2Fgened%2Fgeneraleducation%2F&data=02%7C01%7Cagriffin%40uark.edu%7Ce4e632415f9b49eda9bf08d7f5c20b91%7C79c742c4e61c4fa5be89a3cb566a%2BDWRVEfAqIMsYNX4KXEgX2JdEJJY7Go%3D&reserved=0), although there are additional considerations to satisfy the general education learning outcomes. Students are encouraged to consult with their academic adviser when making course selections.

[2] Students who enter the university with credit for ENGL 1023 are not required to complete ENGL 1033. Students who enter the university with exemption from ENGL 1023 are encouraged to take ENGL 1033.

Minor in Data Analytics

Requirements for the minor in Data Analytics: The minor requires completion of 15-18 credits of coursework, including:

One course from Applied Statistics and Math Modeling group		3-4
INEG 2314	Statistics for Industrial Engineers I	
INEG 2333	Applied Probability and Statistics for Engineers II	
INEG 3313	Engineering Probability and Statistics	
ELEG 3143	Probability & Stochastic Processes	
STAT 2823	Biostatistics	
STAT 3013	Introduction to Probability	
Two courses from Computing and Informatics group		6-8
CSCE 2004	Programming Foundations I	
CSCE 2014	Programming Foundations II	
INEG 4683	Decision Support in Industrial Engineering	
INEG 3833	Introduction to Database Concepts for Industrial Engineers	
ISYS 2263	Principles of Information Systems	
STAT 3003	Statistical Methods	
STAT 3001L	Statistics Methods Laboratory	
Two courses from the Analytics group		6
CSCE 4143	Data Mining	
or INEG 4143	Data Mining	
CSCE 4273	Big Data Analytics and Management	
CSCE 4613	Artificial Intelligence	
ECON 4743	Introduction to Econometrics	
ECON 4753	Forecasting	
INEG 4163	Introduction to Modern Statistical Techniques for Industrial Applications	
ISYS 4193	Business Analytics and Visualization	
ISYS 4293	Business Intelligence	
STAT 4333	Analysis of Categorical Responses	
Total Hours		**15-18**

Minor in Engineering Management

Requirements for the minor in Engineering Management: The student must be pursuing a bachelor of science degree from an engineering program accredited by the Engineering Accreditation Commission of ABET. The minor requires completion of 15-16 credit hours of coursework.

INEG 2413	Engineering Economic Analysis	3
INEG 3443	Project Management	3
INEG 4433	Systems Engineering and Management	3
Select one of the following:		3-4
INEG 2314	Statistics for Industrial Engineers I	
INEG 3313	Engineering Probability and Statistics	
Select one of the following:		3
INEG 4123	Global Engineering and Innovation	
INEG 4253	Leadership Principles and Practices	
INEG 4323	Quality Engineering and Management	
INEG 4453	Productivity Improvement	
INEG 5433	Cost Estimation Models	
INEG 5443	Decision Models	
EMGT 5033	Introduction to Engineering Management	
Total Hours		**15-16**

