INFORMATION TECHNOLOGY AND MANAGEMENT

Michael Paul Galvin Tower, Suite 1500A
10 W. 35th St.
Chicago, IL 60616
312.567.5290
iit.edu/itm

Chair
Gurram Gopal

Associate Chair for Curriculum and Undergraduate Affairs
Ray Trygstad

Faculty with Research Interests
For information regarding faculty visit the Department of Information Technology and Management website.

The objective of the Bachelor of Information Technology and Management degree is to produce graduates prepared for a career in the information technology field, while equipping them with the critical thinking skills necessary to cope with the emergence of new technologies and with management principles needed to advance in their careers. While the program was originally designed for students who have achieved an associate's degree and would like to complete a bachelor's degree, students may also enter the program as first-year students. The Bachelor of Information Technology and Management degree is accredited by the Computing Accreditation Commission of ABET (abet.org). Bachelor of science degrees give students the mathematical grounding necessary to prepare them for further research-focused graduate studies.

Government studies such as Free and Aspray: *The Supply of Information Technology Workers in the United States*, show that technology positions will be the fastest growing segment in the United States for the next 30 years. Organizations of all kinds have become dependent on networked computing infrastructure as the key element to enabling modern business processes, and our graduates are prepared to select, manage, and maintain that infrastructure, ensuring that it meets organizational needs. Information technology professionals assume responsibility for selecting hardware and software products appropriate for an organization, integrating those products with organizational needs and infrastructure, and installing, customizing, and maintaining those applications for the organization's computer users. Planning and managing an organization's technology infrastructure is a difficult and complex job that requires a solid foundation in applied computing as well as management and people skills. Professionals in this discipline require special skills, such as understanding how networked systems are composed and structured and what their strengths and weaknesses are, and being prepared to deal with important software systems concerns such as reliability, security, usability, and effectiveness and efficiency for their intended purpose. These topics are difficult and intellectually demanding.

The Bachelor of Information Technology and Management degree produces graduates who are able to:

- Problem solve and create innovative answers to provide technology solutions for the problems of business, industry, government, nonprofit organizations, and individuals
- Perform requirements analysis, design and administration of secure computer and network-based systems conforming to policy and best practices, and monitor and support continuing development of relevant policy and best practices as appropriate
- Apply current industry, technical, and mathematical concepts and practices in the core information technologies and recognize the need to engage in continuing professional development

To meet these goals, graduates must demonstrate knowledge and proficiency in these areas:

- Techniques, skills, and tools necessary for computing practice
- Principles and practices for secure computing
- Local and global impacts of computing solutions on individuals, organizations, and society
- Fundamentals and applied practice in
  - information management
  - integrated systems
  - platform technologies
  - system paradigms
  - user experience design
  - networking
  - software development and management
  - web and mobile systems

- Advanced and supplemental IT topics that build on fundamentals and applied practice to provide depth
- Principles and practices of IT project management

Bachelor of Information Technology and Management students are required to complete a minor. The minor may be in a field which will complement information technology such as business or professional and technical communication, or may be chosen from a field very different such as history or sociology to provide a more widely rounded educational experience.

The Bachelor of Science in Applied Cybersecurity and Information Technology degree produces graduates who are able to:

- Problem solve and create innovative answers to provide technology solutions for the problems of business, industry, government, non-profit organizations, and individuals
- Perform requirements analysis, design and administration of secure computer and network-based systems conforming to policy and best practices, and monitor and support continuing development of relevant policy and best practices as appropriate
- Apply current industry, technical, and mathematical concepts and practices in the core information technologies and recognize the need to engage in continuing professional development
- Design and implement an enterprise security program using policy, technology, and awareness to implement appropriate controls and technically secure enterprise information assets and resources to deter, detect, and prevent the success of attacks and intrusions
- Investigate information security incidents and violation of law using computer resources in a manner such that all evidence is usable for fault analysis and, when applicable, admissible in a court of law

To meet these goals, in addition to the knowledge and proficiency expected of graduates in Information Technology and Management, cybersecurity graduates must complete 33 hours of coursework in computing and cybersecurity that must cover application of the crosscutting concepts of confidentiality, integrity, availability, risk, and adversarial thinking, as well as fundamental and advanced topics from the following areas:

- Data Security: protection of data at rest, during processing, and in transit
- Software Security: development and use of software that reliably preserves the security properties of the protected information and systems
- Component Security: the security aspects of the design, procurement, testing, analysis, and maintenance of components integrated into larger systems
- Connection Security: security of the connections between components, both physical and logical
- System Security: security aspects of systems that use software and are composed of components and connections
- Human Security: the study of human behavior in the context of data protection, privacy, and threat mitigation
- Organizational Security: protecting organizations from cybersecurity threats and managing risk to support successful accomplishment of the organizations' missions
- Societal Security: aspects of cybersecurity that broadly impact society as a whole

Admission for transfer students is based on a review of college transcripts and documentation of work experience. Applicants must submit an application for admission as a degree-seeking student. Transfer applicants must hold an associate's degree (A.A.) from an accredited college or the equivalent (completion of at least 55 credit hours). Only courses in which the student has earned a grade of "C" or better may be accepted for transfer. Supporting documentation to be included with the application includes official transcripts of all college-level work.

