WHAT IS INDUSTRIAL & OPERATIONS ENGINEERING?
Industrial engineers determine the most effective ways to use the basic factors of production – people, machines, materials, information, and energy – to improve a human-machine-environment system, make a product, or provide a service. They are mostly concerned with enhancing productivity, safety, and efficiency through the management of people, business organization, and technology. To solve organizational, production, and related problems efficiently, industrial engineers carefully study the product and process requirements, use mathematical and scientific methods to meet those requirements, and design manufacturing and information systems. They develop management control systems to support financial planning and cost analysis, and design production planning and control systems to coordinate activities and ensure product quality. They also design or improve systems for the physical distribution of goods and services, as well as determine the most efficient plant locations. Industrial engineers develop wage and salary administration systems and job evaluation programs. Many industrial engineers move in to management positions because the work is closely related to system management.

NEEDED SKILLS:
0 Decision-making and problem-solving
0 Data analysis
0 Computer skills
0 Time management
0 Communication and listening skills
0 Mathematical reasoning
0 Reading comprehension skills**

INDUSTRIES AND OCCUPATIONS
0 Manufacturing
0 Aerospace industry
0 Automobile industry
0 Semiconductor/electronics industry
0 Scientific research
0 Corporate or nonprofit management
0 Business consulting
0 Healthcare operations and medical systems
0 Telecommunications industry
0 Public administration/government

JOB TITLES include:
- Automation Engineer
- Industrial Engineer
- Systems Engineer
- Quality Assurance Engineer
- Logistical Engineer
- Supply Chain Manager
- Industrial Methods Consultant
- Safety and Ergonomics Engineer
- Production Control Manager

JOB OUTLOOK
This occupation is versatile both in the nature of the work it does and in the industries in which its expertise can be put to use. Industrial engineers work in all sectors of economy including manufacturing and production companies, transportation, financial institutions, health care, education and government organizations. Because industrial engineers’ work can help with cost control, increasing efficiency, and improving safety, these engineers are attractive to employers in both for-profit and nonprofit organizations.

MORE INFORMATION
- http://www.ieenet.org (Institute of Industrial and Systems Engineers)
- Engineering Career Resource Center, 230 Chrysler
- See an IOE advisor. Sign up on the IOE website at: https://ioe.engin.umich.edu/academics/undergrad/
- IOE Peer Advisors are also available (please refer to the IOE website for Peer Advising Hours).

STARTING SALARY
$71,656 (2017-2018 data)
UM IOE BSE graduates median starting salary
Courtesy of the Engineering Career Resource Center

工程学院

工业与运营管理

工业工程师确定了使用基本生产要素（人、机器、材料、信息和能源）的最佳方式，以改进人机环境系统、制造产品或提供服务。他们主要关心的是增强工作效率、安全性和效率。通过管理人、业务组织和技术，来解决组织、生产和技术问题。工业工程师仔细研究产品和过程要求，使用数学和科学方法来满足这些要求，并设计制造和信息系统。他们开发管理控制系统来支持财务规划和成本分析，并设计生产规划和控制系统来协调活动并确保产品质量。他们还会设计或改进用于货物和服务的物理分布系统，以及确定最有效的工厂位置。许多工业工程师晋升为管理职位，因为这项工作与系统管理密切相关。

需要的技能：
- 决策和问题解决
- 数据分析
- 计算机技能
- 时间管理
- 沟通和听力技能
- 数学推理
- 阅读理解技能**

industry and occupations
- 制造业
- 航空航天工业
- 汽车工业
- 半导体/电子工业
- 科学研究
- 公司或非营利组织
- 商业咨询
- 医疗保健运营和医疗系统
- 电信行业
- 公共管理/政府

工作标题包括：
- 自动化工程师
- 工业工程师
- 系统工程师
- 质量保证工程师
- 物流工程师
- 供应链经理
- 工业方法顾问
- 安全和人机工程
- 生产控制经理

工作前景
这项工作既可以在从事其中所采用的专长的行业中应用，也可以在所有行业中应用。工业工程师在所有经济部门工作，包括制造和生产公司、运输、金融机构、医疗保健、教育和政府组织。因为工业工程师的工作有助于成本控制、提高效率和改善安全，这些工程师对营利和非营利组织来说都很有吸引力。

更多信息
- http://www.ieenet.org (工业与系统工程师学会)
- 工程职业资源中心，230克赖斯勒
- 见IOE导师。在IOE网站上注册。
- IOE同伴导师也可用（请参阅IOE网站获取同伴辅导时的信息）。

起薪
$71,656（2017-2018数据）
本科学位毕业生的中位起薪
Courtesy of the Engineering Career Resource Center

工程学院 • http://advising.engin.umich.edu • eac_advising@umich.edu • 734-647-7106

更新于2019年4月
WHICH IOE CLASSES SHOULD YOU START WITH?
To start the IOE major, it is necessary to take IOE 201 and IOE 202. These half-semester courses provide an excellent introduction to IOE. Then, many students elect IOE 265, IOE 333, IOE 334, and a 4-credit non-IOE engineering course. Also, IOE students must take Math 214 (Linear Algebra and Differential Equations) instead of Math 216 (Introduction to Differential Equations). Read more about the IOE Department at: http://ioe.engin.umich.edu/

SAMPLE COURSE DESCRIPTIONS

IOE 201 – 2 credits (7 week course)
Economic Decision Making
Prerequisites: Engr 100 and Engr 101.
Overview of business operations, valuation and accounting principles. Time value of money and new present values. Practical team project experience.

IOE 202 – 2 credits (7 week course)
Operations Modeling
Prerequisites: Engr 100 and Engr 101.
Process of mathematically modeling operational decisions including the role of uncertainty in decision making. Basic tools for solving the resulting models, particularly mathematical programs, statistical models and queuing models. Cases may come from manufacturing and service operations and ergonomics.

IOE 265 – 3 credits
Probability and Statistics for Engineers
Prerequisites: Math 116 and Engr 101.
Graphical representation of data; axioms of probability, conditioning, Bayes Theorem; discrete distributions (Geometric, Binomial, Poisson); continuous distributions (normal exponential, Weibull); point and interval estimation, likelihood functions, test of hypotheses for means, variances, and proportions for one and two populations.

IOE 333 – 3 credits
Ergonomics
Prerequisite: Preceded or accompanied by IOE 265.
Introduction to human sensory, decision, control, and motor systems in the context of visual, auditory, cognitive, and manual task evaluation and design. Problems with computer displays, illumination, noise, eye-hand coordination, as well as repetitive and high physical effort tasks are presented. Work place and vehicle design strategies used to resolve these are discussed.

IOE 334 – 1 credit
Ergonomics Lab
Prerequisite: Preceded or accompanied by IOE 333.
Principles of measurement and prediction of human performance in man-machine systems. Laboratory experiments investigating human capabilities of vision, hearing, information processing, memory, motor processes, strength, and endurance.

Three non-IOE engineering courses must be chosen from the list below. You will need to choose one class from 3 of the 6 categories (for a total of 11-12 credits) by the time you graduate.

1. MECHENG 211 or CEE 211 or MECHENG 240
2. MECHENG 235 or ChemE 230
3. MSE 220 or MECHENG 382
4. BiomedE 458 or EECS 270 or EECS 314
5. CEE 265 or NERS 211
6. EECS 280