

BACHELOR OF INDUSTRIAL TECHNOLOGY AND MANAGEMENT

www.intm.iit.edu

INDUSTRIAL TECHNOLOGY AND MANAGEMENT (INTM)

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The Bachelor of Industrial Technology and Management (BINTM) program is designed to prepare skilled adults for managerial positions in industry. This is a completion program for working individuals who have technical education in industrial specialties, including manufacturing, supply chain/logistics, construction, facilities maintenance/management, and other related areas. The program enables students to build upon existing skills, improve their managerial capabilities, and thereby expand their career opportunities.

Educational outcomes of the BINTM program include:

- Understand best practices in industry and methods of implementation.
- Identify and evaluate significant factors and issues affecting managerial decision-making.
- Ability to assume a leadership role and a higher level of professional responsibility.
- Understand how to employ various technologies to achieve efficient operations.
- Understand how to address a wide range of operational and situational challenges.
- Understand the importance of ethical and sustainable industrial operations.
- Understand the dynamics of the global industrial landscape.
- Communicate effectively at all levels, in an objective and professional manner.
- Ability to function on multidisciplinary teams.

The program offers five professional specializations: Construction Technology (CT), Facilities Management (FM), Industrial Sustainability (ST), Manufacturing Technology (MT), and Supply Chain Management (SCM). Students have the option to complete a specialization or take courses from more than one specialization area as electives. The core curriculum covers material applicable to all industrial sectors. This approach allows students to optimize course selection to suit individual career objectives.

The ideal candidate for this program is a person who is already working within, or has a strong interest in, a career in industry or a related field. This curriculum provides a broad knowledge base which gives students the flexibility to advance within a chosen technical specialty, or move into a related career at a professional or management level.

Admission to the program is based on a review of college transcripts plus consideration of work experience and career goals. In general, 60 credit hours from an accredited college are needed for admission (only courses graded "C" or better are accepted for transfer). Those who have accrued at least 45 hours towards admission requirements may be admitted with the condition that remaining requirements be completed within two years of starting the BINTM program. Candidates with more than 60 hours of transferable credit may qualify to have excess credit applied towards BINTM coursework.

To accommodate full-time work schedules, courses are offered evenings and Saturdays at IIT's Mies (Main) Campus in Chicago, and via the Internet for students who are unable to attend live classes.

A three-course INTM certificate program is available for individuals interested in improving managerial and decision-making skills. The courses are part of the regular curriculum and can be applied toward the BINTM degree.

A co-terminal degree program is now available, allowing completion of both the BINTM degree and the Master of Industrial Technology and Operations (MITO) in an expeditious manner. The co-terminal reduces overall time and credits required to earn both degrees by nine (9) hours.

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Admission Requirements

Undergraduate candidates must complete an application for admission and submit official transcripts from all colleges attended. The BINTM program nominally requires the transfer of 60 semester hours, as outlined below:

Mathematics*

Five (5) to six (6) credit hours at the level of trigonometry or above. Statistics highly recommended. Technical mathematics is also accepted.

Natural Science or Engineering*

Ten (10) to eleven (11) credit hours of science or engineering courses. Relevant courses include physics, chemistry or biology (physics highly recommended). Up to six credit hours may be in engineering graphics/drafting/CAD. Two sequential courses must be completed in a single field, and the third course must be in a different field. In certain cases, technology courses may satisfy this requirement.

**A minimum of 16 credit hours is required between Mathematics and Natural Science or Engineering.*

Computer Science

Three (3) credit hours of computer literacy/programming.

Humanities and Social Sciences

Nine (9) credit hours. Humanities courses include literature, philosophy (except logic) and history. Social sciences typically include anthropology, geography, political science, psychology, sociology and economics (recommended). A minimum of three (3) credit hours in humanities and three (3) credit hours in social sciences is required.

Technical Coursework

Thirty-one (31) credit hours. (Candidates with adequate college credit but lacking the technical coursework may qualify for admission based on a strong interest and/or relevant industry experience.)