Illinois Tech/College of DuPage and Illinois Tech/Joliet Junior College Dual Admissions Programs

Students who meet the requirements of the Dual Admissions Program (DAP) may enroll simultaneously at the College of DuPage (COD) or Joliet Junior College (JJC) and Illinois Institute of Technology. Students accepted into the DAP will have access to advising and other services from both institutions. Students who successfully complete the institutional course requirements of both institutions under the DAP will be awarded an associate's degree from COD or JJC and a Bachelor of Information Technology and Management from Illinois Institute of Technology.

Eligibility for the Program

Students applying to the DAP must be enrolled in one of the following programs:

At COD: Associate of Applied Science in Computer Information Systems or Associate of Applied Science in Computer Internetworking Technologies

At JJC: Associate of Applied Science in Computer Information Systems; Network Specialist, Programming, or Web Design and Administration options

Students must have and maintain a cumulative GPA of at least 3.00 at COD or JJC to be eligible for admission to Illinois Tech. Students must make satisfactory academic progress at COD, as defined by COD, or at JJC, as defined by JJC.

Application Process

Applicants must complete a Statement of Intent Form, which permits the exchange of academic admission and advising information between Illinois Tech and COD or JJC. Applicants must also complete the application process at both COD or JJC and Illinois Tech in order to be admitted to both institutions. The Illinois Tech application may be submitted only for a Bachelor in Information Technology and Management. Admission to other Illinois Tech programs may have additional requirements that are outside the scope of the program.

Academic Program Requirements

Students must follow each institution's policies regarding admission, course enrollment, transfer hours, probation, dismissal, and reinstatement. Transcripts must be sent to the Illinois Tech Office of Undergraduate Academic Affairs each semester for each student attending COD or JJC and enrolled in the DAP. Illinois Tech will provide COD and JJC with major and course updates, course prerequisites, and program requirements for the information technology and management bachelor's degree completion program.

Graduation Requirements

Students enrolled in the DAP must follow the COD or JJC catalog to satisfy requirements for the associate's degree and the requirements set out in the Illinois Tech Undergraduate Catalog in effect at the time of admission into the DAP for the bachelor's degree.

The Center for Cyber Security and Forensics Education

The Center for Cyber Security and Forensics Education (C^2SAFE) is a multi-disciplinary center within the College of Computing. The objectives of the Center for Cyber Security and Forensics Education are to:

- Develop, promote, and support education and research in cybersecurity technologies and management, information assurance, and digital forensics across all academic disciplines at Illinois Institute of Technology
- Engage with business and industry, government, professional associations, and community colleges to enhance knowledge, awareness, and education in cybersecurity and digital forensics and improve practices in information assurance
- Coordinate the designation of Illinois Institute of Technology as a National Center of Academic Excellence in Cyber Defense Education
- Maintain resources for education and research in cybersecurity and digital forensics, publish student and faculty research in the field, and sponsor, organize, and conduct conferences and other events to promote and advance cyber security and forensics education
- Support the university's academic departments in the delivery of the highest caliber of cyber security and digital forensics education

The center plans, organizes, and conducts the annual ChiCyberCon (formerly ForenSecure) conference in the spring of each year, as well as additional activities and student competitions that advance the mission of the center.

The center actively cooperates and coordinates activities with agencies of the federal government and with professional organizations and programs such as the Information Systems Security Association (ISSA), the Information Systems Audit and Control Association (ISACA), the Association of Information Technology Professionals (AITP), the Association for Computing Machinery (ACM), the Institute of Electrical and Electronic Engineers (IEEE), UNIFORUM, CompTIA, Infragard, and others. The center makes every effort to engage in joint activities with these organizations and to encourage them to engage with the center whenever possible.

Illinois Institute of Technology has been designated as a National Center of Academic Excellence in Cyber Defense Education by the National Security Agency. This designation results from meeting stringent Center of Academic Excellence criteria and mapping of information technology and management curricula to a core set of cyber defense knowledge units. Students attending Center of Academic Excellence in Cyber Defense Education institutions are eligible to apply for scholarships and grants through the Department of Defense Cyber Scholarship Program and the Federal Cyber Service Scholarship for Service Program. This designation reflects Illinois Institute of Technology's commitment to producing professionals with cyber defense expertise for the nation.

Resources for education and research as well as published student and faculty research in the form of technical reports and white papers are available on the center's website (www.iit.edu/c2safe).

Degree Programs

- Bachelor of Information Technology
- Bachelor of Information Technology and Management

- Bachelor of Information Technology and Management: Transfer Program
- Bachelor of Science in Applied Cybersecurity and Information Technology

Accelerated Master's Program: Co-Terminal Options

The Department of Information Technology and Management also offers the following co-terminal degrees, which enables a student to simultaneously complete both an undergraduate and graduate degree in as few as five years:

- Bachelor of Information Technology/Master of Information Technology
- Bachelor of Information Technology and Management/Master of Cyber Forensics and Security
- Bachelor of Information Technology and Management/Master of Information Technology and Management

These co-terminal degrees allow students to gain greater knowledge in specialized areas while, in most cases, completing a smaller number of credit hours with increased scheduling flexibility. Additional co-terminal options are also available upon departmental approval. For more information, please visit the Department of Information Technology and Management website (iit.edu/itm) and the Accelerated Master's Program: Co-Terminal information page.

Minors

- Minor in Cyber Defense
- Minor in Cyber Security Foundations
- Minor in Information Security
- Minor in Information System Administration
- Minor in Information System Network Management
- Minor in Information Technology and Management
- Minor in Information Technology Foundations
- Minor in Internet Application Development

Course Descriptions

ITM 300
Communication in the Workplace
Review, analyze and practice verbal and written communication formats found in the workplace. Emphasis on developing skills in technical writing and oral presentations using electronic and traditional media. Credit not granted for both ITM 300 and COM 421. INTM 301 may be substituted for this course.
Lecture: 3 **Lab:** 0 **Credits:** 3
Satisfies: Communications (C)

ITM 301
Introduction to Contemporary Operating Systems and Hardware I
Students study the basics of computer architecture and learn to use a contemporary operating system. Hardware requirements, hardware components, software compatibility, and system installation topics are covered along with post-installation, storage, security and system diagnosis, and repair. Topics also include discussion of current and future technology industry trends.
Lecture: 2 **Lab:** 2 **Credits:** 3

ITM 303
Introduction to Contemporary Operating Systems and Hardware II
Introduces features of an advanced operating system, including basic commands, file and directory manipulation, security, and suitability for server applications. Popular and business-focused desktop and mobile device operating systems will be examined, as well as enterprise and open-source server implementations.
Lecture: 2 **Lab:** 2 **Credits:** 3

ITM 311
Introduction to Software Development
A broad introduction to object-oriented programming and the related knowledge necessary to program in a contemporary programming language. This would include coverage of an Application Development Kit, a standard integrated Development environment, and the use of GUI components.
Lecture: 2 **Lab:** 2 **Credits:** 3

ITM 312
Introduction to Systems Software Programming
Introduces basic concepts of systems programming. Students learn to apply basic programming concepts toward solving problems, create source files and implement header files, work with and effectively use basic data types, abstract data types, control structures, code modularization and arrays. Students will be introduced to object paradigm including, classes, inheritance, and polymorphism applications.
Lecture: 2 **Lab:** 2 **Credits:** 3

ITM 313
Introduction to Open Source Application Development
Introduces basic concepts of systems programming using a modern open source language. Students learn to apply basic programming concepts toward solving problems, writing pseudocode, working with and effectively using basic data types, abstract data types, control structures, code modularization and arrays. They will learn to detect errors, work with variables and loops, and discover how functions, methods, and operators work with different data types. Students will be introduced to the object paradigm including classes, inheritance , and polymorphism.
Lecture: 2 **Lab:** 2 **Credits:** 3

ITM 497

Independent Study

Special projects.

Credit: Variable

ITM 498

Undergraduate Research Immersion: Team

This course provides a faculty-mentored immersive research experience as a part of a student team. Research topics are determined by faculty mentor's area of research.

Lecture: 0 **Lab:** 6 **Credits:** 3

ITMD 321

Data Modeling and Applications

Basic data modeling concepts are introduced. Hands-on database design, implementation, and administration of single-user and shared multi-user database applications using a contemporary relational database management system.

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 361

Fundamentals of Web Development

This course covers the creation and deployment of modern, standards-compliant web pages written in HTML, CSS, and JavaScript in the context of the client-server architecture of the web. Students create and deploy a website with multiple, structured pages cross-linked by a site navigation structure.

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 362

Human-Computer Interaction and Web Design

Students in this course will learn the importance of human-computer interaction design and the effectiveness of user-centered design. The course will cover a survey of methods frequently used in the HCI profession, such as usability testing and prototyping, as well as general design principles and the use design guidelines. A particular emphasis will be placed on usability for website engineering. Students will apply knowledge from the field in the design and construction of user-centered websites.

Prerequisite(s): ITMD 361

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 411

Intermediate Software Development

This course covers a broad spectrum of object-oriented programming concepts and application programming interfaces. The student considers the details of object-orientated development in topics of multi-threading, data structure collections, stream I/O and client interfaces. Software engineering topics of packaging and deployment are covered as well. Hands-on exercises reinforce concepts taught throughout the course.

Prerequisite(s): (ITM 311 or CS 116 or CS 201) and (ITM 312 or ITM 313 or CS 331)

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 412

Advanced Structured and Systems Programming

Structured programming continues with advanced concepts including strings, arrays, pointers, data structures, file manipulation, and dynamic memory management. Students create more complex applications that work with user input, manipulate user supplied text or text obtained from a file, apply standard library routines for working with literal text, use pointers to store complex structures within arrays, and read and write data from files, the console, and the terminal. The object-oriented programming (OOP) paradigm is covered in depth including the philosophy of OOP, classes and objects, inheritance, template classes, and making use of class libraries.

Prerequisite(s): ITM 312 or Graduate standing

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 413

Open Source Programming

Contemporary open-source programming languages and frameworks are presented. The student considers design and development topics in system, graphical user interface, network, and web programming. Dynamic scripting languages are covered using object-oriented, concurrent, and functional programming paradigms. Concepts gained throughout the course are reinforced with numerous exercises which will culminate in an open-source programming project.

Prerequisite(s): ITMD 411

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 415

Advanced Software Development

This course considers Web container application development for enterprise systems. The primary focus is on database connectivity (JDBC) integration with Web application programming using an enterprise-level application framework. A Web application term project considers the design and implementation of a database instance that serves as the information tier in a contemporary 3-tier enterprise solution.

Prerequisite(s): ITMD 411

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 419

Topics in Software Development

This course will cover a particular topic in software development, varying from semester to semester, in which there is particular student or staff interest. This course may be taken more than once but only 9 hours of ITMD 419/519 credit may be applied to a degree.

Credit: Variable

ITMD 422

Advanced Database Management

Advanced topics in database management and programming including client server application development are introduced. Expands knowledge of data modeling concepts and introduces object-oriented data modeling techniques. Students will learn the use of Structured Query Language in a variety of application and operating system environments.

Prerequisite(s): ITMD 321

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 441
Web Application Foundations
In this course students examine core web technologies that are integral in the creation of web-based applications typically delivered in a browser. The course will cover fundamental web protocols, web application architectures, markup, and scripting languages. A focus will be placed on writing modern, standards-compliant JavaScript and how it is used to interact with HTML and CSS to enable rich user interfaces and communication with other services. Current frameworks, libraries, and tools will also be explored.
Prerequisite(s): ITMD 361
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 442
Full-Stack Web Development
This course covers the fundamental concepts and techniques of full-stack web development, focusing on server-delivered front-end content such as server-rendered HTML or JSON and its integration with back-end architectures and data stores.
Prerequisite(s): ITMD 441
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 443
Front-End Web Development
Catalog description: This course emphasizes front-end, browser-based components of web application development. It includes a robust survey of Web APIs in addition to advanced coverage of visual design executed in leading-edge CSS.
Prerequisite(s): ITMD 442
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 444
Back-End Development
This course emphasizes back-end, server-side components of web application development. It provides broad coverage of server-side data stores and languages, and surveys multiple leading server-side web development frameworks.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 445
Web Real-Time Communication
This course covers the WebRTC specification's set of protocols, architectures, and APIs designed to enable browser-to-browser real-time communication of voice, video, and data. Students will learn to apply basic technologies including WebSockets, HTTP, HTML5, Web Sockets, NAT, STUN, TURN, and ICE to ensure two-way real-time communication. Students will use JavaScript and development environments to create basic data and media applications based on WebRTC technologies and will analyze the impact of their applications on the performance and behavior of the networks that carry them.
Prerequisite(s): ITMD 441
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 446
Web Microservices and APIs
This course covers fundamental principles and methods for programmatically accessing and parsing data returned by internet-available data APIs. The course guides students in carefully examining the structure of API endpoints expressed as URLs and the conventions of RESTful architecture.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 447
Web Systems Integration
In this project-based course, student teams will build an enterprise-grade website and web infrastructure integrating server-side applications, databases, and client-side rich internet applications as a solution to a defined business problem.
Prerequisite(s): ITMD 442 and ITMD 441
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 449
Topics in Web Development
This course will cover a particular topic in web development, varying from semester to semester, in response to a specific student or faculty interest. This course may be taken more than once, but only 9 hours of ITMD 449 credit may be applied to a degree.
Credit: Variable

ITMD 453
Enterprise Intelligent Device Applications
Intelligent device application development is covered with proprietary enterprise and open-source technologies on media device, mobile, and robotic platforms. Utilizing contemporary toolkits, the student considers design and development on simulated and real "smart" devices including smart phones, tablets, sensors, actuators, drones, and robots. Numerous exercises reinforce concepts gained throughout the course. A term project will integrate course topics into a comprehensive intelligent device application.
Prerequisite(s): ITM 311
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 454
Mass-Market Intelligent Device Applications
Intelligent device application development is covered with leading mass-market and open-source technologies on media device, mobile, and robotic platforms. Utilizing contemporary toolkits, the student considers design and development on simulated and real "smart" devices including smart phones, tablets, sensors, actuators, drones, and robots. Numerous exercises reinforce concepts gained throughout the course. A term project will integrate course topics into a comprehensive intelligent device application.
Prerequisite(s): ITM 312
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 455
Open-Source Intelligent Device Applications
Intelligent device application development is covered with various technologies on mobile and robotic platforms. Utilizing contemporary toolkits, the student considers design and development on emulated and real "smart" devices including smart phones, personal digital assistants, sensors, actuators, and robots. Numerous exercises reinforce concepts gained throughout the course. A term project will integrate course topics into a comprehensive intelligent device application.
Prerequisite(s): ITM 311
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 460
Fundamentals of Multimedia
Students are introduced to computer-based multimedia theory, concepts, and applications. Topics include desktop publishing, hypermedia, presentation graphics, graphic images, animation, sound, video, multimedia on the World Wide Web and integrated multimedia authoring techniques.
Lecture: 3 **Lab:** 0 **Credits:** 3
Satisfies: Communications (C)

ITMD 466
Service-Oriented Architecture
This course covers IT enterprise systems employing web services technologies in SOA and ESB architectural patterns. The student considers SOA which defines and provisions IT infrastructure and allows for a loosely-coupled data exchange over disparate applications participating in business processes. The simplification of integration and flexible reuse of business components within SOA is greatly furthered by ESB. Lab exercises using contemporary tool-kits are utilized to reinforce platform-agnostic course topics.
Prerequisite(s): ITMD 411 and ITMD 361
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 469
Topics in Application Development
This course will cover a particular topic in application development, varying from semester to semester, in which there is particular student or staff interest. This course may be taken more than once but only 9 hours of ITMD 469/569 credit may be applied to a degree.
Credit: Variable

ITMM 464
Social Media Marketing
Class participants will explore the tactics, tools, and strategies of incorporating new media channels to successfully grow a business and/or to maximize the goals of other types of organizations.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 470
Fundamentals of Management for Technology Professionals
This course explores fundamentals of management for professionals in high-technology fields. It addresses the challenges of the following: managing technical professionals and technology assets; human resource management; budgeting and managerial accounting; management of services, infrastructure, outsourcing, and vendor relationships; technology governance and strategy; and resource planning.
Lecture: 3 **Lab:** 0 **Credits:** 3
Satisfies: Communications (C)

ITMM 471
Project Management for Information Technology and Management
Basic principles of project management are taught with a particular focus on project planning for information technology hardware, software and networking project implementation. Management of application development and major Web development projects will also be addressed.
Prerequisite(s): ITM 100
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 481
Information Technology Entrepreneurship
This course prepares students to become leaders in information technology and to build ITM companies. Students design and develop a prototype ITM product and prepare a business plan and venture proposal presentation.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 482
Business Innovation
This course is designed to teach innovative thinking through theory, methods, and practice of innovation. The course incorporates Einstein's thinking, and Edison's method to establish the innovation process that can be applied in current business environment. Current economic conditions and global sourcing requires that innovation becomes a leading tool for developing a competitive edge. Innovation has been considered a competency of educated, design engineering, and a selected few employees that has become insufficient today. Corporations and organizations need innovation to develop customer-specific solutions in almost real time.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 485
Legal and Ethical Issues in Information Technology
Current legal issues in information technology are addressed including elements of contracting, payment systems and digital signatures, privacy concerns, intellectual property, business torts, and criminal liability including hacking, computer trespass and fraud. Examination of ethical issues including privacy, system abuse, and ethical practices in information technology equip students to make sound ethical choices and resolve legal and moral issues that arise in information technology.
Lecture: 3 **Lab:** 0 **Credits:** 3
Satisfies: Communications (C)

ITMM 487
Product Management
This course explores the Product Management role in information tech-nology and common processes, tools, and methods employed. Students will learn to identify business opportunities and market strategies as well as management of develop-ment teams in product developments that cross business and technology boundaries.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 340
Introduction to Data Networks and the Internet
This course covers current and evolving data network technologies, protocols, network components, and the networks that use them, focusing on the Internet and related LANs. The state of worldwide networking and its evolution will be discussed. This course covers the Internet architecture, organization, and protocols including Ethernet, 802.11, routing, the TCP/UDP/IP suite, DNS, SNMP, DHCP, and more. Students will be presented with Internet-specific networking tools for searching, testing, debugging, and configuring networks and network-connected host computers. There will be opportunities for network configuration and hands-on use of tools.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 356
Introduction to Open Source Operating Systems
Students learn to set up and configure an industry-standard open source operating system including system installation and basic system administration; system architecture; package management; command-line commands; devices, filesystems, and the filesystem hierarchy standard. Also addressed are applications, shells, scripting and data management; user interfaces and desktops; administrative tasks; essential system services; networking fundamentals; and security, as well as support issues for open source software. Multiple distributions are covered with emphasis on the two leading major distribution forks.
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMO 417
Shell Scripting for System Administration
Focuses on preparation of shell scripts to enhance and streamline system administration tasks in all contemporary server operating systems. Scripting will be taught in both native and portable environments. The course will address shell programming, regular expressions, common and system-specific shell utilities and built-in commands, user defined and shell variables, flow control structures, shell functions, and the creation and execution of shell scripts. Homework and hands-on exercises will provide practical experience in contemporary server environments. Same as ITMO 517.
Prerequisite(s): ITMO 356 or ITMO 456
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 433
Enterprise Server Administration
Students learn to set up, maintain, and administer X86-based servers and associated networks using a contemporary industry-standard proprietary operating system. Topics include hardware requirements; software compatibility; system installation, configuration and options, and post-installation topics; administrative and technical practices required for system security; process management; performance monitoring and tuning; storage management; back-up and restoration of data; and disaster recovery and prevention. Also addressed is configuration and administration of common network and server services such as DNS, DHCP, remote access, email, basic virtualization, web and web services, and more.
Prerequisite(s): ITM 301 and (ITMO 340 or ITMO 440)
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 441
Network Administration and Operations
Students learn the details, use, and configuration of network applications. Currently protocols and application technologies considered include SNMP, SMTP, IMAP, POP, MIME, BOOTP, DHCP, SAMBA, NFS, AFS, X, HTTP, DNS, NetBIOS, and CIFS/SMB. Windows workgroups and domains: file and printer sharing, remote access, and Windows networking are addressed. A research paper in the above topic areas is required.
Prerequisite(s): ITMO 340 or ITMO 540 with min. grade of C or ITMO 440
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 444
Cloud Computing Technologies
Computing applications hosted on dynamically-scaled virtual resources available as services are considered. Collaborative and non-collaborative "cloud-resident" applications are analyzed with respect to cost, device/location independence, scalability, reliability, security, and sustainability. Commercial and local cloud architectures are examined. A group-based integration of course topics will result in a project employing various cloud computing technologies.
Prerequisite(s): ITMD 421 or ITMD 321
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 446
Telecommunications Over Data Networks
This course covers a suite of application protocols known as Voice over IP (VoIP). It covers key protocols within that suite, including Session Initiation Protocol (SIP), Real-time Transport Protocol (RTP) and Session Description Protocol (SDP) as well as the architectures of various VoIP installations including on-net to on-net; on-net to PSTN; and inter-domain scenarios. The functions of the Network Elements in these architectures are defined and examples of products that include these network elements are examined. Contrast with circuit-switched and web-based communications systems is provided.
Prerequisite(s): ITMO 440 or ITMO 340
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMO 450

Enterprise End-User System Administration

Students learn to set up, configure, and maintain end-user desktop and portable computers and devices in an enterprise environment using a contemporary proprietary operating system, including the actual installation of the operating system in a networked client-server environment. User account management, security, printing, disk configuration, and backup procedures are addressed with particular attention to coverage of networked applications. System installation, configuration, and administration issues as well as network file systems, network access, and compatibility with other operating systems are also addressed. Administration of central server resources associated with management and provisioning of end-user systems in workgroups, domains, or forests is also addressed.

Prerequisite(s): ITM 301

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 453

Open Source Server Administration

Students learn the administration topics and concepts of IT orchestration, automation, monitoring, and metric collection. Topics include configuring industry standard automation tooling and using scripting to achieve immutable infrastructure. Students will learn how to monitor and collect and present metrics in regards to the infrastructure they deploy.

Prerequisite(s): (ITMO 340 or ITMO 440) and (ITMO 356 or ITMO 456)

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 454

Operating System Virtualization

This course will cover technologies allowing multiple instances of operating systems to be run on a single physical system. Concepts addressed will include hypervisors, virtual machines, paravirtualization and virtual appliances. Both server and desktop virtualization will be examined in detail, with brief coverage of storage virtualization and application virtualization. Business benefits, business cases and security implications of virtualization will be discussed. Extensive hands-on assignments and a group project will allow students to gain first-hand experience of this technology.

Prerequisite(s): ITM 301 or ITMO 456 or ITMO 356

Lecture: 2 **Lab:** 2 **Credits:** 3

ITMO 463

Cloud: Software as a Service

Software as a Service (SaaS) allows consumers to use a provider's applications running on a cloud infrastructure, accessible from client devices over a network through either a thin client interface, such as a web browser, or a program interface. Stu-dents will explore different approaches, techniques, tools and technologies to build, deploy, and manage cloud native applications.

Prerequisite(s): ITMO 444

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 464

Cloud: Platform as a Service

Platform as a Service (PaaS) allows developers to deploy onto the cloud infrastructure developer-created or acquired applications created using programming languages, libraries, services, and tools supported by the cloud provider. Students learn to develop applications and services using popular platforms and service tools, and to manage deployed applications as well as configuration settings for the applica-tion-hosting environment.

Prerequisite(s): ITMO 444

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 465

Cloud: Infrastructure as a Service

Infrastructure as a Service (SaaS) allows users to provision processing, storage, networks, and other fundamental computing resources which then allows them to deploy and run arbitrary software, which can include operating systems and applications. Students will learn how to provision, deploy and manage operating systems, storage, and deployed applications as well as virtual networking components such as switches, routers, and firewalls in a cloud environment accessible remotely through a network.

Prerequisite(s): ITMO 444

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 418

Coding Security

This course examines security architecture elements within modern object oriented programming languages that create the framework for secure programming. Analysis of components and services with their inherent strength and weaknesses give rise to common coding security challenges. An exploration of identity management, encryption services and common hacking techniques will enable the student's ability to develop secure code. Homework assignments and projects will reinforce theories taught.

Prerequisite(s): ITMD 411

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 428

Database Security

Students will engage in an in-depth examination of topics in data security including security considerations in applications and systems development, encryption methods, cryptography law and security architecture and models.

Prerequisite(s): ITMD 421

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 438

Cyber Forensics

This course will address methods to properly conduct a computer and/or network forensics investigation including digital evidence collection and evaluation and legal issues involved in network forensics. Technical issues in acquiring court admissible chains-of-evidence using various forensic tools that reconstruct criminally liable actions at the physical and logical levels are also addressed. Technical topics covered include detailed analysis of hard disks, files systems (including FAT, NTFS, and EXT) and removable storage media; mechanisms for hiding and detecting hidden information; and the hands-on use of powerful forensic analysis tools.

Prerequisite(s): ITMO 356 and ITMS 448

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 443
Vulnerability Analysis and Control
This course addresses hands-on ethical hacking, penetration testing, and detection of malicious probes and their prevention. It provides students with in-depth theoretical and practical knowledge of the vulnerabilities of networks of computers including the networks themselves, operating systems, and important applications. Integrated with the lectures are laboratories focusing on the use of open source and freeware tools; students will learn in a closed environment to probe, penetrate, and hack other networks.
Prerequisite(s): ITMO 356 and ITMO 340
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 446
Active Cyber Defense
This course covers the duties of cybersecurity analysts who are responsible for monitoring and detecting security incidents in information systems and networks, and for executing a proper response to such incidents. The course introduces tools and tactics to manage cybersecurity risks, identify various types of common threats, evaluate the organization's security, collect and analyze cybersecurity intelligence, and handle incidents as they occur.
Prerequisite(s): ITMO 340 or CS 542 with min. grade of C or CS 544 with min. grade of C or ECE 407 or ECE 408
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMS 448
Cyber Security Technologies
Prepares students for a role as a network security analyst and administrator. Topics include viruses, worms, and other attack mechanisms, vulnerabilities, and countermeasures; network security protocols, encryption, identity and authentication, scanning, firewalls, security tools, and organizations addressing security. A component of this course is a self-contained team project that, if the student wishes, can be extended into a fully operational security system in a subsequent course.
Prerequisite(s): ITMO 340 or ITMO 540 with min. grade of C
Lecture: 2 **Lab:** 2 **Credits:** 3
Satisfies: Communications (C)

ITMS 458
Operating System Security
This course will address theoretical concepts of operating system security, security architectures of current operating systems, and details of security implementation using best practices to configure operating systems to industry security standards. Server configuration, system-level firewalls, file system security, logging, anti-virus and anti-spyware measures and other operating system security strategies will be examined.
Prerequisite(s): ITMO 356
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMS 464
Cloud Computing Security
Students will learn how to effectively secure cloud-based services and infrastructure in an enterprise setting. Areas addressed will include de-sign principles of secure cloud computing, data security, platform and infrastructure security, application security and the Secure Software Development Life Cycle (SDLC) and DevSecOps processes, and security operations. The course will cover legal, risk, and compliance aspects of cloud computing, all in the context of a set of industry-standard learning domains.
Prerequisite(s): ITMO 444
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 478
Cyber Security Management
In-depth examination of topics in the management of information technology security including access control systems and methodology, business continuity and disaster recovery planning, legal issues in information system security, ethics, computer operations security, physical security and security architecture & models using current standards and models.
Lecture: 3 **Lab:** 0 **Credits:** 3
Satisfies: Communications (C)

ITMS 479
Topics in Information Security
This course will cover a particular topic in Information Security, varying from semester to semester, in which there is particular student or staff interest. This course may be taken more than once but only 9 hours of ITMS 479/579 credit may be applied to a degree.
Credit: Variable

ITMS 483
Digital Evidence
In this course, students learn the fundamental principles and concepts in the conduct of investigations in the digital realm. Students will learn the process and methods of obtaining, preserving and presenting digital information for use as evidence in civil, criminal, or administrative cases. Topics include legal concepts and terminology, ethics, computer crime, investigative procedures, chain of custody, digital evidence controls, processing crime and incident scenes, data acquisition, e-mail Investigations, applicable case law, and appearance as an expert witness in a judicial or administrative proceeding.
Prerequisite(s): ITMS 438
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 484
Governance, Risk, and Compliance
This course is an in-depth examination of topics in information technology/information security governance, risk, and compliance including information assurance policies, standards, and compliance as well as the examination of security risk analysis and the performance of systems certification and accreditation.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMT 330

Introduction to Information Systems and the IT Profession

Introduces students to concepts of systems, systems theory and modeling, information systems, and system integration. Examines the steps necessary to analyze a business problem and identify and define the computing and information requirements appropriate to its solution, with a focus on how to design, implement, and evaluate a technology-based system to meet desired needs. Students learn to analyze the local and global impact of computing on individuals, organizations, and society. Leads students to recognize of the need for continuing professional development, and imparts an understanding of professional, ethical, legal, security and social issues and responsibilities in information technology. Students write and present, building their ability to communicate effectively with a range of audiences, and using standard planning methodologies design an information system to meet the information needs of a small business. This course meets the university Introduction to the Profession Core Course requirement.

Prerequisite(s): (ITM 301 and ITM 311) or ITM 312 or ITM 313 or CS 116 or CS 201

Lecture: 3 **Lab:** 0 **Credits:** 3

ITMT 430

System Integration

In this capstone course, students will identify, gather, analyze, and write requirements based on user needs and will then design, construct, integrate, and implement an information system as a solution to a business problem. Students will document integration requirements using business process models and will learn and apply key systems integration architecture, methodologies, and technologies using industry best practices. User needs and user centered design will be applied in the selection, creation, evaluation, and administration of the resulting system. The system design process will take into account professional, ethical, legal, security, and social issues and responsibilities and stress the local and global impact of computing on individuals, organizations, and society. Discussion will also cover the need to engage in continuing professional development.

Prerequisite(s): ITMD 411 and ITMD 321 and ITMM 471 and ITMO 356 and ITMD 362 and ITMO 340

Lecture: 2 **Lab:** 2 **Credits:** 3

Satisfies: Communications (C), Ethics (E)

ITMT 491

Undergraduate Research

Undergraduate research. Written consent of instructor is required.

Credit: Variable

ITMT 492

Introduction to Smart Technologies

This course covers reconfigurable intelligent devices programmed with modern high level languages focusing on design and integration to modern environments. The course will also cover the topic and deployment of wireless sensor networks and the use of rapid prototyping for commercial application. Students will discover hardware, software and firmware design trade-offs as well as best practices in current embedded systems development. A final project will integrate course topics into a system using an embeddable single-board microcontroller.

Prerequisite(s): ITM 311 or ITM 312

Lecture: 2 **Lab:** 2 **Credits:** 3

ITMT 495

Topics in Information Technology

This course will cover a particular topic varying from semester to semester in which there is particular student or staff interest.

Credit: Variable

TECH 210

English Studies -- Cultural Enrichment

This course is designed to introduce international students to Chicago and American culture while providing opportunities to improve English communication and conversational skills. The course will consist of classroom lectures, discussions, and cultural excursions to events and famous sites in Chicago. English language strategies learned in class will be reinforced by field trips, discussions, structured listening and speaking activities, and readings involving current topics. The course will provide students with real-world opportunities to practice English and enjoy cultural outings.

Lecture: 2 **Lab:** 0 **Credits:** 2

TECH 310

Language Lab

This course is designed to introduce international students to the sound system of North American English (NAE). Students will develop skills to improve pronunciation, fluency, and grammar through a combination of instructor-led activities and computer-based software.

Lecture: 1 **Lab:** 1 **Credits:** 1

TECH 465

Introduction to Social Commerce

Provides an introduction and basic knowledge of social commerce to help students develop a practical understanding of the design, construction, market readiness, and synergistic integration of a business mobile application. The course will provide a practitioner focus that will benefit students in a start-up or company/corporate setting.

Lecture: 3 **Lab:** 0 **Credits:** 3

TECH 497

Special Projects

Independent study and projects in applied technology that are multi/cross-disciplinary not tied to a specific department.

Credit: Variable