Cassady, Richard, Ph.D., M.S.I.S.E., B.S.I.S.E. (Virginia Polytechnic Institute and State University), University Professor, 2000, 2019.
Chimka, Justin Robert, Ph.D., M.S.I.E., B.S.I.E. (University of Pittsburgh), Associate Professor, 2002, 2009.
Crisel, Brandon, M.S.I.E (University of Arkansas), M.S., B.S. (Arkansas State University), Instructor, 2022, Instructor, 2022.
Curry, Robert M., Ph.D. (Clemson University), M.S.I.S.E (University of Florida), B.S.I.E. (University of Arkansas), Assistant Professor, 2023.
Eksioglu, Burak, Ph.D. (University of Florida), M.S.E.B.M. (University of Warwick), B.S.I.E. (Bogazici University), Professor, 2019.
Eksioglu, Sandra, Ph.D. (University of Florida), M.S.E.M.S. (Mediterranean Agronomic Institute of Chania), B.S.B.A. (University of Tirana), Professor, Hefley Professor in Logistics and Entrepreneurship, 2019.
English, John R., Ph.D. (Oklahoma State University) P.E., M.S.O.R., B.S.E.E. (University of Arkansas), Professor, 1991, 1998.
Liao, Haitao, Ph.D., M.S., M.S.I.S.E. (Rutgers University), B.S.E.E. (Beijing Institute of Technology), Professor, John and Mary Lib White Endowed Systems Integration Chair, 2015.
Milburn, Ashlea R., Ph.D. (Georgia Institute of Technology), M.S.I.E. (Virginia Polytechnic Institute and State University), B.S.I.E. (University of Arkansas), Associate Professor, 2010, 2018.
Nachtmann, Heather, Ph.D., M.S.I.E., B.S.I.E. (University of Pittsburgh), Professor, Lillian P. Dyess Endowed Chair in Engineering, 2000, 2013.
Needy, Kim LaScola, Ph.D. (Wichita State University), P.E., M.S.I.E., B.S.I.E. (University of Pittsburgh), Professor, 2008.
Parnell, Gregory S., Ph.D. (Stanford University), M.S. (University of Southern California), M.E.I.S.E. (University of Florida), B.S. (University of New York at Buffalo), Professor of Practice, 2013.
Paulus, David C., Ph.D. (Colorado State University), M.S.I.E., B.S.M.E. (University of Tennessee, Professor of Practice, 2023.
Pohl, Edward A., Ph.D., M.S.R.E. (University of Arizona), M.S.S.E. (Air Force Institute of Technology), M.S.E.M. (University of Dayton), B.S.E.E. (Boston University), Professor, Twenty-First Century Professorship in Engineering, 2004, 2013.
Pohl, Letitia, Ph.D. (University of Arkansas), M.S.S.E. (Air Force Institute of Technology), B.S.M.E. (Tulane University), Teaching Associate Professor, 2013, 2021.
Rainwater, Chase E., Ph.D. (University of Florida), B.S.I.E. (University of Arkansas), Professor, Twenty-First Century Professorship in Engineering, 2009, 2021.
Rossetti, Manuel D., Ph.D., P.E., M.S.I.E. (The Ohio State University), B.S.I.E. (University of Cincinnati), University Professor, 1999, 2022.
Schubert, Karl, Ph.D. (University of Arkansas), M.S.Ch.E. (University of Kentucky), B.S.Ch.E (University of Arkansas), Professor of Practice, 2016.
Sullivan, Kelly M., Ph.D. (University of Florida), M.S.I.E., B.S.I.E. (University of Arkansas), Associate Professor, 2012, 2019.
Vazquez, Alan, Ph.D. (University of Antwerp, Belgium), M.S. (Monterrey Institute of Technology, Mexico), B.S. (Autonomous University of Nuevo Leon, Mexico), Assistant Professor, 2022.
Zhang, Shengfan, Ph.D., M.I.E. (North Carolina State University), B.M. (Fudan University, Shanghai), Associate Professor, John L. Imhoff Chair in Industrial Engineering, 2011, 2020.

Courses

INEG 2001. Industrial Engineering Seminar. 1 Hour.
Overview of the Department of Industrial Engineering: faculty and their backgrounds and interests, staff and the services they provide, facilities, curricular requirements, extracurricular opportunities, post-graduate opportunities. (Typically offered: Fall)

INEG 2103. Introduction to Industrial Engineering. 3 Hours.
Survey of industrial engineering problems. Application of key concepts from linear algebra and calculus in solving industrial engineering problems. Use of spreadsheets in solving industrial engineering problems. Visualization of common types of industrial engineering data. Exploration of the principles of effective teamwork and professionalism. Prerequisite: MATH 2445 or MATH 2514 or MATH 2554. (Typically offered: Fall and Spring)

INEG 2214. Computing Methods for Industrial Engineers I. 4 Hours.
Introduction to programming and computing methods within the context of traditional industrial engineering problem solving. Students will be exposed to classic industrial engineering problem scenarios. Basic techniques within object-oriented programming, including designing classes, using objects, creating methods, looping and decision constructs, arrays, and file handling, will be used to facilitate solving these problems. Pre- or Corequisite: INEG 2103. (Typically offered: Fall and Spring)

