INDUSTRIAL TECHNOLOGY AND MANAGEMENT

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Faculty Research/Student Projects
For information on faculty and student research projects, visit the Industrial Technology and Management website.

Industrial Technology and Management (INTM) programs provide students with a broad knowledge of industrial technologies and operational activities, and the managerial and communication skills required to effectively manage operations, personnel, and resources in a competitive, performance-oriented industrial environment. Emphasis is on the range of competencies required for an individual to successfully function in a managerial, supervisory, or staff position in industry, and their ability to provide practical solutions to complex situations.

The Master of Industrial Technology and Operations (MITO) is a professional, ten-course STEM (Science, Technology, Engineering, and Math) degree which allows students to pursue a program of study suited to their professional interests and career objectives. INTM courses focus on functional activities and managerial skills, utilization of current and emerging technologies, and the development of critical thinking and innovative problem-solving abilities. In-depth study of industry-specific topics is achieved through the completion of an industrial specialization, options for which include:

- Construction Technology (CT)
- Facilities Management (FM)
- Industrial Sustainability (ST)
- Manufacturing Technology (MT)
- Supply Chain Management (SCM)

The MITO program may be completed on a full-time or part-time basis. INTM courses generally meet one night a week to suit the schedules of working adults. Classes meet at Illinois Institute of Technology's Mies Campus in Chicago, and may be taken online by students with time constraints or who are located elsewhere in the world.

Admission Requirements

Applicants must hold a four-year bachelor's degree from an accredited institution. Students with a GPA of 3.0/4.0 can be admitted unconditionally. Students with a GPA of 2.5/4.0 can be admitted contingent upon their earning a GPA of 3.3 or better in the first three courses taken at the university. The GRE is not required for applicants who have completed a degree at a U.S. institution.

Applicants who have completed an undergraduate degree outside the U.S. must complete the GRE and submit scores with the admission application. Minimum required GRE scores are 2.5 for analytical writing and a combined score of 292 for the verbal and quantitative portions of the exam. Applicants from countries where English is not the primary language also must complete the TOEFL with a minimum score of 70 on the internet-based test (equivalent to 523 PBT) with no individual section scored below 15. IELTS scores are also accepted, with a minimum score of 5.5. Students with a TOEFL score between 70 and 89 or an IELTS score between 5.5 and 6.0 will be required to complete an English assessment test upon arrival at the university to identify need and placement in a remedial English course during the first term of study.

All applicants must submit a completed application form, the application fee, official transcripts (or certified copies) for all academic work at the college level, and a professional statement. International students must also submit financial support documentation verifying sufficient funds to cover degree studies and living expenses.

Prospective students who have previously obtained a M.S. or even a Ph.D. in highly technical subjects may be well served to pursue the MITO degree. These individuals are often technical experts who, once employed in industry, have found that they need to improve their managerial skills and expand their understanding of industrial operations and applied technologies. As a hybrid program covering both technology and management, the MITO curriculum enables such specialists to move into operations or management.

