INFORMATION TECHNOLOGY AND MANAGEMENT

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

The mission of the Department of Information Technology and Management is to educate and inform students to prepare them to assume technical and managerial leadership in the information technology and cybersecurity fields. The information technology and management degrees apply a hands-on, reality-based approach to education that allows students to apply what they learn in class to solve real-life problems. Additional courses may be taken from the Chicago-Kent College of Law curriculum to give cybersecurity and forensics practitioners a thorough grounding in legal issues and compliance. The program provides an innovative experience where students work on cutting-edge, industry-sponsored projects. This teaching philosophy prepares students to become innovators, entrepreneurs, and leaders of the future. For some areas of study, it is possible to complete the entire Master of Information Technology and Management degree online.

Laboratories and Research Centers

The School of Applied Technology operates and administers over 400 computers and servers at the Mies and Rice campuses to support teaching, learning, and research. Ten laboratories include a networking/network security and computer forensics facility, and a dedicated Real-Time Communications (RTC) facility which includes an entire CISCO VoIP LAN as well as video and mesh wireless capabilities. The security/forensics and RTC laboratories as well as the general-use laboratories provide additional facilities for student projects and applied research, some of which is undertaken in conjunction with industry partners. Some laboratories are available for student use outside of class hours, and one or more laboratories are available for student use weekdays between 10 a.m. and 10 p.m. at the Rice Campus. A wireless network at the Rice Campus provides complete coverage of the campus and operates at all times that the campus is open. Students make extensive use of the network infrastructure provided to support personal notebook computers.

The Center for Cyber Security and Forensics Education

The Center for Cyber Security and Forensics Education (C^{2}SAFE) 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 cyber security 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 cyber security 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 by the National Security Agency and the Department of Homeland Security
- Maintain resources for education and research in cyber security 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 university 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.

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 at ccsafe.iit.edu.

Placement Examinations

Students entering the Master of Information Technology and Management degree program may be required to take placement examinations based on an evaluation of their background and their undergraduate degree program.

Students may be required to demonstrate proficiency in the use of a contemporary object oriented programming language through completion of a programming proficiency examination. Students will be requested to complete a representative set of basic programming tasks and will have a choice of contemporary programming languages in which to complete the tasks; Visual Basic is not an acceptable language for this purpose. References may be consulted, but the test is timed so ability to code is necessary. Students who cannot satisfactorily complete the exam may be required to attend a refresher workshop or short course in their selected programming language, or may be required to complete an ITM programming course; appropriate action will be based on their score on the exam.

Students who are not required to complete the Test of English as a Foreign Language (TOEFL) but have low scores on the GRE verbal may be required to complete an English evaluation. If students cannot pass the examination or evaluation they will be required to enroll in an appropriate PESL course and demonstrate proficiency at course completion.

Accelerated Courses

The program may offer accelerated courses for credit in several areas of information technology and management. Students should see the definition of accelerated courses in this catalog.

Accelerated courses provide an opportunity for degree-seeking students at the university to complete graduate degree requirements in a shorter time period. If taken by non-degree seeking students, all courses may be later applied toward the Master of Information Technology and Management degree for those who apply and are accepted to the degree program.

Admission Requirements

Applicants for admission to a professional masters degree must have earned a four-year bachelor's degree from an accredited institution with a minimum cumulative undergraduate GPA of 3.0/4.0. International applicants are required to submit a GRE score with a minimum score of 300 (combined quantitative and verbal), 151 quantitative, and 3.0 analytical writing and may be required to submit a TOEFL score (see the Graduate Admission section). Admission as a non-degree student follows the university policy set forth in this catalog.

Applicants for admission to a master of science degree should hold a four-year bachelor's degree in a computing or computing-related engineering discipline from an accredited institution with a minimum cumulative undergraduate GPA of 3.0/4.0 and minimum GRE score of 305 (combined quantitative and verbal), 151 quantitative, and 3.0 analytical writing; international applicants may be required to submit a TOEFL score (see the Graduate Admission section). Applicants admitted to a master of science degree who do not hold a four-year bachelor's degree in a computing or computing-related engineering discipline may be required to complete up to one year of prerequisite courses prior to beginning formal graduate studies.

