Application Requirements

Application requirements consist of institutional and program requirements for applicable semesters of entry during the current academic year. Additional information and changes to admission requirements for semesters other than the current academic year can be found on The Graduate College's website (http://www.gradcollege.txstate.edu/).

Unless otherwise noted on The Graduate College program page, AI tools can only be used to correct spelling and grammar errors in application materials.

Institutional Requirements

Institutional requirements are the minimum standards for admission to any graduate program at Texas State. These include:

- Completed online application
- Nonrefundable application fee
  - Degree Programs (Doctoral and Master's)
    - $55 fee, or
    - $90 for applications with international credentials
  - Post-Baccalaureate Programs (Certificate, Certification, Non-Degree, and Visiting)
    - $20 fee, or
    - $60 for applications with international credentials
- Official transcripts from each institution where course credit was granted. Final transcripts showing degree completion are required before the student may register for their second term of enrollment.
- GPA requirements (a higher GPA may be listed in the Program Requirements)
  - Doctoral programs require a 3.00 overall GPA or a 3.00 GPA in your last 60 hours (https://www.gradcollege.txst.edu/admissions/policy.html#gpa) of undergraduate course work (plus any completed graduate courses).
  - Master's and Specialist programs require a 2.75 overall GPA or a 2.75 GPA in your last 60 hours (https://www.gradcollege.txst.edu/admissions/policy.html#gpa) of undergraduate course work (plus any completed graduate courses).
  - Post-Baccalaureate programs require a 2.50 overall GPA or a 2.50 GPA in your last 60 hours (https://www.gradcollege.txst.edu/admissions/policy.html#gpa) of undergraduate course work (plus any completed graduate courses).
- Baccalaureate degree from a regionally accredited university. (Non-U.S. degrees must be equivalent to a four-year U.S. Bachelor's degree. In most cases, three-year degrees are not considered. Visit our International FAQs (https://www.gradcollege.txst.edu/international/faqs.html) for more information.)

Approved English Proficiency Exam Scores

Applicants are required to submit an approved English proficiency exam score that meets the minimum requirements below unless they have earned a bachelor's degree or higher from a regionally accredited U.S. institution or the equivalent from a country on our exempt countries list (http://www.gradcollege.txstate.edu/international/language.html#waiver). Some programs may restrict acceptable tests or require higher scores than the institutional scores; this will be noted in the Program Requirements.

- official TOEFL iBT scores required with a 78 overall if taken on or before January 21, 2026
- official TOEFL iBT scores required with a 4 overall if taken after January 21, 2026
- official PTE scores required with a 52 overall
- official IELTS (academic) scores required with a 6.5 overall and minimum individual module scores of 6.0
- official Duolingo scores required with a 110 overall
- official TOEFL Essentials scores required with an 8.5 overall
- official Texas State Intensive English Program score of 90% or higher in the highest-level course (level 5)

The institution does **not** offer admission if the scores above are not met.

Program Requirements

- Texas State industrial engineering majors who have at least a 3.25 GPA at the end of the spring semester of their Junior year
- Completion of the following courses prior to the start semester with a grade of B or higher:
  - IE 3340 Operations Research
  - IE 3330 Quality Engineering
  - MATH 2393 Calculus III
- GRE not required
- A letter of endorsement from the graduate advisor of the dual degree program (3/2) Bachelor of Science (B.S.) Major in Industrial Engineering / Master of Science (M.S.) Major in Industrial and Business Operations Engineering (Thesis option)
- Resume/CV detailing prior work experience, research experience, awards, scholarships, and other related qualifications
- Statement of purpose (two pages) conveying research interests, plans for graduate study, and professional aspirations

The program does not offer admission if the above requirements are not met.

General Requirements

The program can be completed at the San Marcos Main Campus (M).