Degree Offered

- Master of Industrial Technology and Operations

Course Descriptions

INTM 502
Industrial Engineering Concepts and Applications
Beginning with productivity and productivity improvement, students learn Industrial Engineering concepts and are trained to apply them to optimize engineering and operational tasks. Topics covered include time and motion studies, work measurement, ergonomics, value stream engineering, and value stream mapping. Data envelopment analysis and analytical hierarchy process are implemented, using Excel to optimize operations. Plant location selection and layout are covered. Students learn to optimize project selection using ROI and other metrics and execute projects using Microsoft Project. An open source ERP system is used to illustrate MRP and other planning functions. The application of statistical methods, including hypothesis testing, to improve performance is also covered.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 505
Maintenance Technology and Management
Maintenance of facilities and building systems is a major concern for all industrial operations. Facility managers must maintain heating, ventilation, air conditioning, plumbing, fire-life safety, electrical and other building systems, many of which are interrelated. Dysfunction in one system can cause problems in another, leading to occupant discomfort, poor energy efficiency and premature equipment failure. Equipment maintenance techniques have evolved to include more scientific diagnosis for increased uptime reliability. Preventive, predictive and prescriptive maintenance command a high percentage of modern behaviors to keep facilities running at peak efficiency. This course blends both the technical and managerial sides of maintenance with a focus on procedural analysis.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 507
Construction Technology
Introduces the full range of technologies involved in construction of both new and modified facilities, including steel, concrete and timber construction as well as supporting specialties such as HVAC, electrical, plumbing, etc. The interactions between the various construction trades will be covered along with the role of the architects and engineers.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 508
Cost Management
This course introduces accounting information used for decision-making within a business enterprise. Financial reporting, financial terminology, and the three major financial statements are reviewed. Product costing, short-term and long-term decision-making, budgeting, control of operations, and performance evaluations are covered as are cost-volume-profit relationships, relevant costs, flexible budgets, and standard costs.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 509
Inventory Control
Fundamentals of inventory control including inventory classifications, i.e. raw materials, work-in-process (WIP) and finished goods. Topics include inventory record keeping, inventory turnover, the 80/20 (or ABC) approach, external and internal lead times, excess/obsolete inventory, and inventory controls. Material Resource Planning (MRP) are included.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 511
Industrial Leadership
Supervision and management practices are key to all components and sectors of industry. People are the key resources and their effective use is critical to a successful operation. As companies move to become high performance organizations, traditional management tools and techniques have to be reviewed and reconsidered. Skills covered include motivation, developing consensus, conflict avoidance and negotiations. Group dynamics along with handling of individual workers is critical.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 515
Advanced Project Management
This course covers project management in the PMP framework and provides a structured approach to managing projects using Microsoft Project and Excel. Coverage includes creation of key project management charts (Gantt, Pert, CPM, timelines and resource utilization), basic statistics used in estimating task times, critical path generation in Excel and Project, project cost justification in Excel, SPC and acceptance sampling for machine, project analysis via simulation, and management of personnel, teams subcontractors and vendors. Case studies are utilized to demonstrate core concepts and dynamic scheduling.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 516
Integrated Facilities Management
Integrated Facilities Management involves understanding the processes and tools needed to successfully manage new construction and renovation projects, building systems improvements, ongoing facilities management functions, and integration of new technologies within buildings and infrastructure. Students learn to assess facilities projects, develop project scope, plan for implementation, and create a project team. Explores real world successes and failures in buildings, equipment and technologies. Coursework focuses on completion of a comprehensive project, from conceptualization to development and implementation, inclusive of costing, team building and creating a pitch for project funding to upper management.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 518
Industrial Risk Management
Each year industrial companies are affected by critical incidents which cause disruptions in operations and significant monetary losses due to repairs and/or lost revenue. Whether it is a small fire, an extended electrical outage or an incident of a more serious magnitude, all company stakeholders-from the board of directors to the employees to the customers -are impacted. The key to understanding the complexities of industrial resiliency lies in focusing on the issues of preparedness: prevention, mitigation and control. This course is designed to prepare the student for managing a critical incident, including understanding risk and business impact, emergency preparedness, contingency planning and damage control.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 520