Students whose undergraduate degree is not in a computer-related area or who do not have significant experience or certifications in the information technology field will be required to demonstrate proficiency in undergraduate courses that are prerequisites for the graduate program. Proficiency may be demonstrated by taking and passing a written exam or taking and passing, with a grade of "B" or better, the prerequisite undergraduate courses at Illinois Institute of Technology. Proficiency may also be demonstrated by presentation of documentation of equivalent training or certification; in this case waivers of the prerequisites may only be granted by the graduate adviser or the ITM associate director.

Current prerequisites for the Master of Information Technology and Management include computer hardware and operating system literacy (ITM 301 or equivalent coursework, certification, or experience) and an ability to program at a basic level using a contemporary programming language (ITM 311 or ITM 312 or ITM 313 or equivalent coursework, certification, or experience); basic knowledge of HTML, CSS, and JavaScript (ITMD 361); and the ability to create and administer databases using a modern database management system. Students enrolled in undergraduate post-baccalaureate studies (see the Graduate Admission section) may take these courses as part of that program.

Current prerequisites for the Master of Cyber Forensics and Security include computer hardware and operating system literacy (ITM 301 or equivalent coursework, certification, or experience); an ability to program at a competent level using a contemporary programming language (ITMD 411 or ITMD 510); basic knowledge of networking concepts, protocols, methods, and the Internet (ITMO 540); and the ability to create and administer databases using a modern database management system.

Current prerequisites for the Master of Science in Applied Cybersecurity and Digital Forensics include computer hardware and operating system literacy (ITM 301 or equivalent coursework, certification, or experience); an ability to program at a competent level using a contemporary programming language (ITMD 411 or ITMD 510); basic knowledge of networking concepts, protocols, methods, and the Internet (ITMO 540); the ability to create and administer databases using a modern database management system; and completion of a program of mathematics culminating in a calculus-based course in probability and statistics (MATH 474).

Current prerequisites for the Master of Science in Information Technology and Management include computer hardware and operating system literacy (ITM 301 or equivalent coursework, certification, or experience) and an ability to program at a competent level using a contemporary programming language (ITMD 411 or ITMD 510); basic knowledge of HTML, CSS, and JavaScript (ITMD 361); the ability to create and administer databases using a modern database management system; and completion of a program of mathematics culminating in a calculus-based course in probability and statistics (MATH 474).

Degrees Offered

- Master of Cyber Forensics and Security
- Master of Information Technology
- Master of Information Technology and Management
- Master of Science in Applied Cybersecurity and Digital Forensics
- Master of Science in Information Technology and Management
- Doctor of Philosophy in Information Technology

Certificate Programs

- Advanced Software Development
- Cyber Security Management
- Cyber Security Technologies
- Information Technology Innovation, Leadership, and Entrepreneurship
- System Administration
- Systems Analysis
- Web Design and Application Development

Course Descriptions

ITM 501
Research Methods for Information Technology
This course prepares graduate students to undertake independent research inquiry by providing an in-depth examination of applied research methods across a range of information technology disciplines. Students receive training in major research paradigms, principles of research design, research ethics, research theories and quantitative and qualitative methodologies as well as tools and techniques for data collection and analysis. Students will be encouraged to develop their own research agenda and design a research methodology to undertake their research.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITM 601
Research Methods for Information Technology
This course prepares doctoral students to undertake independent research inquiry by providing an in-depth examination of applied research methods across a range of information technology disciplines. Students receive training in major research paradigms, principles of research design, research ethics, research theories and quantitative and qualitative methodologies as well as tools and techniques for data collection and analysis. Students will be encouraged to develop their own research agenda and design a research methodology to undertake their research.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITM 691
Research and Thesis Ph.D.
Instructor permission required.
Credit: Variable

ITM 695
Doctoral Seminar
Doctoral Seminar.
Credit: Variable

ITM 701
Introduction to Contemporary Operating Systems and Hardware 1a
In this introductory industry-focused undergraduate course, students study the basics of computer architecture and learn to use a contemporary operating system. Hardware requirements and hardware components are covered. Topics also include discussion of current and future technology industry trends.
Lecture: 1 **Lab:** 0 **Credits:** 1

ITM 702
Introduction to Contemporary Operating Systems and Hardware 1b
In this introductory industry-focused undergraduate course, students study software compatibility and system installation, along with concepts of client virtualization, cloud computing, and network fundamentals.
Lecture: 1 **Lab:** 0 **Credits:** 1

ITM 703
Introduction to Contemporary Operating Systems and Hardware 1c
In this introductory industry-focused undergraduate course, students study system installation topics along with post-installation, security and system diagnosis, and repair. Topics also include discussion of current and future technology industry trends.
Lecture: 1 **Lab:** 0 **Credits:** 1