1. The general education core curriculum courses are listed in the degree plan below along with the statewide component code number. See the General Education Core Curriculum (https://mycatalog.txstate.edu/undergraduate/general-education-core-curriculum/) section of this catalog for the Texas State requirements and options in the core curriculum, including Honors courses.
2. Students must complete a minimum of 36 advanced hours (3000 or 4000 level courses).
3. Nine semester credit hours must be writing intensive (WI).
4. Students entering Texas State with fewer than 16 credit hours completed after high school graduation will be required to take US 1100 (https://mycatalog.txstate.edu/search/?P=US%201100). All others will be exempt from taking this course.
5. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.

6. The Industrial Engineering major includes all the courses required for an Applied Mathematics minor.
7. The dual degree program (3/2) allows undergraduate industrial engineering students to enter the Master of Science in industrial and business operations engineering program at the end of their Junior year (i.e., end of third year) and earn a B.S. in Industrial Engineering and an M.S. in Industrial and Business Operations Engineering.
8. Applicants to the five-year program who meet the minimum requirements will submit materials to the MS program by the Fall deadline of their Junior year.
9. Students continuing into the 4th year of the 3/2 program must finish the entire 129 hours and then will be eligible for the Bachelor's degree at the end of their 4th year. Students will then continue into their 5th year and must finish the remaining hours needed to be conferred the Master's degree in Industrial and Business Operations Engineering at the end of their 5th and final year.
10. Students in the 3/2 program will be required to complete the same two-year, 31-hour curriculum as other students admitted to the Master in Industrial and Business Operations Engineering program. Because students will not take the required 3 hours undergraduate course IE 4310 Design of Experiments and the 9 hours in undergraduate industrial engineering electives, students will take 117 hours of undergraduate courses and 31hours of graduate course work (i.e., a total of 148 hours), of which 12 hours will be applied to the undergraduate degree.
11. Once accepted to the 3/2 program, students are required to maintain a 3.0 graduate GPA. Students who do not maintain a 3.0 graduate GPA during their senior year will not be allowed to continue in graduate courses in their fifth year and will graduate with only the undergraduate degree.
12. Students that are not accepted or unable to continue with the 3/2 program may complete the remaining requirements for the BS in Industrial Engineering.
13. The degree plan has been laid out showing the students the number of hours they must take each semester in order to complete the dual degree program. The undergraduate portion of the plan is a suggested plan that must be followed closely to ensure specific courses are completed by Spring of 3rd year (Junior year). There may be some modifications in course order that can occur but students should consult with academic advisors for the dual degree program (i.e., 3/2) before changes are made to ensure they are meeting degree requirements.
14. The graduate portion of the plan is a suggested plan that must be followed closely to ensure the 31hours of graduate course requirements are satisfied by the end of the Spring of the 5th year in any of the following two ways:
    - 16 hours required courses, 9 hours prescribed electives and 6 hours thesis or
    - 16 hours required courses, 6 hours prescribed electives, 3 hours open electives, and 6 hours thesis.

Year 1

First Semester Hours		Second Semester Hours	
CHEM 1335 (Life and Physical Sciences Component Code 030 [TCCN CHEM 1309 or 1409])[1]	3	PHYS 2325 & PHYS 2125 (Life and Physical Sciences Component Code 030 [TCCN PHYS 2325 & PHYS 2125])	4
CHEM 1135 (TCCN CHEM 1109 [taken with TCCN CHEM 1309])[2]	1	IE 1310	3
MATH 2471 (Mathematics Component Code 020 [TCCN MATH 2413])	4	MATH 2472 (Component Area Option Code 090/092 [TCCN MATH 2414])	4
ENGR 1304 (TCCN ENGR 1304)	3	ENG 3303 (Communication Component Code 010)[3]	3
US 1100	1	American History Component Code 060	3
ENG 1310, 1320, or 1321 (Communication Component Code 010 [TCCN ENGL 1301, ENG 1302])	3		
	15		**17**

Year 2

First Semester Hours		Second Semester Hours	
PHYS 2326 & PHYS 2126 (Life and Physical Sciences Component Code 093 [TCCN PHYS 2326 & PHYS 2126])	4	CS 1342	3
MATH 3377	3	MATH 3323	3
MFGE 2332	3	ENGR 2301 (TCCN ENGR 2301)	3
POSI 2310 (Government/ Political Science Component Code 070 [TCCN GOVT 2306])	3	ECO 2301 (Social and Behavioral Sciences Component Code 080 [TCCN ECON 1301])	3
American History Component Code 060	3	POSI 2320 (Government/ Political Science Component Code 070 [TCCN GOVT 2305])	3
		Creative Arts Component Code 050 [HUMA 1315]	3
	16		**18**