Applied Strategies for the Competitive Enterprise
Course covers the application of proven management principles and operational practices. Learn how high performance companies create a competitive advantage despite economic challenges and a transitional customer base. Factors covered include strategy deployment, financial analysis, new product development, quality, customer service, and attaining market leadership. Case studies illustrate variable impacts on business situations.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 522
Modeling for Decision-Making
Management Information Systems (MIS) are utilized in all industrial sectors to manage, analyze, and optimize operational processes. This course examines the integration of MIS for a range of operational activities, including production scheduling, inventory control, purchasing, shipping, and invoicing. Students will be exposed to the theory of MIS by reviewing case studies and successful applications. Students learn how to build spreadsheet models for multiple business problems using linear programming (LP) and integer programming (IP) and perform regression analysis and basic time series forecasting. A variety of Microsoft Excel tools are introduced.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 523
Sustainable Facilities Operations
Maintaining and managing buildings and facilities is a challenging, multifaceted occupation. Facilities are becoming smarter and greener as the goals of energy conservation and occupant comfort have shifted to include environmental responsibility. This course examines facility operations and management (O&M) related to sustainability and green technology, with an emphasis on the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) requirements, rating system, and the process for properties to apply for certification as a resource-efficient operation.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 530
Global Logistics Management
Introduces students to the various aspects of the logistics function within a firm's operations. Covers planning, implementation and control of all activities governing the effective and efficient transportation and storage of products from the point of origin to the point of consumption, while conforming to all requirements. Topics covered include logistics as a competitive advantage, supply chain network design, making decisions involving inventory management, transportation and storage, logistics performance measurement, logistics IT, logistics security and risk management, and issues related to global trade including international contracts.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 534
Digital Transformation
Explores current and emerging trends in the adoption of various digital technologies to help transform business operations. Key elements include IoT, Artificial Intelligence, Machine Learning, Data Analytics, RPA, Virtual Reality, Augmented Reality (and more) and how those are applied in various industries like Construction, Manufacturing, Transportation, Facility Management, etc. Students learn to identify and evaluate digital solutions to improve processes and/or products for any business. Emphasis on implementation and change management.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 535
Performance Management in Food Operations
Creating an organization-wide culture of quality and performance is critical to managing the unique demands of a food processing company. Learn how to develop, manage, and improve food production processes, implement lean principles to eliminate waste and improve yields, and measure operational performance. Topics covered include budgeting and financial tools, introducing new food products and processes, Total Quality Management (TQM), evaluation and management of supply chain activities, and strategy deployment techniques.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 537
Smart Factory Automation
Technology changes how companies operate, impacting internal processes and how comprehensive manufacturing solutions are established to serve customer needs. The challenge lies in connecting independent processes into systems that are reliable, self-adjusting, and communicate in real time. Internal systems must successfully blend hardware, software, sensors and codes, and integrate new technologies to automate, assess and control manufacturing operations. The goal is to achieve a transparent system with faster processing times, fewer interruptions and a more continuous flow, resulting in competitive advantage throughout the entire value stream. This course covers interconnection, optimization and automation of processes to achieve competitive advantage in manufacturing operations.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 538
Advanced Machining for Manufacturing 1
Today's leading edge manufacturing environment has advanced technology and systems embedded throughout its framework. This course exposes students to the functional aspects and capabilities of a 5-axis CNC machining center, and the processes involved in taking a machined part from prototype to production. This state-of-the-art technology is used by high-production companies around the world to create complex, precision-machined parts and products with tight tolerances and extreme repeatability. Students gain experience using SinuTrain simulators and hands-on learning on a 5-axis CNC machine. Coverage includes CNC programming and use of IIoT system technologies embedded in the machine to obtain internal diagnostics with real time data and connect with internal departments, suppliers and customers. Prior completion of a course in manufacturing processes highly recommended. First course in a two-course sequence.
Lecture: 2 **Lab:** 2 **Credits:** 3

