Department of Industrial Engineering and Management (IEM)

Chairperson:	Maddah, Bacel
Professors:	Maddah, Bacel; Salameh, Moueen; Yassine, Ali
Assistant Professors:	Al-Qaisi, Saif; Azar, Jimmy; Hani, Selim; Moacdieh, Nadine; Noueihed, Maher; Tarhini, Hussein
Senior Lecturers:	Abillama, Walid; Charif, Hassan; Nehme, Nabil; Noueihed, Nazim; Saad, Youssef; Trabulsi, Samir
Lecturers:	Bdeir, Fadl; Hamade, Tarek; Itani, Bilal; Khraibani, Rayan; Rahi, Khalil
Instructors:	Gharios, Nadim; Jaafar, Maysaa; Kadi, Samir; Sarieddine, Mouna; Olleik, Majd

The Department of Industrial Engineering and Management offers an undergraduate degree program leading to a Bachelor of Engineering in Industrial Engineering and a minor in Engineering Management.

Bachelor of Engineering (BE)

Major: Industrial Engineering (IE)

The Industrial Engineering Program extends over a four-year period and is offered exclusively on a daytime, on-campus basis. The program is offered in eleven terms whereby eight terms are 16-week Fall/Spring terms given over four years, and three terms are eight-week summer terms taken during the first three years of the program. In the summer term of the third year (Term IX), students are required to participate in a practical training program with a local, regional or international organization. The entire program is equivalent to five academic years but is completed in four calendar years with three summer terms.

Program Mission

The mission of the Industrial Engineering program is to graduate students who assume leadership positions in the industrial engineering profession and excel in graduate education. Our graduates are sought to be lifelong learners that contribute to the wellbeing of Lebanon and the region.

Program Educational Objectives

Graduates of the IE program will be able to:

- assume key roles in a range of industries that use industrial engineering, including manufacturing and service.
- effectively participate in, coordinate and manage diverse teams of engineers and analysts, especially in large-scale systems.
- pursue advanced degrees in industrial engineering and other related fields at reputable regional and international universities.

- appreciate the importance of professional ethics and actively use their knowledge and experience to the benefit of the community.

IE Program Learning Outcomes

Upon graduation, IE students will be able to demonstrate:

- an ability to apply knowledge of mathematics, science and engineering to model, optimize and evaluate integrated systems of people, technology and information.
- an ability to design and conduct experiments, as well as to analyze and interpret data.
- an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
- an ability to function on multidisciplinary engineering teams.
- an ability to identify, formulate and solve engineering problems and to develop integrated solutions to large-scale, sociotechnical problems through quantitative models.
- an understanding of professional and ethical responsibility.
- an ability to communicate effectively in oral and written form.
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
- recognition of the need for, and ability to engage in, lifelong learning.
- knowledge of contemporary issues.
- an ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

Program Requirements

The BE curriculum in Industrial Engineering is a four-year program (with three summers) consisting of 143 credit hours of coursework.

The IE curriculum is supported by four pillars:

a) basic science courses, b) general education courses, c) basic business courses and d) general engineering fundamental courses.

The specific course requirements are as follows:

- Basic Science Courses: MATH 201, MATH 202, MATH 218/219, MATH 251, STAT 230, PHYS 210, PHYS 210L, CHEM 201/202, CHEM 203, BIOL 210
- General Education Requirements: 6 credits in English, ENGL 203 and ENGL 206; an Arabic elective; 12 credits in the humanities including INDE 410; 6 credits in the social sciences including ECON 211
- Basic Business Courses: MNGT 215, ACCT 210, MKTG 210
- Engineering Fundamentals: CIVE 210, MECH 220, MECH 230, EECE 210, EECE 230, MECH 421

The IE courses are distributed in three core areas:

a) Operations Research, b) Engineering Management and c) Production Systems.

Curriculum

Term I (Fall)		Credits
FEAA 200	Introduction to Engineering and Architecture	3
CIVE 210	Statics	3
PHYS 210	Introductory Physics II	3
PHYS 210L	Introductory Physics LAB II	1
MATH 201	Calculus and Analytic Geometry III	3
ENGL 203	Academic English	3
		Total 16

Term II (Spring)		Credits
EECE 210	Electric Circuits	3
MECH 230	Dynamics	3
MECH 220	Engineering Graphics	1
MATH 202	Differential Equations	3
EECE 230	Introduction to Programming	3
ARAB XXX	Arabic Elective	3
		Total 16

Term III (Summer)		Credits
MATH 218/219	Linear Algebra	3
STAT 230	Introduction to Probability and Random Variables	3
ECON 211	Microeconomic Theory	3
		Total 9

Term IV (Fall)		Credits
MNGT 215	Fundamentals of Management and Organizational Behavior	3
BIOL 210	Human Biology	3
CHEM 201/202	Chemistry Course	3
CHEM 203	Chemistry Lab	2
INDE 301	Engineering Economy	3
INDE 302	Operations Research I	3
		Total 17