Year 3

First Semester Hours		Second Semester Hours	
ENGR 3311	3	MATH 2393	3
ENGR 3315	3	IE 3330	3
ENGR 3373	3	IE 3340	3
IE 3320	3	IE 3360	3
PHIL 1305 or 1320 (Language, Philosophy, and Culture Component Code 040 [TCCN PHIL 1301 or PHIL 2306])	3	MATH/Science Elective[4]	3
	15		**15**

Year 4

First Semester Hours		Second Semester Hours	
IE 4355	3	IE 4320	3
IE 4392	3	IE 4350	3
IE 4370	3	IE 4393	3
IE 5310	3	MFGE 4396	3
Year 4 Graduate Prescribed Elective[5]	3	IE 5330	3

Year 4 Graduate Prescribed Elective[5]	3		
	18		**15**

Fifth Year

First Semester Hours		Second Semester Hours	
ENGR 5100	1	IE 5320	3
ENGR 5399A	3	Year 5 Graduate Elective (Prescribed or Open)[6]	3
IE 5340	3	ENGR 5399B	3
IE 5347	3		
	10		**9**

Total Hours: 148

1. While CHEM 1335 is strongly preferred, the department will accept CHEM 1341 to satisfy this requirement.
2. While CHEM 1135 is strongly preferred, the department will accept CHEM 1141 to satisfy this requirement.
3. While ENG 3303 is strongly preferred, the department will not require transfer students or newly declared Industrial Engineering majors to earn credit for ENG 3303 if they have credit for six hours of the following coursework: COMM 1310, ENG 1310, ENG 1320, ENG 1321, HON 2301A, or HON 2301B.
4. Three (3) hours in Math/Science electives chosen from: MATH 2358, MATH 3330, PHYS 2335 and PHYS 2135, PHYS 3315, or HON 3392V
5. Year 4: Six (6) hours in Graduate M.S. Industrial and Business Operations Engineering Prescribed Electives from: IE 5343, and IE 5397. Graduate electives listed above substitute (6) hours 4000-level IE undergraduate electives
6. See Year 5 electives below.

Code	Title	Hours
Prescribed Electives		
EE 5331	Machine Learning for Engineering Applications	3
MMIE 7310	Machine Learning and Artificial Intelligence for Engineers	3
MMIE 7317	Applied Data Science I	3
MMIE 7318	Applied Data Science II	3
IE 5345	Advanced Optimization	3
MMIE 7362	Time Series Analysis and Forecasting	3
MMIE 7367	Large-Scale Optimization	3
MMIE 7370	Stochastic Simulation	3
MMIE 7372	Network Flow Optimization	3
MMIE 7374	Multi-Objective Optimization	3
IE 5360	Advanced Inventory Control	3
IE 5370	Scheduling	3
MMIE 7379	Modeling and Design of Net-Zero Manufacturing and Service Enterprises	3
Open Electives		
BLAW 5333	Legal Issues of Sustainability and Responsibility	3
ISAN 5355	Database Management Systems	3
ISAN 5357	Computing for Data Analytics	3
ISAN 5358	Agile Project Management For Business Professionals	3
ISAN 5370	Enterprise Resource Planning and Business Intelligence	3
MGT 5310	Organizational Change Management	3
MGT 5311	Process Improvement Management in Organizations	3
MGT 5315	New Venture Management	3
MGT 5318	Cross-Cultural Management	3
MGT 5321	Supply Chain Management	3
MGT 5390	Managerial Data Analysis	3
TECH 5315	Engineering Economic Analysis	3
TECH 5382	Industrial Ecology and Sustainability Engineering	3
CS 5316	Data Mining	3
CS 5326	Advanced Studies in Human Factors of Computer Science	3
CS 5332	Database Theory and Design	3
CS 5334	Advanced Internet Information Processing	3
CS 5346	Advanced Artificial Intelligence	3
CS 5351	Parallel Processing	3
MATH 5315		3
MATH 5345		3
MATH 5360	Mathematical Modeling	3
ENGR 5384	Problems in Engineering	3
ENGR 5310	Probability, Random Variables, & Stochastic Processes for Engineers	3
MFGE 5316	Advanced Computer Aided Design and Manufacturing	3
MFGE 5318	Additive Manufacturing	3
MFGE 5320	Polymer Nanocomposites	3
MFGE 5326	Advanced Robotics in Manufacturing Automation	3
MFGE 5330	Semiconductor Manufacturing	3
MSEC 7301	Practical Skills in Commercialization and Entrepreneurship	3
MSEC 7302	Leadership Skills in Commercialization and Entrepreneurship	3