Industrial Technology and Management Curriculum

A total of 126 credit hours are required for the bachelor's degree, consisting of 66 credits (22 courses) of junior- and senior-level courses completed at Illinois Institute of Technology and the 60 transfer credits required for admission. Students may attend on a part-time or full-time basis, understanding that INTM courses are generally offered evenings to accommodate full-time work schedules of students.

The core curriculum (15 courses) emphasizes proficiency in the essential functions of industrial enterprises with a focus on management-related topics. This coursework includes upper-level humanities and social science electives and two (2) Interprofessional Projects (IPRO). In addition, students complete seven (7) electives, generally consisting of three (3) technical electives and four (4) specialization electives. Electives provide more in-depth coverage of specific aspects of industrial organizations and their related sectors. Students choose elective courses based on career goals and personal interests, and have the option to complete a formal specialization by taking four courses within one specialty area.

Five industrial specializations are available:

Construction Technology (CT)

Covers construction technology, estimating, project management, and contract administration.

Facilities Management (FM)

Covers facilities operations and maintenance (O&M), the role and responsibilities of the facilities manager, integration of new technologies, energy efficiency in buildings, and activities required for LEED certification.

Industrial Sustainability (ST)

Covers a range of issues in sustainability, critical material resources, and alternative energies.

Manufacturing Technology (MT)

Covers advanced technologies, process optimization, automation, quality control, and information systems.

Supply Chain Management (SCM)

Covers strategic supply chain management, inventory, information systems, warehousing and distribution, purchasing, transportation, and export/import activities.

Bachelor of Industrial Technology and Management

Required courses	Credit Hours
Admission Requirements (transfer credits)	60
Industrial Technology Requirements INTM 301, 315, 322, 404, 408, 410, 425, 441, 459	27
Electives (Technical and/or Specialization)	21
Humanities Electives 300/400-level courses	6
Social Science Electives 300/400-level course	6
Interprofessional Projects (IPRO)	6
Total Hours	126

Bachelor of Industrial Technology and Management Curriculum

A suggested program based on half-time attendance. Students may complete coursework at their own pace.

Semester 1			Lect.	Lab. Hrs.	Cr. Hrs.	Semester 2			Lect.	Lab. Hrs.	Cr. Hrs.
INTM 301	Comm. for the Workplace	3	0	3	INTM 322	Industrial Project Management	3	0	3		
INTM 315	Industrial Enterprises	3	0	3	INTM Elective		3	0	3		
INTM 404	Marketing, Sales & Product Intro	3	0	3	INTM Elective		3	0	3		
Totals		9	0	9	Totals		9	0	9		
Semester 3			Semester 4								
INTM 410	Operations Management	3	0	3	INTM 425	Human Resource Management	3	0	3		
INTM Elective		3	0	3	INTM Elective		3	0	3		
Humanities Elective (300+)		3	0	3	Social Science Elective (300+)		3	0	3		
Totals		9	0	9	Totals		9	0	9		
Semester 5			Semester 6								
INTM 459	Issues in Industrial Sustainability	3	0	3	INTM 441	Supply Chain Management	3	0	3		
Humanities Elective		3	0	3	INTM Elective		3	0	3		
IPRO Elective I		3	0	3	Social Science Elective (300+)		3	0	3		
Totals		9	0	9	Totals		9	0	9		
Semester 7			Semester 8								
INTM 408	Cost Management	3	0	3	IPRO Elective II		1	6	3		
Humanities Elective (300+)		1	6	3	INTM Elective		3	0	3		
Totals		4	6	6	Totals		4	6	6		
Total Credit Hours									66		

The Core Curriculum includes the following 15 courses:

INTM 301 Communications for the Workplace	INTM 425 Human Resource Management
INTM 315 Industrial Enterprises	INTM 441 Supply Chain Management
INTM 322 Industrial Project Management	INTM 459 Issues in Industrial Sustainability
INTM 404 Marketing, Sales and Product Introduction	Two (2) Interprofessional Project (IPRO) Courses
INTM 408 Cost Management	Two (2) 300- or 400-level Humanities Electives
INTM 410 Operations Management	Two (2) 300- or 400-level Social Science Electives

INTM Electives (7 courses) are chosen from both Technical and Specialization elective options**Technical Electives:**

INTM 314 Maintenance Technology and Management	INTM 420 Applied Strategies for the Competitive Enterprise
INTM 319 Electronics in Industry	INTM 427 E-Commerce in Marketing & Supply Chain Networks
INTM 414 Topics in Industry	INTM 477 Entrepreneurship in Industry
INTM 418 Industrial Risk Management	

Specialization Electives include the following; complete four (4) courses in one focus area to obtain a Specialization.**Construction Technology (CT)**

INTM 407 Construction Technology
INTM 413 Contract Administration for Construction Projects
INTM 415 Advanced Project Management
INTM 417 Construction Estimating

Facilities Management (FM)

INTM 314 Maintenance Technology and Management
INTM 411 Functional Facilities Management
INTM 413 Contract Administration for Construction Projects
INTM 415 Advanced Project Management
INTM 416 Integrated Facilities Management
INTM 423 Sustainable Facilities Management

Industrial Sustainability (ST)

INTM 423 Sustainable Facilities Operations
INTM 460 Sustainability of Critical Materials
INTM 461 Energy Options in Industry
INTM 462 Special Topics in Sustainability

Manufacturing Technology (MT)

INTM 406 Quality Control
INTM 433 Chemical Manufacturing Processes in Industry
INTM 434 Manufacturing 4.0
INTM 435 Performance Management in Food Operations
INTM 436 Lean Manufacturing
INTM 437 Smart Factory Automation
INTM 446 Manufacturing and Logistics Information Systems

Supply Chain Management (SCM)

INTM 409 Inventory Control
INTM 427 E-Commerce in Marketing & Supply Chain Networks
INTM 430 Transportation
INTM 432 Sales and Operations Planning
INTM 442 Warehousing and Distribution
INTM 443 Purchasing
INTM 444 Export/Import
INTM 446 Manufacturing and Logistics Info Systems

Co-Terminal Bachelor of Industrial Technology and Management/ Master of Industrial Technology and Operations (BINTM/MITO)

The BINTM/MITO co-terminal degree program provides an attractive opportunity for BINTM students who intend to pursue a graduate degree. The seamless format of the curriculum, the reduction of total credit hours and overall time required, and the ability to apply undergraduate financial aid scholarships towards the BINTM/MITO co-terminal program are most positive attributes.

An application for the BINTM/MITO co-terminal program should be submitted by current BINTM students during their first term in their senior year (U4). Applicants must have an undergraduate GPA of 3.25 in order to be admitted to the

co-terminal program. Once admitted, students must maintain a GPA of 3.0/4.0 to remain in the program. If a student fails to meet GPA requirements, they will be dismissed from the co-terminal program.

The BINTM/MITO co-terminal program reduces the total credit hours ordinarily required to complete both degrees from 156 to 147 (a reduction of 9 hours). The graduate curriculum remains flexible to suit students' professional and career interests. Students will work with an academic advisor to ensure program requirements for both degrees are satisfactorily achieved.

Certificate in Industrial Technology and Management

The three-course INTM Certificate provides an introduction to industrial organizations and how they operate. Certificate students should have at least two years of work experience and some college credit in industrial subjects. The INTM Certificate program does not qualify for federal financial aid.

Students must complete the following three courses:

INTM 315 Industrial Enterprises
 INTM 322 Industrial Project Management
 INTM 410 Operations Management.

Course Descriptions

All courses earn three credits, unless noted otherwise. (C) indicates course fulfills communications general education requirements.