Term V (Spring)		Credits
ACCT 210	Financial Accounting	3
MATH 251	Numerical Computing	3
INDE 303	Operations Research II	3
INDE 320	Work Measurement and Methods Engineering	3
ENGL 206	Technical English	3
		Total 15

Term VI (Summer)		Credits
MKTG 210	Principles of Marketing	3
	Technical Elective 1	3
	Humanities Elective 1	3
		Total 9

Term VII (Fall)		Credits
INDE 410	Engineering Ethics	3
INDE 412	Engineering Entrepreneurship	3
INDE 421	Human Factors Engineering	3
INDE 411	Introduction to Project Management	3
	Technical Elective 2	3
		Total 15

Term VIII (Spring)		Credits
INDE 402	Facilities Planning and Material Handling	3
INDE 430	Statistical Quality Control	3
INDE 431	Production Planning and Inventory Control	3
MECH 421	Manufacturing Processes I	3
	Humanities Elective 2	3
		Total 15

Term IX (Summer)		Credits
INDE 500	Approved Experience	0
		Total 0

Term X (Fall)		Credits
INDE 501	Final Year Project I	3
INDE 504	Discrete Event Simulation	4
INDE 513	Information Systems	3
	Humanities Elective 3	3
	Technical Elective 3	3
		Total 15

Term XI (Spring)		Credits
INDE 502	Final Year Project II	3
INDE 533	Industrial Automation	3
INDE 534	Manufacturing Systems Analysis	3
	Social Sciences Elective	3
	Technical Elective 4	3
		Total 15
		Total Credit Hours 143

The 12-credit technical electives requirement should consist of (i) 6-9 credits from the graduate courses offered by the IEM Department, (ii) 0-3 credits from outside the IEM Department and (iii) 3 credits from sciences.

Minor in Engineering Management

The Department of Industrial Engineering and Management offers a minor in Engineering Management that can be pursued by undergraduate Engineering and Architecture students, as well as by students from related majors, starting as early as the fall term of their third year of enrollment. Only students who have a cumulative average of 70 (GPA: 2.2) or more are eligible to apply for the minor. To satisfy the requirements of this minor, a student (GPA:2.2 or more) must earn 18 credits of coursework from the IEM Department course offerings as follows:

- 9 credits from the undergraduate (Industrial Engineering) courses offered by the IEM Department, which must include INDE 301 Engineering Economy.
- 9 credits from either the undergraduate or the graduate (Engineering Management) courses offered by the IEM Department.
- A minimum grade of 70 (C+) is required for a course to be counted toward the fulfillment of a minor in Engineering Management. Additionally, a cumulative average of 75 (GPA: 2.7) or above in all minor courses is required.

Course Description

FEAA 200   Introduction to Engineering and Architecture   3 cr.
The course is designed to familiarize first year students with the different disciplines in Engineering and Architecture including: Architecture, Civil, Mechanical, Electrical, Chemical, Industrial and technologies used in the fields. The course takes a unique interdisciplinary approach to the field and introduces the related disciplines in the world of engineering and architecture. One key objective is to promote interdisciplinary interaction and innovative thinking. The course is organized into modules covering the different disciplines within the Maroun Semaan Faculty of Engineering and Architecture (MSFEA). The last module of the class showcases interdisciplinary projects demonstrating interactions among the different fields. The lectures explain as applicable to each discipline, through examples, notions of problem solving, design thinking, process of invention and innovation, environmental and civic responsibility, and measures of success in aesthetics and performance. The course project is a key component of the course. It is interdisciplinary in nature bringing ideas and solutions from all disciplines in engineering and architecture. *Annually.*

INDE 301   Engineering Economy   3 cr.
A course that covers principles, basic concepts and methodology for making rational decisions in the design and implementation of real engineering projects; time value of money, depreciation, comparing alternatives, effect of taxes, inflation, capital financing and allocation, and decision under uncertainty. *Every term. Formerly ENMG 400.*

INDE 302   Operations Research I   3 cr.
A course on operation research modeling concepts with an emphasis on linear programming; topics include: linear programming, network programming and project management. *Prerequisite: MATH 218 or Math 219, or equivalent. Annually. Formerly ENMG 500 .*

INDE 303   Operations Research II   3 cr.
Another course on operation research modeling concepts with an emphasis on probability models and stochastic processes; topics include conditional probability, discrete- and continuous-time Markov chains and their application in modeling queues, inventories and production process behavior. *Prerequisite: STAT 230 or equivalent. Formerly ENMG 501. Annually*

INDE 320   Work Measurement and Methods Engineering   3 cr.
A course on system and work design concepts; time studies; performance rating and allowances; standard and pre-determined times; work methods improvement; design of manual work, equipment, tools and work environments; line balancing; manpower determinations, job analysis and incentives; systems analysis, lean and value analysis. *Prerequisite: STAT 230 or equivalent. Annually.*