Comprehensive Examination Requirement

An oral thesis defense is required to serve as the comprehensive examination. All students will have a faculty advisor and a graduate committee composed of a minimum of three graduate faculty members, including the faculty advisor. The faculty advisor will provide technical direction for the student's thesis, and the graduate committee will be responsible for approving the thesis proposal, receiving thesis progress reports, and approving the final thesis presentation and written report. Should the student fail, a second oral defense is allowed.

Courses Offered

Industrial Engineering (IE)

IE 1310. Introduction to Industrial Engineering.
This course provides an introduction to the field of industrial engineering through examination of its historical development, foundational concepts, and principal areas of practice. Students are introduced to analytical methods and problem solving approaches used to analyze and design systems involving people, materials, information, and technology. Topics include productivity analysis, operations research, facilities planning, statistical process control, and human factors. The course also surveys career paths in manufacturing, healthcare, logistics, and service industries, emphasizing the professional roles and functions of industrial engineers within contemporary organizations. Prerequisite: [MATH 1315 or MATH 1317 or MATH 1319 or MATH 1329 or MATH 2321 or MATH 2417 or MATH 2471 with a grade of "C" or better] or [ACT Mathematics score of 24 or better] or [SAT Mathematics score of 520 or better] or [SAT Math Section score of 550 or better] or [Accuplacer College Mathematics score of 86 or better] or [Compass College Algebra score of 46 or better] or [Next-Generation Advanced Algebra and Functions Test of 263 or better].
3 Credit Hours. 2 Lecture Contact Hours. 1 Lab Contact Hour.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 3305. Introduction to Data Analysis.
This course introduces principles and applications of data analysis using spreadsheet and programming tools, including Microsoft Excel, Python, and SQL. Students study methods for data manipulation, visualization, optimization, and decision support modeling within industrial engineering contexts. The course examines spreadsheet based productivity techniques, database interaction, and the use of programming languages for advanced analytical tasks. Students also explore contemporary machine learning methods as analytical tools used in modern industrial systems. Emphasis is placed on interpreting empirical data, constructing analytical models, and supporting technical decision making through systematic computational approaches. Corequisite: IE 3320 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 3320. Engineering Statistics.
This course introduces principles of probability and statistics used in engineering analysis, including probability distributions, data visualization, interval estimation, hypothesis testing, and regression modeling. Students study statistical methods applied to engineering problems and contemporary data analysis contexts. The course examines mathematical frameworks for interpreting datasets, assessing variability, and evaluating statistical significance. Emphasis is placed on the use of descriptive and predictive statistical models to support technical analysis and informed engineering decision#making. Prerequisites: MATH 2472 or MATH 2473 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 3330. Quality Engineering.
This course provides an introduction to quality engineering methods used to analyze, monitor, and improve manufacturing and service processes. Students examine statistical tools for measuring process variability and apply continuous improvement methodologies to evaluate system performance. Topics include DMAIC, statistical process control, process capability analysis, and acceptance sampling. Emphasis is placed on data driven decision making and the use of statistical software to analyze quality characteristics. Through applied examples, students develop the ability to interpret results, assess process performance, and support engineering judgments in quality related contexts across diverse operational environments. Prerequisite: IE 3320 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 3340. Operations Research.
This course examines fundamental optimization models and analytical methods in operations research, including linear programming, simplex-based algorithms, duality theory, sensitivity analysis, integer programming, and network flow models. Emphasis is placed on mathematical formulation, algorithmic solution techniques, and interpretation of model outcomes in engineering decision-making contexts. Students engage in quantitative modeling and computational implementation of optimization methods to address structured industrial problems. By the end of the course, students will be able to formulate optimization models, apply appropriate solution methods, analyze solution properties, and evaluate their practical implications. Prerequisite: [CS 1428 or CS 1342] and ENGR 3315 and MATH 3377 and IE 1310 with grades of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 3360. Lean Systems and Ergonomics.
This course examines lean process improvement tools, ergonomics, and work design principles used in industrial and service systems. Topics include time study and motion analysis, process mapping, 5S, line balancing, setup time reduction, standardized work, and work sampling. The course also introduces anthropometry and ergonomic design guidelines as analytical frameworks for evaluating human–system interaction. Emphasis is placed on applying quantitative and observational methods to analyze system performance, workplace design, and operational efficiency across manufacturing and service contexts. Prerequisite: IE 3320 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 4310. Statistical Design of Experiments.
This course examines principles and analytical methods in the statistical design and analysis of experiments. Topics include hypothesis testing, analysis of variance, blocked and factorial designs, fractional factorial experiments, regression modeling, and response surface methodology. Emphasis is placed on experimental planning, model formulation, statistical inference, and interpretation of experimental results in engineering contexts. Students apply statistical modeling techniques and computational tools to analyze experimental data and evaluate system performance. By the end of the course, students will be able to design controlled experiments, analyze experimental data, and assess the validity and practical implications of statistical conclusions. Prerequisite: IE 3320 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 4320. Integrated Production Systems.