INTM 301

Communications for the Workplace

Review, analyze and practice verbal and written communication formats found in the workplace. Emphasis is on developing skills in technical writing, oral presentations, business correspondence and interpersonal communications using electronic and traditional media. Credit not granted for both INTM 301 and COM 421. (C)

INTM 314

Maintenance Technology and Management

Maintenance of facilities is a major concern for all industrial operations. Course covers technologies involved as well as the management aspects for maintaining buildings, construction, and equipment installation and maintenance for all types of operations.

INTM 315

Industrial Enterprises

An introduction to the world of industrial enterprises and the organizational priorities required to achieve efficiency and competitiveness. Students learn to assess the present state of a company, address performance issues, foster functional communication and cooperation between departments, identify sources and impacts of waste, identify value-added activities, and transform outdated business practices into flexible, customer-driven processes. (C)

INTM 319

Electronics in Industry

Basic overview of electrical and electronic technology in industry. Emphasis on electrical and electronic components, industrial devices, electrical theory, application, and basic troubleshooting. Students select and complete an electrical/electronic class project.

INTM 322

Industrial Project Management

Projects are the driving force behind innovation and improvement in any organization. This course identifies the tools and techniques needed to lead any project to its intended conclusion. Topics include project plans, managing expectations and contingencies, building a winning team, gaining commitments, managing project risks, and development of personal skills critical to the successful project manager. (C)

INTM 404

Marketing, Sales and Product Introduction

This course examines marketing and sales, and the differences and details of these activities as applied within industry. The range of marketing types is covered, to include business-to-business, industrial, commercial, retail, internet, social media, and entrepreneurial/professional. Sales fundamentals include understanding the

customer and the competition, sales strategy, sales management, product positioning, product life cycle, sales structures, margins, and prospecting for new customers. Product development is addressed throughout the course, inclusive of market feedback, product evaluation, opportunity assessment, prototyping, field trials and marketing testing, and product launch. (C)

INTM 406

Quality Control

This course focuses on how organizations manage quality in a competitive marketplace regardless of the nature of the industry. Topics include principles of quality, cost of quality, inspection and receiving, audits, corrective and preventive action systems, Supply Performance Management (SPM), FMEA and control plans, process capability studies and Statistical Process Control (SPC), measurement system analysis, Quality Management Systems (QMS), process improvement methodologies (Lean, Six Sigma and Kaizen), and creation of a performance dashboard.

INTM 407

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.

INTM 408

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.

INTM 409

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, safety stock, forecasting, dependent and independent demand, lead times, excess/obsolete inventory, and inventory controls. Material Resource Planning (MRP) and Enterprise Resource Planning (ERP) are included.

INTM 410**Operations Management**

Focuses on core processes within an organization – the activities that add value. An operations strategy depends on the industrial sector as well as the organization. This course introduces a variety of qualitative and quantitative tools for such activities as project management, process analysis, job design, forecasting, resource planning, productivity, quality, inventory and scheduling. The objective of this course is to provide the framework for integrating approaches covered in other INTM courses.

INTM 411**Functional Facilities Management**

Covers key activities in facilities management, the role and responsibilities of the facilities manager, and the functional aspects of management and maintenance activities by building type (commercial, high rise, hotels, hospital, data center). Budgeting, strategic planning, and coordination of capital and operating projects; inspection, repair, and renovation of equipment and buildings in accordance with health and safety standards; managing internal staffing, external contractors, insurance and control activities (parking, waste disposal, building security, etc.). Information systems, real estate management, sustainability issues and emergency preparedness also covered.

INTM 413**Contract Administration for Construction Projects**

Covers fundamentals of project administration and characteristics of the construction industry. Pre-construction discussion includes technical and economic feasibility, project delivery systems, documents, bonding and bidding. Duties and liability of parties at pre-contract stage and during contract administration, to include scheduling and time extensions, payment, retainage, substantial and final completion, change orders, suspension of work, contract termination and dispute resolution. Labor law, labor relations, safety, and general management of a construction company.