ITM 705
Hardware and Operating System Foundations I
In this introductory graduate course, students will explore the basics of computer architecture and use of contemporary operating systems and networking. Covers hardware requirements, components, software compatibility, and system configuration and administration as well as other key operating systems functions. Popular and business-focused desktop and mobile device operating systems will be examined, as well as enterprise and open-source server implementations.
Lecture: 1 **Lab:** 0 **Credits:** 1

ITM 706
Hardware and Operating System Foundations II
In this introductory graduate course, students will explore the basics of computer architecture and use of contemporary operating systems and networking. Covers system installation topics as well as other key operating systems functions. Networking, virtualization, cloud computing, and security concepts are introduced. Popular and business-focused desktop and mobile device operating systems will be examined, as well as enterprise and open-source server implementations.
Lecture: 1 **Lab:** 0 **Credits:** 1

ITM 707
Hardware and Operating System Foundations III
Explores the basics of computer architecture and use of contemporary operating systems and networking. Covers software troubleshooting, security implementation, and operational procedures and best practices. Documentation, communication, and professionalism are addressed. Popular and business-focused desktop and mobile device operating systems will be examined, as well as enterprise and open-source server implementations.
Lecture: 1 **Lab:** 0 **Credits:** 1

ITMD 504
Programing and Application Foundations
This course covers 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. Fundamentals of programming in a modern programming language is covered. Basic data modeling concepts are also introduced, including hands-on database design, implementation, and administration of single-user and shared multi-user database applications using a contemporary relational database management system. These topics are taught in an integrated hands-on manner, where students will learn how frontend, backend, and database systems are written and deployed to work together in a full stack web application.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 505
Programing and Application Foundations
This course covers 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. Fundamentals of programming in a modern programming language is covered. Basic data modeling concepts are also introduced, including hands-on database design, implementation, and administration of single-user and shared multi-user database applications using a contemporary relational database management system. These topics are taught in an integrated hands-on manner, where students will learn how frontend, backend, and database systems are written and deployed to work together in a full stack web application.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 510
Object-Oriented Application Development
This course covers a broad spectrum of object-oriented programming concepts and application programming interfaces. The student considers the details of object-oriented development in topics of multi-threading, data structure collections, stream I/O and clientinterfaces. Software engineering topics of packaging and deployment are covered as well. Strong emphasis is placed on the creation of applications providing solutions for defined business problems. Hands-on exercises reinforce concepts taught throughout the course.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 511
Application Development Methodologies
Students learn concepts in a systematic approach to the analysis, design, implementation and maintenance of software. Includes studies of the various models of the software life-cycle, software development project management, system requirements analysis, and methodologies for practical application of these models to software development, including the use of CASE (Computer Aided Software Engineering) tools. Students apply these principles in projects to improve the quality of their development process and final products.
Prerequisite(s): ITMD 510 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 512
Structured and Systems Programming
Structured programming with advanced concepts including strings, arrays, pointers, data structures, file manipulation, and dynamic memory management. Students create 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. Strong emphasis is placed on the creation of applications providing solutions for defined business problems or specific operating system issues.
Prerequisite(s): ITM 312 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 513
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 510 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 514
Programming for Data Analytics
This course will introduce essential programming concepts and techniques used in analytics. Students will learn and make use of industry standard programming languages widely used in application programming for data and statistical analysis as well as other purposes. Students will understand and use various libraries for data manipulation, preparation, and analysis, and will be equipped to use the programming languages covered in real world scenarios and circumstances upon completion.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 515
Advanced Software Programming
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 510 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 519
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. The 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 521
Big Data Infrastructure
This course covers both concepts and practical applications of distributed data paradigms. This provides a comparison between SQL and MapReduce. The course focuses on how to treat and prepare unstructured data to be used in the MapReduce framework in a parallel fashion. Students will be tasked with learning and demonstrating the MapReduce framework through implementing the Hadoop framework and associated Java technology.
Prerequisite(s): ITMD 510 with min. grade of C or ITMD 411 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 522
Data Mining and Machine Learning
Data mining is a useful tool to uncover patterns and underlying relationships in large data by using data analytics and knowledge discovery techniques. Machine learning algorithms additionally learn from the data and make predictions or decisions by different optimization methods. This course is a graduate level survey of concepts, principles and techniques related to data mining and machine learning. Students will be familiar with data preprocessing skills and the popular data mining and machine learning techniques, including the supervised learning (regressions and classification) and unsupervised learning(clustering and association rules analysis), as well as semi-supervised learning and ensemble learning. Students will also learn the related applications, including text mining/NLP, Web mining, information retrieval and recommender systems. Students will learn R and Python programming for data mining and machine learning and be able to handle real-world data or applications.