This course introduces concepts and mathematical models used in the design and control of integrated production systems within manufacturing and service environments, emphasizing forecasting, aggregate production planning, inventory management, material requirements planning, and shop floor control. Students apply quantitative models and decision making tools to create demand forecasts, production plans, determine optimal inventory levels and reorder points, and schedule shop floor activities. Emphasis is placed on formulating engineering solutions, analyzing data to support operational decisions, and evaluating system performance. Prerequisite: IE 3320 with a grade of "D" or better. Corequisite: IE 3340 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 4330. Reliability Engineering.
This course teaches analytical methods to model, design, and maintain system reliability, aiming to prevent and ensure equipment performance over its lifecycle. Key topics include statistical models such as exponential and Weibull lifetime distribution for components and systems, reliability block diagram for series, parallel, k-out-of-n redundancy and networks, accelerated life testing and proportional hazard rate model, failure in time and design for reliability, preventive and predictive maintenance, spare parts logistics and repairable inventory, and Markov decision process with applications in condition-based maintenance. Prerequisite: IE 3320 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 4335. Lean Six Sigma Methodologies.
This course examines the principles and methodologies associated with Lean Six Sigma in manufacturing and service systems. Inquiry centers on structured improvement models such as DMAIC and PDCA and supporting tools for process analysis and control. Quantitative topics include statistical process control, introductory experimental design, and process risk assessment techniques used to evaluate process changes. The course examines approaches for diagnosing process issues, proposing improvements, and developing sustainment plans. Examples are drawn from both manufacturing and service enterprises. Prerequisite: IE 3330 and IE 4310 with grades of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 4340. Non-Linear Optimization Techniques.
This course introduces mathematical modeling and computational methods for nonlinear programming problems in engineering applications. The course presents techniques for optimizing unconstrained and constrained nonlinear models. Instructional methodology includes lectures and hands-on computational experiences using Python and multiple contemporary nonlinear optimization software. Students examine how problem structure affects tractability and solution quality. By the end of the course, students should be able to formulate and solve engineering problems using nonlinear programming approaches and evaluate solution performance in applied contexts. Prerequisite: IE 3340 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 4342. Advanced Linear and Integer Programming.
This course examines advanced mathematical modeling and computational techniques used to formulate and solve linear and integer programming problems in engineering contexts. Students explore stochastic programming, dynamic programming, and decomposition methods that support large#scale optimization. Emphasis is placed on understanding model structures, evaluating algorithmic approaches, and interpreting solution properties. Applications include manufacturing, service operations, supply chains, healthcare, and electrical systems. The course provides students with the analytical tools needed to select appropriate models, apply solution algorithms, and assess computational performance in complex decision#making environments. Prerequisite: IE 3340 with a grade of “D” or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 4350. Supply-Chain Engineering.
This course examines engineering and managerial issues in supply chain systems with an emphasis on decision making in complex operational environments. Topics include supply chain strategy, network design, demand and supply planning, inventory management, sourcing, transportation, pricing, and coordination enabled by information systems. The course emphasizes how decisions across multiple stages of a supply chain interact and influence overall system performance. Through analytical modeling and problem solving, students evaluate tradeoffs among cost, service level, responsiveness, and operational efficiency in manufacturing and service settings. Prerequisite: IE 3340 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 4355. Facilities Planning.
This course examines principles and analytical methods for facility planning, layout design, and material handling systems. Topics include facility location, plant layout models, space requirements analysis, warehouse operations, material handling equipment selection, and system integration considerations. Emphasis is placed on quantitative modeling, systematic layout design procedures, and evaluation of alternative facility configurations under operational constraints. Students apply analytical tools and design methodologies to develop and assess facility planning solutions for manufacturing and service environments. By the end of the course, students will be able to analyze facility systems, design layout alternatives, and evaluate operational performance implications. Prerequisite: ENGR 3315 and MFGE 2332 with grades of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 4360. Human Factors Design.
This course introduces principles and practices of human factors engineering applied to the design and development of ergonomic systems and products. Students apply anthropometric and human performance data using experimental and observational methods to evaluate engineering designs. Emphasis is placed on integrating human capabilities and limitations into engineering decision#making within technical and safety constraints. Through projects and case studies, students examine the application of human factors methods across multiple engineering contexts and assess their impact on system performance, safety, and usability. Prerequisites: IE 3360 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Course Attribute(s): Dif Tui- Science & Engineering|Lab Required|Writing Intensive
Grade Mode: Standard Letter