INDE 402   Facility Planning and Material Handling   3 cr.
Inter-relationships between facilities, process design, systematic layout procedures, computer aided layout, location analysis models, material handling analysis and concepts, warehousing storage and retrieval systems. *Prerequisites: INDE 302 and INDE 303. Annually.*

INDE 410   Engineering Ethics   3 cr.
A course on engineering ethics covering responsibility in engineering; framing the moral problem; organizing principles of ethical theories; computers, individual morality and social policy; honesty, integrity and reliability; safety, risk and liability in engineering; engineers as employees; engineers and the environment; international engineering professionalism; and future challenges. *Formerly ENMG 504. Every term.*

INDE 411   Introduction to Project Management   3 cr.
Introduction to project management for engineers. Conception, planning, scheduling, budgeting, leadership, management, tracking and completion of projects. Project management software is introduced and used. *Prerequisites: INDE 302 and INDE 303. Annually.*

INDE 412   Engineering Entrepreneurship   3 cr.
This course provides students with the tools necessary to create and grow a successful, innovative technology enterprise. Topics include evaluating market opportunities, designing profitable business models, producing a solid business plan, raising capital, addressing legal considerations and developing a winning team. *Prerequisite: INDE 301 or equivalent. Every term. Formerly ENMG 505.*

INDE 421   Human Factors Engineering   3 cr.
Designing for human performance effectiveness and productivity. Introducing human factors and ergonomics. Design and evaluation methods. Perception: vision and hearing. Cognition. Displays and controls. Work-space design. Biomechanics of work. Stress and workload. Safety and human error. Human-computer interaction. *Prerequisite: INDE 320. Formerly ENMG 614. Annually.*

INDE 430   Statistical Quality Control   3 cr.
Design of quality control systems; quality methods for establishing product specifications; process control; variables and attributes charts; acceptance sampling; operating characteristics curves; process capabilities; QC software. *Prerequisite: STAT 230. Annually.*

INDE 431   Production Planning and Inventory Control   3 cr.
Methods of production and inventory planning. Single-product replenishment systems. Inventory management for special classes of items and products. Multiple item and multiple location inventories. Production planning and scheduling: aggregate production planning, MRP, JIT, OPT and short-range production scheduling. *Prerequisites: INDE 302 and 303. Annually.*

INDE 500   Approved Experience   0 cr.
Practical training program with a local, regional or international organization.

INDE 501   Final Year Project I   3 cr.
This is a capstone course where IE students utilize knowledge they acquired from different courses to design and develop an IE-related product or service. This is the first part of the course that spans through the final year of the student's study. *Prerequisite: Completion of third year in IE requirements. Fall. Annually.*

INDE 502   Final Year Project II   3 cr.
This is the second part of the IE capstone course. *Prerequisite: INDE 501. Spring.*

INDE 504   Discrete Event Simulation   4 cr.
System definition; model formulation, Monte-Carlo method; random number generation; discrete events; system entities and its attributes. Emphasis on analysis of systems and models of real-life problems. Lab experience with a modern discrete-event simulation package (e.g., ARENA). *Prerequisite: INDE 303. Annually.*

INDE 513   Information System   3 cr.
This is a course that answers the questions: What is information? How can it best be stored? What to call it? The course also covers the following topics: abstraction, interfaces, barriers, specification, documentation, relational calculus and architectural abstractions, data structures for fast data storage and retrieval, encryption, putting things on the Web, data warehousing and data mining. *Annually. Formerly ENMG 652.*

INDE 533   Industrial Automation   3 cr.
A course that introduces students to the field of industrial automation and control. The course covers a wide range of topic covering areas of instrumentation, basic control, electrical actuators and motors, pneumatics, hydraulics, basic mechanical systems and industrial controllers. The course also introduces concepts on numeric control NC and industrial robots, in addition to brief introduction on factory business and lean manufacturing as related to automation. The course consists of a lecture component (2 cr.) and a laboratory component (1 cr.).

INDE 534   **Manufacturing Systems Analysis**   **3 cr.**

Introduction which brings together useful models and modeling approaches that address a wide variety of manufacturing system design and operation issues: assembly line, transfer lines, job shops, flexible manufacturing systems and group technology. *Prerequisites: INDE 431 and INDE 402. Formerly ENMG 613. Annually.*

INDE 535   **Data Analytics for Operations Research**   **3 cr.**
                    and Financial Engineering

Students will learn to identify, evaluate and capture analytic opportunities that create value for an organization. Basic descriptive analytics methods are reviewed utilizing specialized software (e.g. R) in analyzing large data sets. Predictive analytics techniques including clustering, classification and regression are covered in detail. Prescriptive analytics applications on utilization simulation and optimization over large data to improve business decisions are presented. *Annually.*