Prerequisite(s): ITMD 514* with min. grade of C or ITMS 514* with min. grade of C, An asterisk (*) designates a course which may be taken concurrently.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 523
Advanced Topics in Data Management
Advanced topics in database management and programming including client server application development are introduced. Students will learn the use of Structured Query Language in a variety of application and operating system environments. Expands knowledge of data modeling concepts and introduces object-oriented data modeling techniques with specific attention to the use of database management systems in response to defined business problems.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 524
Applied Artificial Intelligence and Deep Learning
Artificial Intelligence (AI) is being used extensively to solve real-world complex problems. This course will deliver concepts and skills in both classical AI and modern AI. The classical AI refers to the fundamental knowledge in AI, such as search, logic, planning, uncertainty, game theory, Markov models, etc. Modern AI, by contrast, will be concentrated on machine learning and deep learning techniques, especially their applications in NLP, object recognition, recommender systems, etc. Students will learn how to use Python to solve specific AI problems.
Prerequisite(s): ITMD 514 with min. grade of C or ITMS 514 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 525
Topics in Data Science and Management
This course will cover a particular topic in databases, data science, data management, or data analytics, varying from semester to semester, in which there is particular student or staff interest.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 526
Data Warehousing
This class will introduce the student to concepts needed for successfully designing, building and implementing a data warehouse. The class will provide the technological and managerial knowledge base for data modeling approaches such as the star schema and database de-normalization issues. Topics such as loading the warehouse, performance considerations, and other concepts unique to the data warehouse environment will be discussed demonstrated in detail.
Prerequisite(s): ITMD 523 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 527
Data Analytics
This is a hands-on course that focuses on the creation, maintenance, and analysis of large informatics databases. Concepts such as data modeling, probability, linear regression, and statistical data analysis are covered in depth. In addition, this course will use large simulated equities, healthcare, insurance, and banking database systems. The student is expected to have a working understanding of relational database concepts as well as SQL.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 529
Advanced Data Analytics
Informatics is the application of information technology to solve problems in other fields. Informaticists use technology and information to build intelligent systems used to bridge the gaps between information, technology, and the people who use it. The study of informatics is about blending applied mathematics with technology while understanding the broader consequences of computing on society and the problem being solved. It is important for any student to develop a broad perspective of technology and the people it serves. This course builds upon the student's knowledge of mathematical concepts of predictive modeling of samples and populations with an emphasis on applying technology to solve real world problems.
Prerequisite(s): ITMD 527 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 532
UML-Based Software Development
Study of software development using the Unified Modeling Language (UML). Covers architecture-driven and component based techniques for modeling object-oriented applications. Particular emphasis is placed on the hands on application of tools and components used for object oriented systems modeling.
Prerequisite(s): ITMD 510 with min. grade of C or ITMD 512 with min. grade of C or ITMD 515 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 534
Human and Computer Interaction
Introduction to human-computer interaction, a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use. Emphasis is given to the structure of communication between people and computers, capabilities of people to use computers, concerns that arise in designing and building interfaces, design trade-offs, and the process of specification, design, and implementation of user interfaces. Particular emphasis is placed on practical design and usability of computer system user interfaces.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 535
Human-Computer Interaction Design
Advanced study in human-computer interaction with a particular focus on the design of application and web interfaces.
Prerequisite(s): ITMD 534 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 536
Software Testing and Maintenance
This course covers the basic concepts of software testing and maintenance. The Testing Maturity Model provides a framework for developing a more mature test process. Testing techniques, test metrics and test plan management concepts are described within this framework.
Prerequisite(s): ITMD 510 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 537
Data Science Practicum
In this project-oriented course, students will work in small groups to solve real-world data analysis problems and communicate their results. Innovation, soundness of solutions and evaluations, and clarity of presentation will be key elements of evaluation. The topic of the projects may come from university research faculty or from industry partners.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 541
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.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 542
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.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 543
Front-End Web Development
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.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 544
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.
Prerequisite(s): ITMD 542
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 545
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 541
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 546
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 547
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 441 or ITMD 541) and (ITMD 442 or ITMD 542)
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 549
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 549 credit may be applied to a degree.
Credit: Variable