INEG 2223. Computing Methods for Industrial Engineers II. 3 Hours.
A continuation of INEG 2214. Review of fundamental computing methods and exposure to advanced use of computing libraries. Developing and implementing algorithms using computing methods to solve illustrative and practical problems of interest to industrial engineers. Students will use existing computing libraries, data structures, and programming interfaces to implement software using problem-based learning. Prerequisite: INEG 2214. (Typically offered: Fall and Spring)

INEG 2314. Statistics for Industrial Engineers I. 4 Hours.
Applications to industrial engineering of descriptive statistics, single-population point and interval estimation, single-population hypothesis testing, two-population point and interval estimation, two-population hypothesis testing, goodness-of-fit testing, contingency table testing, linear regression, correlation, design of experiments, and analysis of variance. Introduction to statistical quality control. Use of modern statistical analysis software is emphasized. Prerequisite: INEG or DTSC students only. Pre- or corequisite: INEG 2103 or DASC 2594. (Typically offered: Fall and Spring)

INEG 2314H. Honors Statistics for Industrial Engineers I. 4 Hours.
Applications to industrial engineering of descriptive statistics, single-population point and interval estimation, single-population hypothesis testing, two-population point and interval estimation, two-population hypothesis testing, goodness-of-fit testing, contingency table testing, linear regression, correlation, design of experiments, and analysis of variance. Introduction to statistical quality control. Use of modern statistical analysis software is emphasized. Prerequisite: Honors standing, and INEG or DTSC students only. Pre- or corequisite: INEG 2103 or DASC 2594. (Typically offered: Fall and Spring)
This course is equivalent to INEG 2314.

INEG 2323. Probability and Stochastic Processes for Industrial Engineers. 3 Hours.
Development and analysis of industrial engineering applications of random experiments, random variables, renewal processes, Poisson processes, and Markov chains. Application areas include inventory, quality control, queueing, and reliability. Pre- or corequisite: INEG 2103 or DASC 2594. (Typically offered: Fall and Spring)

INEG 2333. Applied Probability and Statistics for Engineers II. 3 Hours.
Applications to engineering problems of two-population point and interval estimation, two-population hypothesis testing, linear regression, correlation, design of experiments, analysis of variance, and nonparametric statistics. Introduction to statistical quality control. Corequisite: Drill component. Prerequisite: INEG 2314. (Typically offered: Fall and Spring)

INEG 2413. Engineering Economic Analysis. 3 Hours.
Economic aspects of engineering, including current economic problems and the treatment of estimates when evaluating alternative courses of action. Methods of selection and replacement of equipment and break-even points of operation; desirability of new processes or projects where asset life, rate of return on investment, and first, fixed, differential, marginal, and sunk costs must be considered. Corequisite: Drill component. Prerequisite: MATH 2445 or MATH 2514 or MATH 2554. (Typically offered: Fall and Spring)

INEG 2613. Introduction to Operations Research. 3 Hours.
Introduction to modeling and analysis of deterministic operations design and planning problems using formal optimization algorithms and software. Identification and formulation of appropriate applications, linear programming, sensitivity, network flows/transportation/assignment problems, shortest paths, and integer linear programming. Prerequisite: INEG 2214 or DASC 1204. Pre- or corequisite: INEG 2103 or MATH 3083 or DASC 2594. (Typically offered: Fall and Spring)

INEG 3313. Engineering Probability and Statistics. 3 Hours.
Applications to engineering problems of data summary and presentation, random variables and probability distributions, point and interval estimation, hypothesis testing, linear regression, and design of experiments. Not for credit toward the Bachelor of Science in Industrial Engineering. Corequisite: Drill component. Prerequisite: MATH 2564. (Typically offered: Fall, Spring and Summer)

INEG 3333. Statistics for Industrial Engineers II. 3 Hours.
Introduction to model statistical learning, statistical learning beyond linear regression, data-driven anomaly detection and process monitoring, optimal sampling for data collection. Prerequisite: INEG 2223, INEG 2314 and INEG 2323. (Typically offered: Fall and Spring)

INEG 3443. Project Management. 3 Hours.
Analysis of the strategic level of project management including planning, organizing, and staffing for successful project execution. Professional creativity, motivation, leadership, and ethics are also explored. At the tactical level, project selection, control, and systems management are analyzed. Systems development and decision support tools for project management are studied. (Typically offered: Fall and Spring)

INEG 3443H. Honors Project Management. 3 Hours.
Analysis of the strategic level of project management including planning, organizing, and staffing for successful project execution. Professional creativity, motivation, leadership, and ethics are also explored. At the tactical level, project selection, control, and systems management are analyzed. Systems development and decision support tools for project management are studied. (Typically offered: Fall and Spring)
This course is equivalent to INEG 3443.