INTM 414**Topics in Industry**

Provides overview of multiple industrial sectors and the influences that are forcing change. All aspects of industry are considered: history of industry, inventory, supply chain, e-commerce, management, manufacturing, industrial facilities, resource management, electronics and chemical industries, alternate energies, marketing, entrepreneurship, computers as tools, and other specialty areas.

INTM 415**Advanced Project Management**

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 acceptance, project analysis via simulation, and management of personnel, teams, subcontractors and vendors. Case studies utilized to demonstrate core concepts and dynamic scheduling.

INTM 416**Integrated Facilities Management**

This course involves understanding processes and tools needed to successfully manage building systems, functions and personnel in any type of building, complex of buildings or physical environment. Course covers topics in facilities management ranging from routine maintenance to complex systems interactions and financial decisions. Students learn to assess issues of safety, human comfort, sustainable

use of resources, building and infrastructure life cycles, and company objectives, and develop solutions based on studying real problems in facilities management organizations.

INTM 417**Construction Estimating**

General approaches for estimating construction costs are covered. Several commercially available software packages are introduced. Emphasis is on acquiring the knowledge required to develop cost estimates for construction, renovation and maintenance projects for buildings, facilities and equipment.

INTM 418**Industrial Risk Management**

Industrial companies can be affected by critical incidents which cause disruptions in operations and significant monetary losses due to repairs and/or lost revenue. Be it a small fire, an extended electrical outage or a more serious incident, all company stake-holders – 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.

INTM 420**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.

INTM 423**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.

INTM 425**Human Resource Management**

This course will introduce students to key aspects of HR management, including legal requirements for all normal HR activities as well as techniques for dealing with employees when hiring, evaluating, promoting and terminating. (C)

INTM 427**E-Commerce in Marketing & Supply Chain Networks**

This course covers electronic commerce and its applications in industrial organizations. Topics covered include the role of e-commerce in a firm's business operations and competitiveness, e-commerce infrastructure technologies, e-commerce applications in product development and marketing, and effective use of e-commerce in supply chain management and collaboration. Innovations in business models, marketing strategies and supply chain processes driven by web-enabled applications are included. Social and ethical challenges posed by the widespread adoption of e-commerce will also be studied.

INTM 430**Transportation**

This course covers transportation practices and strategies for the 21st century. The role and importance of transportation in the economy and its relationship to the supply chain will be covered in detail. Transportation modes – truck, rail, air, and water – will be examined for both domestic and global transportation. Costing and pricing strategies and issues will be discussed, as well as security issues in domestic and international transportation.

INTM 432**Sales and Operations Planning**

This course covers Sales and Operations Planning (S&OP) processes, objectives and procedures utilized by leading global supply chain companies. Key elements of the S&OP process are explained, including demand plans, forecasts and capacity plans. Students also learn how to develop, maintain and manage supplier relationships (SRM) and how companies use Customer Relationship Management (CRM) tools to enhance business relationships.

INTM 433**Chemical Manufacturing Processes in Industry**

This course provides an overview of current and emerging chemical processes in the energy, food, drug, and plastics sectors. Current and future impacts of various manufacturing processes on society, environment, and sustainability are covered as are issues related to OSHA, EPA, FDA, USDA, and other regulatory systems. The various implications of recovery and reuse are explored as well as new non-polluting, zero-emissions processes and technologies. Students will gain an appreciable understanding of "how it's made" and the range of chemical processes and related technical challenges involved in manufacturing. A background in chemistry is not required.

INTM 434**Manufacturing 4.0**

This course focuses on the Fourth Industrial Revolution (Industry 4.0) and the major manufacturing technologies that must be integrated and implemented effectively in a timely manner in order to sustain a competitive advantage. Advances in product design, breakthrough achievements in materials used in products, and the reduced time to market require the use of advanced industrial processes to maximize customer service and company profitability. Topics include: shaping the fourth industrial revolution, manufacturing 4.0, manufacturing economics, manufacturing analytics, supply chain 4.0, quality 4.0, Industrial Internet of Things (IIoT), future of manufacturing skills, advanced manufacturing (digital, automated, additive), AI, augmented reality, modern manufacturing leadership, and change management.