ITMD 553
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.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 554
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.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 555
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.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 556
Intelligent Device Projects
Students create projects that exercise and expand their understanding of intelligent device application development. Instructional materials and lectures are provided as needed to support projects. Scope and deliverables will be determined through joint decision of the instructor and students. Students will describe requirements, create test plans as needed, demonstrate the application when applicable, create a written description of the work, and may deliver a formal presentation to an audience appropriate to the scope and scale of the work completed. This course may be taken more than once but only 6 hours of ITMD 556 credit may be applied to a degree.
Prerequisite(s): ITMD 553 with min. grade of C or ITMD 554 with min. grade of C or ITMD 555 with min. grade of C
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMD 561
Web Intelligence
Embrace the dynamic landscape of the digital realm with our groundbreaking course in Web Intelligence. This course is designed to empower students with a profound understanding of Web Mining, Natural Language Processing (NLP), Information Retrieval (IR), and Recommender Systems (RecSys), pivotal components in shaping the intelligent future of the web. Web Mining can uncover the hidden gems within the vast expanse of the web through the exploration of web mining techniques. NLP is a popular topic in AI and job market. From sentiment analysis to language generation, students will gain hands-on experience in developing systems that can understand, interpret, and generate human language effectively. We will also navigate the intricacies of IR and learn the art of efficiently accessing and presenting relevant information from the vast web ecosystem. Topics in RecSys help students explore the art and science of personalized content delivery. This course will feature both knowledge (e.g., concepts, algorithms) and practical skills (e.g., tools and libraries by Python) in these related topics.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMD 566
Service-Oriented Architectures
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 toolkits are utilized to reinforce platform-agnostic course topics.
Prerequisite(s): ITMD 510 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

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

ITMM 537
Vendor Management and Service Level Agreements
Management of service level agreements (SLAs) at an enterprise level is presented from both a client and service provider perspective. Fundamental structure and issues of contract law are introduced and various models for management of service level agreements are presented. The role of SLAs in enterprise architecture and planning is addressed, and service level definitions, quality of service, and performance metrics are examined.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 570
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

ITMM 571
Project Manangement for Information Technology Management
Basic principles of project management are taught. Includes software development concepts of requirements analysis, object modeling and design and software testing. Management of application development and major Web development projects will also be addressed.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 572
Process Engineering for Information Technology Managers
This course will provide students with the knowledge and skills to define, model, measure and improve business processes. The course will focus on re-engineering processes through the application of technology to achieve significant and measurable improvement. The course will explore the latest industry standards and students will use state-of-the-art software tools for hands-on experiential learning.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 573
Building and Leading Effective Teams
This course will prepare students to be effective IT managers. Students will be introduced to the general challenges of management as well as the challenges unique to leading teams of technology professionals. The course will explore the skills necessary to excel as a leader including dealing with conflict, developing leadership skills, recruiting and developing employees, and leading remote and virtual teams. Students will explore case studies and execute team exercises to enrich their learning experience.
Prerequisite(s): ITMM 570 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 574
Information Technology Management Frameworks
This course will examine the application of industry standard frameworks to the management of information technology infrastructure, development and operations. Frameworks including the Information Technology Infrastructure Library (ITIL), Control Objectives for Information and related Technology (COBIT), and others will be covered. Students will learn to use these frameworks to tailor a set of concepts and policies to necessary manage IT in a specific enterprise.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 575
Networking and Telecommunications Management
This course address the design, implementation, and management of computer networks and enterprise telecommunications systems. Design issues in wide area networks and telecommunications with emphasis on Internet connectivity are also addressed. Tools for supporting the distribution and sharing of system resources and information are discussed, along with tools to support network design and management.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 576
Data Center Management
This course is an in-depth examination of best practices in the management of enterprise data centers. Topics include data center consolidation; data center maintenance; server and network management methods and tools; budget and finance; service-level agreements; managing data center personnel and staff; and disaster recovery.
Prerequisite(s): ITMT 535 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 577
Case Studies in Management of Information Technology
This course examines approaches and models for the management of information technology at an enterprise level through the use of case studies in the field.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 581
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 582
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 584
Information Technology at C-Level
The issues, competencies, challenges and rewards of managing information technology in major enterprises at the Chief Information Officer/Chief Technology Officer level are examined in depth. The course will equip students with a fundamental awareness of what the enterprise and the profession expects from the highest levels of IT management. Readings, case studies and guided discussions will be supplemented by a series of guest lectures from-and discussions with-Chicago-area IT professional currently employed in these roles.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 585
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