INEG 3513. Manufacturing Processes. 3 Hours.
This course focuses on the manufacturing processes that impart geometry and properties to engineering materials including casting, metalworking, machining, joining, heat treatment, and polymer processes. Process selection and analysis, design-for-manufacturing principles, cost estimation, and selection of process parameters are covered. Lab component covers communication of manufacturing specifications via engineering drawings. Prerequisite: MEEG 2303. Corequisite: Lab component. (Typically offered: Spring)

INEG 3533. Transportation Logistics. 3 Hours.
This course introduces students to transportation and logistics systems, including the components of logistics system and their interactions. There is emphasis on quantitative models and techniques for the optimization and analysis of transportation and logistics systems. Topics covered include: an overview of logistics systems and modes of transportation; facility location analysis and network design; network flow and transportation modeling; and vehicle routing. Prerequisite: INEG 2613. Pre- or corequisite: INEG 2223. (Typically offered: Fall and Spring)

INEG 3543. Facility Logistics. 3 Hours.
The design and analysis of efficient logistics systems at the facility level, with an emphasis on distribution facilities. Unit load, break bulk, crossdock and order fulfillment centers and their component systems and software. Automated and manual systems.Prerequisite: INEG 2413. Pre- or corequisite: INEG 2613. (Typically offered: Fall and Spring)

INEG 3553. Production Planning and Control. 3 Hours.
Strategy and competition, forecasting, aggregate planning, inventory control subject to known demand, inventory control subject to uncertain demand, supply chain management, push and pull production control systems, and operations scheduling. Prerequisite: INEG 2314 or STAT 3003. Pre- or corequisite: INEG 2613. (Typically offered: Fall and Spring)

INEG 3624. Simulation. 4 Hours.
The development and use of discrete-event simulation models for the analysis and design of systems found in manufacturing, distribution, and service contexts. Coverage includes conceptual modeling, model translation to computer form, statistical input models, random number generation and Monte Carlo methods, experimentation and statistical output analysis, and queuing analysis. Includes the use of modern computer simulation languages. Corequisite: Drill component. Prerequisite: (INEG 2223 or DASC 1204), INEG 2314 and INEG 2323. Pre- or Corequisite: INEG 2413. (Typically offered: Fall and Spring)

INEG 3624H. Honors Simulation. 4 Hours.
The development and use of discrete-event simulation models for the analysis and design of systems found in manufacturing, distribution, and service contexts. Coverage includes conceptual modeling, model translation to computer form, statistical input models, random number generation and Monte Carlo methods, experimentation and statistical output analysis, and queuing analysis. Includes the use of modern computer simulation languages. Corequisite: Drill component. Prerequisite: (INEG 2223 or DASC 1204), INEG 2314, INEG 2323 and honors standing. Pre- or corequisite: INEG 2413. (Typically offered: Fall and Spring)
This course is equivalent to INEG 3624.

INEG 3714. Work Methods and Ergonomics. 4 Hours.
Ways of designing jobs, machines, operations and work environments so they are compatible with human capacities and limitations. Work methods topics include methods analysis, time studies, work sampling and learning curves. Cognitive and physical capabilities and limitations of humans are addressed through the study of human information processing, motor control theory, anthropometry, biomechanics, work physiology and manual material handling. Design of controls and displays, hand tools and workstations, along with work related musculoskeletal disorders. Laboratory required. Corequisite: Lab component. Prerequisite: INEG 2314. (Typically offered: Fall and Spring)