INTM 435**Performance Management in Food Operations**

Creating an organizational culture of quality and performance is critical to managing the unique demands of a food processing company. Students will learn how to develop, manage, and improve food production processes, implement lean principles to eliminate waste and improve yields, and measure operational performance. Coursework includes Total Quality Management (TQM), evaluation and management of supply chain activities, and strategic deployment techniques.

INTM 436**Lean Manufacturing**

Lean principles are the primary continuous improvement tool utilized in the manufacturing industry. In this course, students learn how to evaluate process performance, starting with lean thinking to determine exactly what is needed to achieve the desired outcome of a process and the value it creates. With lean thinking comes the identification of waste, which can take many forms including organizational policies and practices which may not provide any value to the customer. The next step is to map the process as it is in its current state so that potential future state improvement are more easily identified and serve as a catalyst toward achieving process perfection. Diagnostic tools are introduced, both qualitative and quantitative in nature, to help reveal the potential of the process.

INTM 437**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.

INTM 441**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. (C)

INTM 442**Warehousing and Distribution**

This course covers warehouse layout and usage based on product requirements 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/railcar 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.

INTM 443**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.

INTM 444**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.

INTM 446**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: INTM 441, or department permit.

INTM 449**Telecommunications over Data Networks**

This course covers a suite of application protocols known as Voice over IP (VoIP). It describes important protocols within that suite including RTP, SDP, MGCP and SIP and the architecture of various VoIP installations including on-net to on-net, on-net to PSTN and Interdomain scenarios. The functions of the Network Elements that play significant roles in this architecture will be defined. Examples of network elements currently available as products will be examined.

Prerequisite: ITMO 440 or ITMO 540

INTM 459**Issues in Industrial Sustainability**

This course examines the concept of sustainability and its application in the industrial environment. Underlying stresses on natural and human environments are identified as well as 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 sustainability improvements. Industrial Ecology is discussed as well as strategies for developing sustainable practices in manufacturing, power generation, construction, architecture, logistics, and environmental quality. Case studies on businesses employing successful sustainability programs are reviewed.

INTM 460**Sustainability of Critical Materials**

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.

INTM 461**Energy Options for 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.

INTM 462**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 touch on industrial ecology, ethics, regulations, environment, resource use, alternative manufacturing methods, facilities, logistics, etc. This is the fourth course in a specialization in Industrial Sustainability.

INTM 477**Entrepreneurship in Industry**

Introduces various forms of entrepreneurship with emphasis towards industrial organizations. Provides helpful tools for developing and implementing significant "game-changing" actions to effect change within an existing organization or develop a new business venture. Students complete an Opportunity Assessment (OPASS) Project wherein they identify, evaluate and develop an approach for a "real-life" business and produce a formal report and presentation.

INTM 491**Undergraduate Research**

Undergraduate research. (Credit: Variable)

INTM 497**Special Project**

Individual special project; topic requires approval of academic advisor. (Credit: Variable)

INTM 498**Undergraduate Research Experience**

Team research experience; topic determined by supervising faculty.

IPRO 497 Interprofessional Project

IPRO projects develop communication, teamwork and leadership skills, as well as an awareness of economic, marketing, ethical and social issues within the framework of a multidisciplinary team project. Project teams are integrated across academic programs and at different levels within programs. Visit <http://ipro.iit.edu>.

INTM 500-level Course Options

Detailed in IIT's Graduate Programs Bulletin and on the INTM website at www.intm.iit.edu.

Please note: This information is compiled from IIT's current Undergraduate Programs Bulletin and includes recent department updates. The Undergraduate Programs Bulletin is the official university publication consulted when delineating or assessing degree requirements.