IE 4370. Probabilistic Operations Research.
This course describes probabilistic models in operations research to include queuing theory, simulation, and Markov chains. Main topics include discrete Markov transition models and probability matrix, Ergodic and non-ergodic Markov process, computing steady-state probability using one-step transition probability, death-birth queueing model, Little's law, Erlang B and Erlang C queueing systems, and machine repairperson problem. Emphasis will be placed on modeling applications to solve problems in manufacturing and service industry sectors, such as aerospace, energy production, retail stores and maintenance logistics supply chains. Prerequisite: [CS 1428 or CS 1342] and IE 3320 with grades of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 4381. Introduction to Systems Engineering.
This course explores the strategic design and management of complex, large-scale systems and their interdependencies within a "systems of systems" framework. The scope encompasses the entire lifecycle, from initial needs analysis and concept definition to final integration and evaluation. Students will apply systems thinking methodologies to model and solve multi-disciplinary engineering challenges. Upon completion, participants will be equipped to lead technical projects using standardized systems engineering processes to ensure operational efficiency and resilience. Prerequisite: IE 3320 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

IE 4392. Industrial Engineering Design I.
This course introduces students to the application of Industrial Engineering principles in a project#based, team#oriented environment. Students analyze industrial and systems engineering problems, identify technical and economic constraints, and apply relevant engineering standards under realistic conditions. Through structured planning, documentation, and iterative development, student teams learn to design, evaluate, and communicate engineering solutions for real or simulated industrial contexts. Emphasis is placed on effective project management, professional communication, and the ability to integrate knowledge acquired in prior engineering coursework. This course serves as the first part of a two#course sequence and prepares students for continued project development in Industrial Engineering Design II (IE 4393). Prerequisite: IE 3330 and IE 3340 and IE 3360 all with grades of "D" or better. Corequisite: 6 hours from [IE 4310 or IE 4355 or IE 4370] both with grades of "D" or better.
3 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering|Writing Intensive
Grade Mode: Standard Letter