INEG 3833. Introduction to Database Concepts for Industrial Engineers. 3 Hours.
An introduction to the basic principles of database modeling and technologies for industrial engineers. Coverage includes analyzing user requirements, representing data using conceptual modeling techniques (e.g. UML, ERD), converting conceptual models to relational implementations via database design methodologies, extracting data via structured query language processing, and understanding the role of database technology in industrial engineering application areas, implementing database applications. Pre- or corequisite: INEG 2223. (Typically offered: Fall and Spring)

INEG 400VH. Honors Thesis. 1-3 Hour.
For Honors College students majoring in Industrial Engineering only. Prerequisite: Honors college students only and instructor consent. (Typically offered: Fall, Spring and Summer)

INEG 410V. Special Topics in Industrial Engineering. 1-4 Hour.
Consideration of current industrial engineering topics not covered in other courses. Prerequisite: Senior standing. (Typically offered: Irregular) May be repeated for up to 4 hours of degree credit.

INEG 410VH. Honors Special Topics in Industrial Engineering. 1-3 Hour.
Consideration of current industrial engineering topics not covered in other courses. Prerequisite: Senior standing. (Typically offered: Irregular) May be repeated for up to 3 hours of degree credit.
This course is equivalent to INEG 410V.

INEG 411V. Individual Study in Industrial Engineering. 1-3 Hour.
Individual study and research on a topic mutually agreeable to the student and a faculty member. Prerequisite: Instructor consent. (Typically offered: Fall, Spring and Summer)

INEG 411VH. Honors Individual Study in Industrial Engineering. 1-3 Hour.
Individual study and research on a topic mutually agreeable to the student and a faculty member. Prerequisite: Instructor consent and honors candidacy. (Typically offered: Fall, Spring and Summer)
This course is equivalent to INEG 411V.

INEG 4123. Global Engineering and Innovation. 3 Hours.
This course provides engineering students a global perspective for design and innovation. Students explore various design thinking tools and techniques. Students apply engineering design and innovation techniques to create solutions that meet specified markets with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental and economic factors. Students also have the opportunity to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which considers the impact of the engineering solution in the global, economic, environmental, and social contexts. Prerequisite: Senior standing or instructor consent. (Typically offered: Irregular)

INEG 4143. Data Mining. 3 Hours.
The course focuses on the principles, theory, design, and implementation of data mining algorithms for large-scale data. Topics include foundations of data mining; preprocessing; mining frequent patterns, associations and correlations; supervised learning including decision tree induction, naïve Bayesian classification, support vector machine, logistic regression, Bayesian network, and K-nearest neighbor learning; unsupervised learning including K-means clustering, hierarchical clustering, density-based clustering, and grid-based clustering; outlier analysis; graph mining; scalable and distributed data mining. Prerequisite: (INEG 2333 and INEG 2223) or (CSCE 2014 and INEG 3313) or (INEG 2314 and INEG 2223) or INEG 3333. (Typically offered: Fall)

INEG 4163. Introduction to Modern Statistical Techniques for Industrial Applications. 3 Hours.
This application-oriented course is driven by real problems arising from industry and focuses on problem solving using both modern and classic statistical methods. For both senior undergraduate and graduate students, the main goal of this course is to provide a comprehensive introduction to those most popular statistical learning methods and tools (such as R and Apache Spark) which are widely used in industry today. Prerequisite: INEG 2333 or INEG 2314 or INEG 3333. (Typically offered: Spring)

INEG 4253. Leadership Principles and Practices. 3 Hours.
The course is designed to expose students to multiple approaches to leadership in a wide variety of settings. Leadership styles, the knowledge areas and competencies expected of today's leaders, the challenges leaders face, the historical and philosophical foundations of leadership, the relationships among leadership theory, leadership practice, and the moral-ethical aspects of leadership are among the topics covered in the course. A number of respected regional, national, and international leaders share "lessons learned" in their leadership journeys. Plus, a number of highly regarded leadership books and case studies on leadership are read and discussed. Students may not receive credit for INEG 4253 and INEG 5253/OMGT 5253. Prerequisite: Senior standing. (Typically offered: Fall)

INEG 4253H. Honors Leadership Principles and Practices. 3 Hours.
The course is designed to expose students to multiple approaches to leadership in a wide variety of settings. Leadership styles, the knowledge areas and competencies expected of today's leaders, the challenges leaders face, the historical and philosophical foundations of leadership, the relationships among leadership theory, leadership practice, and the moral-ethical aspects of leadership are among the topics covered in the course. A number of respected regional, national, and international leaders share "lessons learned" in their leadership journeys. Plus, a number of highly regarded leadership books and case studies on leadership are read and discussed. Students may not receive credit for INEG 4253 and INEG 5253/OMGT 5253. Prerequisite: Honors standing and instructor consent. (Typically offered: Fall)
This course is equivalent to INEG 4253.