ITMM 586
Information Technology Auditing
Industry standard practices and standards in the auditing of information technology in an organization are addressed, with a particular emphasis on examination of IT governance, assets, controls, and control techniques. Specific areas covered will include the audit process, IT governance, systems and infrastructure life cycle management, IT service delivery and support, protection of information assets, and business continuity and disaster recovery. Students will examine case studies and complete hands-on exercises.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMM 587
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 503
Hardware and Operating System Foundations
Explores the basics of computer architecture and use of contemporary operating systems and networking. Covers hardware requirements, components, software compatibility, and system installation topics as well as other key operating systems functions. Networking, virtualization, cloud computing, and security concepts are introduced. Intro-duces features of an advanced operating system, including basic commands, file and directory manipulation, security, and suitability for server ap-plications. Popular and business-focused desktop and mobile device operating systems will be examined, as well as enterprise and open-source server implementations.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 504
Hardware and Operating System Foundations
Explores the basics of computer architecture and use of contemporary operating systems and networking. Covers hardware requirements, components, software compatibility, and system installation topics as well as other key operating systems functions. Networking, virtualization, cloud computing, and security concepts are introduced. 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: 3 **Lab:** 0 **Credits:** 3

ITMO 517
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 417.
Prerequisite(s): ITMO 556 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 533
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): ITMO 540 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 540
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 541

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 540 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 542

Wireless Technologies and Applications

This course will provide students with the knowledge of wireless communication technologies. The course will focus on the 3G and 4G wireless networks such as UMTS, LTE, and WiMAX. Students will have the opportunity to study the different wireless networks architectures and major network elements including devices, base stations, base station controller, and core networks. Major topics of the course include air interfaces, protocols, session management, QoS, security, mobility, and handoff.

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

ITMO 544

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): ITMO 556 with min. grade of C and ITMD 510 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMO 545

Telecommunications Technology

This course introduces technologies underlying telecommunications and real-time communications systems and services. Topics will include: wire-line and fiber systems including those associated with the public switched telephone networks and cable service providers; wireless systems including cellular, WiFi and WiMAX. Methods and architectures for delivery of signaling, voice and video are introduced; analog telephone systems, digital telephone systems on circuit switched networks both wire-line and cellular; digital telecommunications on packet switched networks. Codecs and transformation of voice and video into digital formats are introduced. Physical and data-link layer protocols are studied with emphasis on how they carry voice and video. Channelization and multiple-access methods are introduced. Switching methods studied include circuit switching, virtual circuit switching and packet switching.

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

ITMO 546

Telecommunications Over Data Networks

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

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

ITMO 547

Telecommunications Over Data Networks: Projects and Advanced Methods

Mentored projects focused on real-time media applications, systems and services. HTTP-based and SIP-based systems are studied; reference is made to RTCWeb, W3C and IETF specifications and initiatives. Topics may include web-based real-time media applications; web-conferencing and distributed class-room applications; communications systems using SIP and Web technologies; standards-based systems supporting emergency calls over IP backbone networks; metrics for performance characteristics of real-time systems; security of streaming media; interoperability/conformance testing of real-time applications and services. Students present/demonstrate projects in a public meeting. Students should have previous or concurrent experience with one or more of the following: SIP, HTTP, HTML, and scripting or coding languages.

Prerequisite(s): ITMO 546 with min. grade of C
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMO 550

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.

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

ITMO 553

Open Source System 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 556 with min. grade of C and ITMO 540 with min. grade of C

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

ITMO 554

Operating Systems 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): ITMO 556 with min. grade of C

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

ITMO 556

Introduction to Open Source Software

This course will cover the fundamental concepts and philosophy behind free and open source software (FOSS). The course will discuss open source and free software licensing; open source business strategies and impact; FOSS utilization in the enterprise; and development methodologies. Students will 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 557

Storage Technologies

Modern enterprise data storage technologies and architectures are examined in depth. Topics include storage devices, file systems, storage networks, virtual storage, RAID, NAS, SAN, and other current enterprise-level storage models. Storage management, replication, deduplication, storage tiers, backups as well as fundamentals of business continuity, application workload, system integration, and storage/system administration are addressed. Specific knowledge and skills required to configure networked storage to include archive, backup, and restoration technologies are covered.