IE 4393. Industrial Engineering Design II.
This course continues the two#semester design sequence by guiding student teams through the implementation and evaluation of solutions to industrial and systems engineering problems. Students work within realistic technical, economic, and organizational constraints while applying analytical methods learned in previous coursework. Emphasis is placed on project definition, modeling, documentation, and adherence to relevant engineering standards. Teams prepare written reports and deliver oral presentations that communicate design decisions to diverse stakeholders. The course provides structured opportunities for applying professional skills in problem solving, documentation, and technical communication. Prerequisite: IE 4392 and 6 hours from [IE 4310 or IE 4355 or IE 4370] with grades of "D" or better. Corequisite: 6 hours from [IE 4320 or IE 4350 or MFGE 4396] with grades of "D" or better.
3 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering|Writing Intensive
Grade Mode: Standard Letter

IE 4399D. Heuristic Optimization Techniques.
This course introduces heuristic and metaheuristic optimization methods for solving large scale and computationally challenging engineering problems. Topics include problem complexity, NP hardness, constructive and improvement heuristics, and major metaheuristic frameworks such as simulated annealing, tabu search, genetic algorithms, ant colony optimization, and particle swarm optimization. Applications are drawn from scheduling, routing, logistics, and resource allocation. Through algorithm development, computational implementation, and evaluation of solution performance, students learn to design, implement, and assess heuristic methods for optimization problems where exact approaches are computationally impractical. Prerequisite: [CS 1428 or CS 1342] and IE 3340 with grades of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Dif Tui- Science & Engineering|Topics
Grade Mode: Standard Letter

IE 4399G. Special Topics in Project Management.
This course provides undergraduate students with solid foundations of project management. Classical, prescriptive and adaptive methodologies are presented. Students will get to know different standards in project management, whereas the main focus will be on those from PMI (Project Management Institute). This course covers all phases of project management and introduces the most relevant tools and techniques to initiate, plan and execute projects in different contexts successfully. In addition to techniques, the “soft” perspective of managing people and their cooperation within projects will be addressed in detail.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Dif Tui- Science & Engineering|Topics
Grade Mode: Standard Letter