INTM 539
Advanced Machining for Manufacturing 2
Continues exploration of the functional aspects, capabilities and limitations of a 5-axis CNC machining center, building upon skills and knowledge obtained in AMM I. Students increase proficiency in metrology, geometric dimensioning and tolerancing per ASME standards, material sciences, and use of computer integrated technology (CAD, CAM and CIM). This course provides a top-to-bottom, hands-on experience for the manufacturing process and the technologies that surround it, with consideration of managerial perspectives and concerns.
Prerequisite(s): INTM 438 or INTM 538
Lecture: 2 **Lab:** 2 **Credits:** 3

INTM 540
Supply Chain Management
This course covers the full range of activities involved in the supply chain. This includes management tools for optimizing of supply chains, relationships with other parts of the organization, in-house versus third party approaches, and suitable performance measurements. Topics covered include Warehouse Management Systems (WMS), Transportation Management Systems (TMS), Advanced Planning and Scheduling Systems (APS) as well as cost benefit analysis to determine the most appropriate approach.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 542
Warehousing and Distribution
This course covers warehouse layout and usage based on product requirement such as refrigeration, hazardous material, staging area, and value added activities. Processes covered include receiving, put-away, replenishment, picking, and packing. The requirement for multiple trailer/rail car loading and unloading is considered as well as equipment needed for loading, unloading and storage. Computer systems for managing the operations are reviewed. Emphasis is on material handling from warehouse arrival through warehouse departure.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 543
Purchasing
Purchasing responsibilities, processes, and procedures are included. Topics covered include: supplier selection and administration, qualification of new suppliers, preparing purchase orders, negotiating price and delivery, strategic customer/vendor relationships, and resolution of problems. All aspects of Supplier Relation Management (SRM) are covered.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 544
Export/Import
Internationalization of industry requires special expertise and knowledge, which must be taken into consideration throughout all interactions with overseas companies either as customers or suppliers. Topics covered include custom clearance, bonded shipping, international shipping options, import financing and letters of credit, customer regulations, insurance, import duties and trade restrictions, exchange rates, and dealing with different cultures.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 545
Strategic International Business
Organizational involvement in international business activities -- whether sourcing material and designs, expanding product sales and reach, or creating economies of scale and scope -- requires an understanding of various factors in international finance, marketing, and strategy. This course brings together these disciplines to explore financial factors that may add or transform risks, the necessary adjustments in the creation of global marketing strategy, and the strategies for creating and preserving a competitive advantage in the international arena.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 546
Manufacturing and Logistics Information Systems
Provides an overview of manufacturing, logistics and supply chain management (SCM) information systems and software packages, as well as practical tools and techniques for effective decision making. Emphasis on the importance of accurate and timely data, efficient business processes, and utilizing state-of-the-art information tools and technologies. Students gain hands-on experience using a modern ERP system to understand the features, functionality, and end-to-end dependencies of the core ERP modules used in an enterprise.
Prerequisite(s): INTM 441 with min. grade of C or INTM 540 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 547
Supply Chain Strategies
The range of supply chain strategies to be considered when assessing a firm's internal and external supply chain network. Strategies involved in the end-to-end supply chain including product life cycle management (PLM), inventory optimization, network design optimization, management tools for optimizing supply chains, relationships with other parts of the organization, in-house versus third-party approaches, and suitable performance measurements.
Prerequisite(s): INTM 441 with min. grade of C or INTM 540 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 548
Agile Methodologies for New Product/Process Development
The development of new products and operational processes in a manufacturing setting requires collaboration and teamwork across multiple departments and flexible (agile) methods to expediently assess product/process viability and implement production without interrupting current operations. This course explores agile methodologies and management strategies involved in developing a new product or process, to include innovation and design, environmental concerns, market analysis, timing, budgets, collaborative strategies, patents and trade secrets, licensing and distribution, and marketing/pricing.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 550
Demand Planning and Forecasting
Foundations, methodologies and strategies of demand management, planning and forecasting. Course covers the range of factors that influence, shape and control demand, digitization of the supply chain, use of technology and big data, forecasting techniques and performance metrics.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 551
Data Analytics for Industry
Organizations of all types employ rigorous analysis of vast amounts of internal and external data to improve the quality of decision making. This course prepares students to define and organize data, perform exploratory analysis, and select and implement analytical models, with a focus on applications in the areas of operations and marketing. Excel plugins, statistical packages (R, SAS or SPSS), and business intelligence products like Tableau will be used extensively for modeling. The course covers descriptive and inferential statistics, principles of design of experiments and analysis of variance (ANOVA), and supervised and unsupervised learning methods including regression, classification, clustering and neural networks. Students will also learn social network data analysis and text mining methods. Prior completion of a course in elementary probability and statistics highly recommended.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 552
Pharmaceutical Manufacturing Technologies, Regulation and Practice
Pharmaceutical manufacturing is a highly regulated and collaborative industry. This course presents the multiple interactions of engineering technology, manufacturing, process, formulation and analytical chemistries, and regulatory disciplines that are involved in the development and manufacture of pharmaceutical drug products and devices, as well as the regulatory approval process. Key practical aspects of manufacturing are addressed, to include 1) the process of drug product development from discovery to manufacturing, 2) drug products in Phase 1 to Phase 3 clinical trials, and 3) the regulatory approval of a new drug product application. Issues related to medical devices, supply chain and packaging are also presented. Understanding industry practices enables proactive interactions with various internal departments to get a final approved product manufactured, packaged and delivered to the customer (patient or pharmacy).
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 559
Issues in Industrial Sustainability
Examines the concept of sustainability and its application in the industrial environment. Identifies underlying stresses on natural and human environments and the resultant problems for business and society including legal, ethical, and political issues related to sustainability. Global warming, peak oil, and commodity pricing are considered as indicators of the need for improvements in sustainability. Industrial ecology will be discussed as well as strategies for developing sustainable practices in manufacturing, power generation, construction, architecture, logistics, and environmental quality. Coverage includes case studies on businesses that have developed successful sustainability programs.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 560
Sustainability Critical Matrls
This course explores the limitations in supply and the need for sustainable use of carbon and non-carbon-based materials such as oil, minerals, food, water, and other natural resources used by industry. Limitations in the global availability of such resources pose challenges to industry which will require careful consideration and planning to ensure continued prosperity for current and future generations. Course will cover strategies and options to mitigate anticipated shortages and optimize the use of non-renewable natural resources, review of fuel and raw material pricing, and cost/benefit analysis of sustainable development proposals. Technical analyses will be presented during class discussions, but a technical background is not required.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 561
Energy Options in Industry
Carbon-based fuels are a limited resource and within decades will be in very short supply. Associated energy costs will increase and industry will be required to incorporate alternate fuels and/or power sources, such as uranium (for nuclear power), hydroelectric, geothermal, wind, wave, solar, etc. This course presents such energy options and explores the anticipated impact on industry.
Lecture: 3 **Lab:** 0 **Credits:** 3

INTM 562
Special Topics in Sustainability
This course allows the student to research and report on an industrial sustainability issue of interest and relevance to their career objectives. Topics may focus on industrial ecology, energy sources/systems, sustainable operations, integrated technologies, regulations, environmental issues, resource use, alternative manufacturing methods, facilities, logistics, etc. Special topics of current interest may be taught as group lecture.
Credit: Variable

INTM 594
Special Projects
Special project.
Credit: Variable

INTM 597
Special Projects
Independent study and project. Permission of instructor required.
Credit: Variable