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

ITMO 563

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. Students will explore different approaches, techniques, tools and technologies to build, deploy, and manage cloud native applications.

Prerequisite(s): ITMO 544

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

ITMO 564

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 application-hosting environment.

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

ITMO 565

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 ap-plications. 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 544

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

ITMS 514

Programming for Cybersecurity Analytics

This course will introduce essential programming concepts and techniques used in analytics. Students will learn and make use of industry standard programming languages widely used in application programming for data and statistical analysis in cybersecurity as well as other purposes. Students will understand and use various libraries for data manipulation, preparation, and analysis, and will be equipped to use the programming languages covered in real world scenarios and circumstances upon completion.

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

ITMS 518
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 510 with min. grade of C or ITMD 512 with min. grade of C or ITMD 515 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 527
AI for Cybersecurity
This course is designed to equip students with knowledge and skills necessary to understand, implement, and leverage artificial intelligence (AI) techniques in the realm of cybersecurity. In an era where cyber threats continue to evolve and grow in complexity, AI has emerged as a powerful tool to defend against and mitigate these threats. This course explores the intersection of AI and cybersecurity, providing a comprehensive understanding of how AI technologies can be used to protect computing systems. By the end of this course, students will be well-equipped to leverage the power of AI to enhance cybersecurity efforts, making them valuable assets in the ever-evolving landscape of digital security. Join us on this exciting journey into the world of "AI for Cybersecurity" and prepare to defend against the digital threats of tomorrow. The course is intended for students with a basic understanding of computing and cybersecurity concepts.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 528
Database Security
Students will engage in an in-depth examination of topics in data security including security considerations in applications & systems development, encryption methods, cryptography law, and security architecture & models.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 534
Human Factors in Cybersecurity
This course introduces the applied theories relevant to human factors in information security, digitalization, and sociotechnical environments. Examines the human element through a comprehensive approach that explores human errors, new technologies, and cybersecurity incidents. Investigates human-related aspects that have an impact on the practices, policies, and procedures that are in place in an organization to secure the firm's information. Topic areas include human behavior, ethics, psychology, social engineering, the culture of hacking, cybercrimes, security fatigue, and burnout. The analysis covers techniques to prevent intrusions and attacks that threaten organizational data and methods to identify potential insider threats.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 538
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.
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMS 539
Steganography
Digital steganography is the science of hiding covert information in otherwise innocent carrier files so that the observer is unaware that hidden information exists. This course studies both digital steganography and digital steganalysis (the science of discovering the existence of and extracting the covert information). In addition to understanding the science and the pathologies of specific carriers and hiding algorithms, students will have hands-on experience with tools to both hide and extract information. Carrier files such as image, audio, and video files will be investigated.
Prerequisite(s): ITMS 538 with min. grade of C or ITMS 548 with min. grade of C
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMS 543
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 540 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 546
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 ITMS 540 with min. grade of C 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 548
Cyber Security Technologies
Prepares students for a role as a network security administrator and analyst. Topics include viruses, worms, 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 he extended into a full operational security system in a follow-course,
Prerequisite(s): ITMO 540 with min. grade of C
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMS 549
Cyber Security Technologies: Projects & Advanced Methods
Prepares students for a role as a network security analyst and developer and gives the student experience in developing a production security system. Topics may include computer and network forensics, advances in cryptography and security protocols and systems; operating system security, analysis of recent security attacks, vulnerability and intrusion detection, incident analysis and design and development of secure networks. This course includes a significant real world team project that results in an fully operational security system. Students should have previous experience with object-oriented and/or scripting languages.
Prerequisite(s): ITMS 539 with min. grade of C and ITMS 548 with min. grade of C
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMS 555
Mobile Device Forensics
This course will address methods for recovering digital data or evidence and conducting forensic analysis of mobile devices such as smart phones and tablets. Various devices will be compared including iPhone, Android, and Blackberry. A brief review of Linux and related forensic tools. ANAND technology and mobile file systems will be discussed. Students will learn how to unlock and root mobile devices and recover data from actual mobile devices.
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMS 557
Introduction to Cyber Warfare
Cyber warfare is defined as "warfare waged in cyberspace," which can include defending information and computer networks and deterring information attacks as well as denying an adversary's ability to do the same. It can include offensive information operations mounted against an adversary or even dominating information on the battlefield. Students participating in this discussion-based course will explore the current state of cyber security from national and international perspectives and consider cyber-based operations through the lens of a government pursuing strategic goals. How might their actions impact the industry's ability to conduct business operations? What does the current threat environment look like? The course will include extensive discussions and student presentations.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 558
Operating Systems 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.
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMS 564
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 544
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 578
Cyber Security Management
In-depth examination of topics in the management of information technology security including access control systems & methodology, business continuity & 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