INEG 4323. Quality Engineering and Management. 3 Hours.
Provides the student with complete coverage of the functional area of "Quality Assurance" ranging from the need for such a function, how it works, techniques utilized, and managerial approaches for insuring its effectiveness. Prerequisite: INEG 2333 or INEG 2314. (Typically offered: Irregular)

INEG 4423. Advanced Engineering Economy. 3 Hours.
Preparation of feasibility studies, including cost estimation, risk and uncertainty, sensitivity analysis and decision making. Effects of taxes, depreciation and financing costs on cash flows. Prerequisite: INEG 2314 and INEG 2413. (Typically offered: Irregular)

INEG 4423H. Honors Advanced Engineering Economy. 3 Hours.
Preparation of feasibility studies, including cost estimation, risk and uncertainty, sensitivity analysis and decision making. Effects of taxes, depreciation and financing costs on cash flows. Prerequisite: INEG 2314 and INEG 2413. (Typically offered: Irregular)
This course is equivalent to INEG 4423.

INEG 4433. Systems Engineering and Management. 3 Hours.
Overview of the fundamental concepts underlying the management of engineering. Reviews the engineering decision process within the life cycle. Examines implementation of basic management functions in technical organizations and development of strategy tools within a complex organization. Prerequisite: INEG 2413. (Typically offered: Fall)

INEG 4433H. Honors Systems Engineering and Management. 3 Hours.
Overview of the fundamental concepts underlying the management of engineering. Reviews the engineering decision process within the life cycle. Examines implementation of basic management functions in technical organizations and development of strategy tools within a complex organization. Prerequisite: INEG 2413. (Typically offered: Fall)
This course is equivalent to INEG 4433.

INEG 4453. Productivity Improvement. 3 Hours.
Analysis of common productivity problems. Development of skills required to diagnose problems; measure productivity; develop improvement strategies; and provide for the implementation and maintenance of productivity measurement and improvement systems. Prerequisite: Senior standing. (Typically offered: Irregular)

INEG 4683. Decision Support in Industrial Engineering. 3 Hours.
Reinforcing important computer programming methods using industrial engineering-based applications. Students will utilize Microsoft Excel and Visual Basic for Applications to develop custom solutions to challenging industrial engineering problems. Emphasis on computational proficiency and computing productivity in a spreadsheet-based setting. Prerequisite: INEG 2214 and INEG 2314. (Typically offered: Fall)

INEG 4913. Industrial Engineering Capstone Experience I. 3 Hours.
First semester of a two-semester, team-based project in support of a real-world industry partner organization. Learn about the industry partner organization and the relevant segment of that organization. Assess and evaluate the operations and performance of the system that needs to be improved, or detail the need for and the requirements of a new system. Communicate findings using reports and presentations. Prerequisite: INEG 2001, INEG 2103, INEG 3333, INEG 3443, INEG 3543 and INEG 3624. Pre- or corequisite: INEG 3533, INEG 3553, INEG 3714, INEG 3833 and INEG 4433. (Typically offered: Fall)

INEG 4924. Industrial Engineering Capstone Experience II. 4 Hours.
Second semester of a two-semester, team-based project in support of a real-world industry partner organization. Develop and assess recommendations for improving system performance, or develop the detailed design of a new system. Evaluate the potential impact of the project. Develop deliverables for the industry partner organization. Communicate findings using reports and presentations. Students must have successfully completed INEG 4913 in the immediate prior semester. Corequisite: Lab component. Prerequisite: INEG 3533, INEG 3553, INEG 3714, INEG 3833, INEG 4433 and INEG 4913. (Typically offered: Spring)