

# BACHELOR OF SCIENCE IN APPLIED CYBERSECURITY AND INFORMATION TECHNOLOGY

All students must complete a minimum of 36 credit hours of courses with a significant written and oral communication component, identified with a (C) in the bulletin; 12 credit hours of (C)-coded courses must be taken in the major.

A maximum of 9 credit hours of ITM graduate courses taken as an undergraduate may be applied to a Master's degree offered by the Department of Information Technology and Management, and any graduate courses taken to fulfill undergraduate degree requirements may not also be applied to a graduate degree unless the student is enrolled in a co-terminal master's degree program.

## Required Courses

<b>Information Technology Core Requirements</b>		<b>(33)</b>
ITM 100	Introduction to Information Technology as a Profession	3
ITM 301	Introduction to Contemporary Operating Systems and Hardware	3
ITM 311	Introduction to Software Development	3
ITM 312	Introduction to Systems Software Programming	3
ITMD 361	Fundamentals of Web Development	3
ITMD 362	Human-Computer Interaction and Web Design	3
ITMD 411	Intermediate Software Development	3
ITMD 421	Data Modeling and Applications	3
ITMM 471	Project Management for Information Technology and Management	3
ITMO 440	Introduction to Data Networks and the Internet	3
ITMO 456	Introduction to Open Source Operating Systems	3
<b>Cybersecurity Core Requirements</b>		<b>(27)</b>
ITMM 485	Legal and Ethical Issues in Information Technology	3
ITMS 418	Coding Security	3
ITMS 438	Digital Forensics	3
ITMS 443	Vulnerability Analysis and Control	3
ITMS 448	Cyber Security Technologies	3
ITMS 458	Operating System Security	3
ITMS 478	Cyber Security Management	3
ITMS 483	Digital Evidence	3
ITMT 430	System Integration	3
<b>Cybersecurity and Information Technology Electives</b>		<b>(6)</b>
Select 6 credit hours from ITMD, ITMM, ITMO, ITMS, ITMT, or TECH		6
<b>Mathematics Requirements</b>		<b>(20)</b>
MATH 151	Calculus I	5
MATH 152	Calculus II	5
MATH 230	Introduction to Discrete Math	3
MATH 251	Multivariate and Vector Calculus	4
MATH 474	Probability and Statistics	3
<b>Natural Science and Engineering Requirements</b>		<b>(10)</b>
EG 225 and PHYS 200 are recommended		
See IIT Core Curriculum, section D		10
<b>Humanities and Social Sciences Requirements</b>		<b>(21)</b>
PSYC 301 is recommended		
See IIT Core Curriculum, sections B and C		21
<b>Interprofessional Projects (IPRO)</b>		<b>(6)</b>
See IIT Core Curriculum, section E		6
<b>Free Electives</b>		<b>(6)</b>
Select 6 credit hours		6
<b>Total Credit Hours</b>		<b>129</b>

## Bachelor of Science in Applied Cybersecurity and Information Technology Curriculum

Students should be aware that students not completing 30 credit hours of study in their first year will still be classified as a first-year student in the first semester of their second year of study, which may adversely impact some financial aid. Students with issues or questions about this should discuss it with a financial aid counselor.

		<b>Year 1</b>	
<b>Semester 1</b>	<b>Credit Hours</b>	<b>Semester 2</b>	<b>Credit Hours</b>
ITM 301	3	ITM 311	3
ITMD 421	3	ITMO 440	3
MATH 151	5	MATH 152	5
Humanities 200-level Elective	3	Social Sciences Elective	3
		Natural Science or Engineering Elective	3
14		17	
		<b>Year 2</b>	
<b>Semester 1</b>	<b>Credit Hours</b>	<b>Semester 2</b>	<b>Credit Hours</b>
ITM 100	3	ITMD 362	3
ITM 312	3	ITMD 411	3
ITMD 361	3	ITMO 456	3
MATH 251	4	ITMS 478	3
Natural Science or Engineering Elective	4	MATH 230	3
		Natural Science or Engineering Elective	3
17		18	
		<b>Year 3</b>	
<b>Semester 1</b>	<b>Credit Hours</b>	<b>Semester 2</b>	<b>Credit Hours</b>
ITMM 471	3	ITMS 438	3
ITMS 418	3	ITMS 443	3
ITMS 448	3	ITMS 458	3
Humanities Elective (300+)	3	I PRO Elective I	3
Social Sciences Elective (300+)	3	MATH 474	3
Free Elective	3		
18		15	
		<b>Year 4</b>	
<b>Semester 1</b>	<b>Credit Hours</b>	<b>Semester 2</b>	<b>Credit Hours</b>
ITMM 485	3	ITMT 430	3
ITMS 483	3	Cybersecurity Elective	3
Cybersecurity Elective	3	Social Sciences Elective (300+)	3
Humanities Elective (300+)	3	I PRO Elective II	3
Free Elective	3	Humanities or Social Sciences Elective	3
15		15	

Total Credit Hours: 129

# INFORMATION TECHNOLOGY AND MANAGEMENT

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10 W. 33rd St.  
Perlstein Hall Room 223  
Chicago IL 60616  
312.567.5290  
[appliedtech.iit.edu/information-technology-and-management](http://appliedtech.iit.edu/information-technology-and-management)

Daniel F. and Ada L. Rice Campus  
201 E. Loop Rd.  
Wheaton, IL 60189  
630.982.6000

## Dean and Chair

C. Robert Carlson

## Associate Chair and Director of Undergraduate Advising

Ray Trygstad

## Faculty with Research Interests

For information regarding faculty visit the Department of Information Technology and Management website.

The objective of bachelors' degrees offered by the Department of Information Technology and Management 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 Bachelor of Information Technology and Management degree 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. 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, create, and effectively communicate 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 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 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:

- Information technology basics including hardware and operating systems
- Application development and programming
- Human-computer interaction
- Databases and data management
- Networking and communications
- Websystems
- Cybersecurity
- Professionalism

## 2 **Information Technology and 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, create, and effectively communicate 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 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.
- Design and implement an enterprise security program using both policy and technology to implement technical, operational, and managerial controls, which will 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 admissible in a court of law.
- Apply current 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, 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 topics from the following areas:

- Information Security
- Software Security
- System Security
- Human Security
- Organizational Security
- Societal Security

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.

## **IIT/College of DuPage and IIT/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 IIT. 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 IIT and COD or JJC. Applicants must also complete the application process at both COD or JJC and IIT in order to be admitted to both institutions. The IIT application may be submitted only for a Bachelor in Information Technology and Management. Admission to other IIT 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 IIT Office of Undergraduate Academic Affairs each semester for each student attending COD or JJC and enrolled in the DAP. IIT 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 IIT Undergraduate Bulletin 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 (C2SAFE) is a multi-disciplinary center within the School of Applied Technology. 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 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 and the U.S. Department of Homeland Security. 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 Information Assurance 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 ([appliedtech.iit.edu/c2safe](http://appliedtech.iit.edu/c2safe)).

## Degree Programs

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

## 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 and Management/Master of Cyber Forensics and Security
- Bachelor of Information Technology and Management/Master of Information Technology and Management
- Bachelor of Information Technology and Management/Master of Science in Applied Cybersecurity and Digital Forensics
- Bachelor of Science in Cybersecurity and Information Technology /Master of Science in Applied Cybersecurity and Digital Forensics

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. For more information, please visit the Department of Information Technology and Management website ([appliedtech.iit.edu/information-technology-and-management](http://appliedtech.iit.edu/information-technology-and-management)).

## Course Descriptions

### ITM 100

#### Introduction to Information Technology as a Profession

Introduces students to the profession of information technology, beginning with 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 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.

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

**Satisfies:** Communications (C)

### 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 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 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:** 0 **Credits:** 3

### ITMD 361

#### Fundamentals of Web Development

This course will cover the creation of Web pages and sites using HTML, CSS, Javascript, jQuery, and graphical applications as well as the client and server architecture of the Internet and related web technologies. The creation and deployment of modern, standards-compliant web pages are addressed.

Students create and deploy a Web site with multiple pages and cross-linked structures.

**Lecture:** 2 **Lab:** 2 **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 by the HCI profession, such as usability testing and prototyping, as well as general design principles and how to use design guidelines. A particular emphasis will be placed on usability for Web site engineering, and students will apply knowledge from the field in the design and construction of user-centered Web sites.

**Prerequisite(s):** [(ITMD 361)]

**Lecture:** 2 **Lab:** 2 **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 and ITM 312)]

**Lecture:** 2 **Lab:** 2 **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)]

**Lecture:** 2 **Lab:** 2 **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: 2 Lab: 2 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: 2 Lab: 2 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 421****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: 2 Lab: 2 Credits: 3**

**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 421)]

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

**Satisfies:** Communications (C)

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

**Satisfies:** Communications (C)

**ITMD 462****Web Site Application Development**

Programming the Common Gateway Interface (CGI) for Web pages is introduced with emphasis on creation of interfaces to handle HTML form data. CGI programming is taught in multiple languages. Security of Web sites is covered with an emphasis on controlled access sites. Setup, administration and customization of content management systems including blog and portal sites is introduced. Students design and create a Web site including basic CGI programs with Web interfaces and process data flows from online forms with basic database structures.

**Prerequisite(s):** [(ITMD 361)]

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

**Satisfies:** Communications (C)

**ITMD 463****Intermediate Web Application Development**

In-depth examination of the concepts involved in the development of Internet applications. Students will learn the differences and similarities between Internet applications and traditional client/ server applications. A discussion of the technologies involved in creating these Internet applications is included, and students will learn to use these technologies to create robust server-side applications.

**Prerequisite(s):** [(ITMD 361)]

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

**ITMD 464****Advanced Web Application Development**

Strategies for management of electronic commerce allow students to learn to re-engineer established business processes to increase enterprise competitive advantage, provide better customer service, reduce operating costs, and achieve a better return on investment. Students will learn to evaluate, use, and deploy state-of-the-art tools and techniques needed to develop a reliable e-commerce offering on the Web. The course will cover state-of-the-art programming and development tools. This class will provide students with hands-on exposure needed to design and build a fully functional e-commerce Web site.

**Prerequisite(s):** [(ITMD 463)]

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

**ITMD 465****Rich Internet Applications**

Students learn to create interactive rich internet applications using web development frameworks, applications, and techniques that primarily operate on the client-side. These applications often exhibit the same characteristics as desktop applications and are typically delivered through a standards-based web browser via a browser plug-in or independently via sandboxes or virtual machines. Current software frameworks used to download, update, verify, and execute these applications are addressed as well as writing applications for deployment in these frameworks.

**Prerequisite(s):** [(ITMD 361)]

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

**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 361 and ITMD 411)]

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

**ITMD 467****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 462 and ITMD 465)]

**Lecture: 2 Lab: 2 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.

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

**Satisfies:** Communications (C)

**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)



**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 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 440)]

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

**ITMO 440****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 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 440) OR (ITMO 540 with min. grade of C)]

**Lecture: 2 Lab: 2 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 411 and ITMO 456)]

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

**ITMO 453****Open Source Server Administration**

Students learn to set up, configure, and administer an industry-standard open source server operating system including integration with client systems using a variety of operating systems in a mixed environment. Topics include hardware requirements; software compatibility; 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 are configuration and administration of common network and server services such as DNS, DHCP, firewall, proxy, remote access, file and printer sharing, email, web, and web services as well as support issues for open source software.

**Prerequisite(s):** [(ITMO 440 and ITMO 456)]

**Lecture: 2 Lab: 2 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)]

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

**ITMO 456****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**

**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****Digital 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 456) and (ITMS 448) OR (ITMS 548)]

**Lecture: 2 Lab: 2 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.

**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 440) OR (ITMO 540)]

**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 456)]

**Lecture: 2 Lab: 2 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 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, ITMD 421, ITMD 434, ITMD 461, ITMM 471, ITMO 440, and ITMO 456)]

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

**Satisfies:** Ethics (E)

**ITMT 491****Undergraduate Research**

Undergraduate research. Written consent of instructor is required.

**Credit:** Variable

**ITMT 492****Embedded Systems and Reconfigurable Logic Design**

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:** 3 **Lab:** 0 **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 497****Special Projects**

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

**Credit:** Variable