ITMS 579
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 579 credit may be applied to a degree.
Credit: Variable

ITMS 583
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 538 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 584

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.
Prerequisite(s): ITMS 578 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMS 588

Incident Response, Disaster Recovery, and Business Continuity

Students learn to design and manage key business information security functions including incident response plans and incident response teams disaster recovery plans; and business continuity plans. Reporting, response planning and budgeting are all addressed. Students working in reams will prepare an incident response, disaster recovery, or business continuity plan for a real-world organizations such as a business or a government body or agency.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMT 514

Enterprise Application Architecture

This course examines current enterprise application architectures from the perspective of senior technology planners and managers. Topics such as models and patterns of enterprise application architecture, application virtualization, cloud application architectures, integration of custom application infrastructure with major vendor products, and full systems integration issues will be addressed.
Prerequisite(s): ITMD 510 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMT 531

Object-Oriented System Analysis, Modeling, and Design

This course will cover object oriented approaches to system analysis, data modeling and design that combine both process and data views of systems. Emphasis is given to practical problems and the techniques needed to create solutions in systems design.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMT 533

Operating System Design Implementation

This course introduces students to the fundamental principles of operating systems design and gives them hands-on experience with real operating systems installation, design, and implementation. The students apply what they learn about operation systems design to practical implementation by modifying and extending the MINIX Operating System. MS Windows and LINUX are briefly discussed as case studies.
Prerequisite(s): ITMD 512 with min. grade of C
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMT 535

Data Center Architecture

The course deals with building integrated data center information infrastructures, including facility, hardware, software, and network components as solutions to particular enterprise information management needs and requirements. Students will learn critical elements of modern data center design including physical plant construction; network infrastructure; data storage technologies; power provisioning and conditioning; environmental controls and HVAC; system and physical security; modular component use; and planning for growth.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMT 537

Instructional Technologies

In this course students will create, assess, and deploy current technologies used for K-College instruction and corporate training environments. Topics covered include developing training materials, courses, individualized instruction, websites, multimedia projects, and on-line instruction in educational settings. focus will be given to modern programming environments and models for developing instructional materials.
Lecture: 3 **Lab:** 0 **Credits:** 3

ITMT 591

Independent Study and Research

Research and Thesis for Masters' degrees. Instructor permission required.
Credit: Variable

ITMT 593

Embedded Systems

This course introduces embedded systems concepts and technology, illustrates the trade-offs which occur as part of embedded systems design, as well as providing practical applications of embedded systems technology. Particular emphasis is given to embedded systems hardware, software and development tools. The course labs include hands-on development of several stand-alone embedded applications using development tools such as compilers, simulators and evaluation boards. Prerequisite: ITM 301 or equivalent computer architecture course; C/C++ programming experience.
Lecture: 2 **Lab:** 2 **Credits:** 3

ITMT 594

Special Projects in Information Technology

Special projects.
Credit: Variable

ITMT 595

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

ITMT 596

Graduate Honors Studies in Information Technology

Graduate honors project, thesis or whitepaper. Prerequisites: Graduate honors status and consent of the instructor.
Credit: Variable

ITMT 597
Special Problems in Information Technology
Independent study and project.
Credit: Variable

TECH 565
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 580
Topics in the Management of Technology
This course will cover a particular topic, 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 TECH 580 credit may be applied to a degree.
Credit: Variable

TECH 581
Consulting for Technical Professionals
This course explores the application of technology and technical management skills to working with business, industry, or various professions in solving specific problems for an organization as an internal or external consultant. Students learn how to involve clients in all phases of problem identification and solution with the goal that, at the end of a consulting assignment, the clients are able to sustain the necessary changes in their organization. Particular attention is paid to managing expectations among change agents, managers, executives, technical professionals, and other members of the organization. The course will cover the most critical, high-level, functional frameworks used by top consulting firms today as well as the tools commonly used by consulting professionals.
Lecture: 3 **Lab:** 0 **Credits:** 3

TECH 597
Special Problems in Technology
Independent study and projects in applied technology that are multi/cross-disciplinary not tied to a specific department.
Credit: Variable