IE 5310. Advanced Statistical Design of Experiments for Engineers.
This course examines advanced methods in the statistical design and analysis of experiments for engineering applications. Topics include full and fractional factorial designs, response surface methodology, optimal and robust design strategies, random and mixed factor experiments, and industrial experimentation techniques. Emphasis is placed on experimental optimization, model adequacy evaluation, and application of DOE methodologies to complex manufacturing and service systems. Students develop advanced experimental strategies to improve system performance and reliability. By the end of the course, students will be able to design advanced experimental frameworks and critically evaluate engineering experimentation outcomes. Prerequisite: ENGR 5310 with a grade of "C" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5320. Modeling and Analysis of Manufacturing Systems.
This course examines methods for modeling and analyzing manufacturing systems. Topics include sustainable production systems, material handling operations, scheduling methods, and supply chain coordination. Analytical and quantitative models are used to evaluate production flow, resource utilization, and system performance in manufacturing environments. The course analyzes how modeling techniques support decision-making in production planning and operational management. Emphasis is placed on identifying system inefficiencies, evaluating alternative production strategies, and improving productivity, cost efficiency, and sustainability across manufacturing and supply chain processes.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5330. Advanced Quality Control and Reliability Engineering.
This course provides in-depth knowledge in reliability modeling and maintenance optimization for components and systems. Main subjects include parametric lifetime models such as exponential, Weibull, lognormal and gamma distribution for components and systems, reliability block diagram for series, parallel, series-parallel, k-out-of-n active redundancy and networks, accelerated life testing and proportional hazard rate model, stress and strength interference model, failure-in-time and design for reliability, preventive and condition-based maintenance, repairable parts inventory, and Markov decision process with applications in predictive maintenance. Prerequisite: ENGR 5310 with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5340. Applied Deterministic Operations Research for Engineers.
This course covers mathematical modeling and computational methods for linear and integer programming in engineering applications. The course presents solution techniques and concepts, including graphical solution, simplex method, duality theory, sensitivity analysis, and branch-and-bound method. Instructional methodology comprises lectures and hands-on computational experiences using Python and multiple contemporary optimization software. Applications are drawn from areas such as manufacturing, service systems, supply chain, healthcare operations and transportation. By the end of the course, students should be able to formulate and solve engineering problems using linear and integer programming methods and report on the results in applied contexts.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5343. Non-Linear Optimization Techniques for Engineers.
This course covers mathematical modeling and computational methods for nonlinear programming problems in engineering applications. The course presents techniques for optimizing unconstrained and constrained nonlinear models. Instructional methodology includes lectures and hands-on computational experiences using Python and multiple contemporary nonlinear optimization software. Students examine how problem structure affects tractability and solution quality and present results in a technical report. By the end of the course, students should be able to formulate and solve engineering problems using nonlinear programming approaches and evaluate solution performance in applied contexts.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5345. Advanced Optimization.
This course examines advanced optimization techniques, including decomposition methods for linear and integer programming as well as multiobjective, stochastic and dynamic programming models. Emphasis is placed on analyzing how model structure and decomposition strategies influence computational tractability and solution quality. Applications are drawn from areas such as manufacturing, supply chain, healthcare operations and energy systems. Instruction includes lectures, case studies, and hands-on computational experiences using Python and contemporary optimization software. By the end of the course, students should be able to design advanced models and decomposition methods for solving large-scale linear and integer programs in applied contexts. Prerequisite: IE 5340 with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5347. Advanced Heuristic Optimization.
This course examines heuristic and metaheuristic optimization techniques with an emphasis on real world engineering applications. Methods that search beyond local optima, including simulated annealing, tabu search, genetic algorithms, ant colony systems, and particle swarm optimization, are studied and applied to practical problems such as scheduling, routing, logistics, and resource allocation. The course addresses problem specific heuristic design, performance evaluation, and serial and parallel implementations. Students analyze selected research papers and conduct computational experiments to assess solution quality and computational efficiency. Emphasis is placed on applying heuristic methods to large scale optimization problems where exact algorithms are impractical. The course is intended for advanced undergraduate students in engineering and related fields.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5360. Advanced Inventory Control.
This course introduces advanced analytical approaches used in inventory management within industrial and supply chain settings. Students examine quantitative forecasting methods, inventory policy design, and optimization techniques that support data#informed decision#making. Emphasis is placed on evaluating model assumptions, comparing alternative strategies, and interpreting system behavior in environments characterized by uncertainty and variable demand. Through case#based and computational exercises, students apply analytical tools to assess the performance of different inventory systems. The course provides a foundation for understanding how inventory models support operational planning and production efficiency without endorsing specific managerial or policy choices. Prerequisite: IE 5340 with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5370. Scheduling.
This course examines advanced scheduling methodologies and the analytical frameworks used to model and optimize production and service systems. Students study deterministic and stochastic scheduling models across single#machine, multi#machine, job shop, flow shop, and multi#echelon environments. Emphasis is placed on evaluating theoretical foundations, comparing alternative solution approaches, and applying mathematical and computational tools to realistic industrial engineering problems. Through structured problem#solving and model#based analysis, students gain experience formulating scheduling problems, assessing algorithmic performance, and interpreting results to support decision#making in complex operational settings. Prerequisite: IE 5340 with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5397. System Thinking and Analysis.
This course explores the strategic design and management of complex, large-scale systems and their interdependencies within a "systems of systems" framework. The scope encompasses the entire lifecycle, from initial needs analysis and concept definition to final integration and evaluation. Students will apply systems thinking methodologies to model and solve multi-disciplinary engineering challenges. Upon completion, participants will be equipped to lead technical projects using standardized systems engineering processes to ensure operational efficiency and resilience. Prerequisite: ENGR 5310 with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter