Department of Information Technology & Management

IIT School of Applied Technology

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

Perlstein Hall room 223
10 W. 33rd Street
Chicago, IL 60616

appliedtech.iit.edu/information-technology-and-management

Dean and Chair:
C. Robert Carlson
630.682.6008
carlson@iit.edu

The mission of the Department of Information Technology & Management is to educate and inform students to prepare them to assume technical and managerial leadership in the information technology and cyber security 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 IIT Chicago-Kent College of Law curriculum to give cyber security 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 & Management degree online.

Degrees Offered

Master of Information Technology & Management

Master of Cyber Forensics and Security

Certificate Programs

Advanced Software Development
Cyber Security Management
Cyber Security Technologies
Data Center Operations and Management
Data Management and Analytics
Digital Voice and Data Communication Technologies

Information Technology Innovation, Leadership and
  Entrepreneurship
Systems Analysis
System Administration
Web Design and Application Development

Faculty

C. Robert Carlson, Professor. Dean of the IIT School of Applied Technology and Chair, Department of Information Technology and Management. B.A. Augustana College, Ph.D. University of Iowa. Database design, object-oriented modeling and design, software engineering, and IT entrepreneurship

Carol Davids, Industry Professor. Director of the Real-Time Communications Laboratory, IIT School of Applied Technology. B.S. Engineering Mathematics Columbia University, M.I.T.M. Illinois Institute of Technology. Voice over IP, voice and data networks, and digital and voice communications.

Jeremy Hajek, Industry Associate Professor. B.I.T.M., M.I.T.M. Illinois Institute of Technology. Cloud computing, systems architecture, enterprise computing, embedded systems, operating systems.

Robert Hendry, Industry Professor. B.S.C.S Aurora University, M.S.I.T. University of Maryland. Data management, databases, data analytics, data warehousing, application development, and informatics.

William Lidinsky, Industry Professor. Interim Director, Center for Cybersecurity and Forensics Education; Director of the Security and Forensics Laboratory, IIT School of Applied Technology. B.S.E.E., M.S.E.E. Illinois Institute of Technology, M.B.A. University of Chicago. Computer networking, computer and network security, computer and network forensics, vulnerability testing, and steganography.

James Papademas, Industry Professor. B.S., B.S.B.A., M.B.A., M.S.M.C. Roosevelt University. M.I.S.M. Keller Graduate School of Management. Object-Oriented Programming, Application Development, Database Design, Mobile Applications.

Ray Trygstad, Industry Professor. Associate Chair, Department of Information Technology and Management; Interim Associate Director, Center for Cybersecurity and Forensics Education; and Director of Information Technology, IIT School of Applied Technology. B.S. United States Naval Academy, M.S.S.M. University of Denver. System administration, operating system virtualization, information security management, information technology policy, cloud computing, Introduction to Open Source Software and applications.

Department of Information Technology & Management

Laboratory and Research Facilities

The IIT School of Applied Technology operates and administers over 400 computers and servers at the Main 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 stu-

dent 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 am and 10 pm 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 (C²SAFE) is a multi-disciplinary center within the IIT 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 Information Assurance by the National Security Agency and the Department of Homeland Security.
- 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 IIT 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 **http://ccsafe.iit.edu/**.

Admission Requirements

Applicants for admission must have earned a four-year bachelors 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 2.5 analytical writing and may be required to submit a TOEFL score (see page 26). Admission as a non-degree student follows the university policy set forth in this bulletin.

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 IIT. 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 & 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 equivalent coursework, certification or experience); basic knowledge of HTML, CSS and JavaScript (ITMD 361 or ITMD 461); and the ability to create and administer databases using a modern database management system (ITMD 421). Students enrolled in undergraduate post-baccalaureate studies (see page 28) 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 440 or ITMO 540); and the ability to create and administer databases using a modern database management system (ITMD 421). Students enrolled in undergraduate post-baccalaureate studies (see page 28) may take these courses as part of that program.

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.

Department of Information Technology & Management

Master of Information Technology & Management

30 credit hours
GPA of 3.0/4.0 or better

At the conclusion of their studies, graduates of this degree should be able to:

- Deliver optimal technical and policy technology solutions for the problems of business, industry, government, non-profit organizations, and individuals in each student's particular area of focus.

- Work with, lead, and manage teams in an enterprise environment to collaboratively arrive at optimal technology solutions.

- Manage and deploy information resources applicable to each student's particular area of focus in an enterprise setting.

All students are required to complete a minimum of three core courses. These core courses will ensure an ability to develop software applications at a competent level using a contemporary programming language; the capability to employ and deploy appropriate system technologies, and a grasp of business development knowledge appropriate to the discipline. Students completing a specialization are required to complete three core courses, selecting one from each of the core subjects. Students electing not to complete a specialization must complete at least one course from each of the seven core subject topic areas. Advisers will assist students in the selection of core courses most relevant to their interests and career goals.

The specializations are meant to guide students in their course selection, allowing them to focus on a particular area of information technology, depending on their interests, background and career goals; alternative courses in each specialization may be available at the discretion of the student's adviser.

Core Courses (9-21 hours)

Required courses
Students electing to complete a specialization must select 3 hours from any topic within each of the following *core subjects*:

    Software Development
    System Technologies
    Business Development

Students not completing a specialization must select 3 hours from each of the following *core topics*:

    Programming
    Application Development
    Information Systems Technologies
    Information Technology Architectures
    Design
    Management
    Innovation

Graduate Core Courses by Subjects and Topics
The following courses comprise the graduate core courses:
Subject: **Software Development**
  Topic: **Programming**
  ITMD 510 Object Oriented Application Development
  ITMD 512 Structured and Systems Programming
  ITMD 515 Advanced Software Development

Subject: **System Technologies**
  Topic: **Application Development**
  ITMD 553 Enterprise Intelligent Device Applications
  ITMD 554 Mass-Market Intelligent Device Applications
  ITMD 555 Open Source Intelligent Device Applications
  ITMD 565 Rich Internet Applications
  ITMD 566 Service-Oriented Architectures
  ITMT 593 Embedded Systems

  Topic: **Information Systems Technologies**
  ITMO 533 Enterprise Server System Administration
  ITMO 553 Open Source Server System Administration
  ITMO 556 Introduction to Open Source Software
  ITMS 558 Operating System Security
  Topic: **Information Technology Architectures**
  ITMO 540 Introduction to Data Networks and the Internet
  ITMO 554 Operating System Virtualization
  ITMS 548 Cyber Security Technologies
  ITMT 535 Data Center Architecture

Subject: **Business Development**
  Topic: **Design**
  ITMD 511 Application Development Methodologies
  ITMD 532 UML Based Software Development
  ITMD 534 Human/Computer Interaction
  ITMT 531 Object Oriented System Analysis, Modeling
          and Design
  Topic: **Management**
  ITMM 570 Fundamentals of Management for Technology
          Professionals
  ITMM 571 Project Management for Information Technology
          Management
  ITMM 574 Information Technology Management Frameworks
  ITMM 575 Networking & Telecommunications Management
  ITMS 578 Cyber Security Management
  Topic: **Innovation**
  ITMM 581 IT Entrepreneurship
  ITMM 582 Business Innovation
  ITMD 535 Human/Computer Interaction Design

Note: Core courses that also apply to a specialization will still fulfill the core course requirement.

Computer and Information Security (21 hours)

Required courses (15 hours)

ITMO 540 Introduction to Data Networks and the Internet
ITMO 556 Introduction to Open Source Software
ITMS 548 Cyber Security Technologies
ITMS 549 Cyber Security Technologies: Projects &
       Advanced Methods
ITMS 578 Cyber Security Management

AND 3 hours chosen from the following:

Any 500-level ITMS elective
(ITMS 579 may only be taken once as part of this requirement)

AND 3 hours chosen from the following:

Any 500-level ITMO elective
Any 500-level ITMS elective
ITMM 586 Information Technology Auditing

Data Center Operations and Management (21 hours)

Required courses (15 hours)

ITMO 540 Introduction to Data Networks and the Internet
ITMO 554 Operating System Virtualization
ITMO 556 Introduction to Open Source Software
ITMM 576 Data Center Management
ITMT 535 Data Center Architecture

AND 6 hours chosen from the following:

ITMD 526 Data Warehousing
ITMM 574 Information Technology Management Frameworks
ITMO 544 Cloud Computing Technologies
ITMO 546 Telecommunications Over Data Networks
ITMO 533 Enterprise Server System Administration
ITMO 553 Open Source Server System Administration
ITMO 557 Storage Technologies
ITMS 548 Cyber Security Technologies
ITMS 578 Cyber Security Management
ITMS 588 Incident Response, Disaster Recovery and
       Business Continuity

Data Management (21 hours)

Required courses (18 hours)

ITMD 523 Advanced Topics in Data Management
ITMD 526 Data Warehousing
ITMD 527 Data Analytics
ITMD 566 Service-Oriented Architectures
ITMS 528 Database Security
ITMT 531 Object Oriented System Analysis, Modeling and
       Design

AND 3 hours chosen from the following:

ITMD 521 Client Server Technologies & Applications
ITMD 525 Topics in Data Science and Management
ITMO 557 Storage Technologies
ITMM 574 Information Technology Management Frameworks
ITMS 578 Cyber Security Management

Digital Systems Technology (21 hours)

Required courses (9 hours)

ITMO 556 Introduction to Open Source Software
ITMT 533 Operating System Design Implementation
ITMT 593 Embedded Systems

AND 3 hours chosen from the following:

ITMD 553 Enterprise Intelligent Device Applications
ITMD 554 Mass-Market Intelligent Device Applications
ITMD 555 Open Source Intelligent Device Applications

AND 6 hours chosen from the following:

ITMD 511 Application Development Methodologies
ITMD 556 Intelligent Device Projects
ITMO 542 Wireless Technologies and Applications
ITMO 544 Cloud Computing Technologies

AND 3 hours chosen from the following:

ITMD 512 Structured and Systems Programming
ITMD 545 WebRTC
ITMD 553 Enterprise Intelligent Device Applications
ITMD 554 Mass-Market Intelligent Device Applications
ITMD 555 Open Source Intelligent Device Applications
ITMD 556 Intelligent Device Projects
ITMD 565 Rich Internet Applications
ITMO 540 Introduction to Data Networks and the Internet
ITMO 541 Network Administration and Operations
ITMO 546 Telecommunications Over Data Networks
INTM 522 Computers in Industry
TECH 565 Introduction to Social Commerce

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IT Management and Entrepreneurship (21 hours)

Required courses (12 hours)

ITMD 534 Human/Computer Interaction
ITMM 570 Fundamentals of Management for Technology
        Professionals
ITMM 581 IT Entrepreneurship
ITMM 582 Business Innovation

AND 3 hours chosen from the following:

ITMD 553 Enterprise Intelligent Device Applications
ITMD 554 Mass-Market Intelligent Device Applications
ITMD 555 Open Source Intelligent Device Applications

AND 6 hours chosen from the following:

Up to six hours of any 500-level ITMM Course
AND/OR
ITMD 556 Intelligent Device Projects
ITMS 578 Cyber Security Management
TECH 565 Introduction to Social Commerce
TECH 581 Consulting for Technical Professionals

Management Information Systems (21 hours)

Required courses (12 hours)

ITMD 521 Client Server Technologies & Applications
ITMD 523 Advanced Topics in Data Management
ITMD 566 Service-Oriented Architectures
ITMM 574 Information Technology Management Frameworks

AND 6 hours chosen from the following:

ITMT 531 Object Oriented System Analysis, Modeling and
        Design
ITMD 532 UML Based Software Development
ITMO 544 Cloud Computing Technologies
ITMO 554 Operating System Virtualization

AND 3 hours chosen from the following:

ITMD 525 Topics in Data Science and Management
ITMD 526 Data Warehousing
ITMD 527 Data Analytics
ITMD 529 Advanced Data Analytics
ITMO 557 Storage Technologies
ITMM 572 Process Engineering for Information Technology
        Managers
ITMM 586 Information Technology Auditing
ITMS 528 Database Security
INTM 522 Computers in Industry
TECH 581 Consulting for Technical Professionals

Software Development (21 hours)

Required courses (12 hours)

ITMD 510 Object Oriented Application Development
ITMD 532 UML Based Software Development
ITMM 571 Project Management for Information
        Technology Management
ITMD 536 Software Testing and Maintenance

AND 6 hours chosen from the following:

ITMD 511 Application Development Methodologies
ITMD 515 Advanced Software Development
ITMD 565 Rich Internet Applications

AND 3 hours chosen from the following:

ITMD 511 Application Development Methodologies
ITMD 512 Structured and Systems Programming
ITMD 513 Open Source Programming
ITMD 515 Advanced Software Development
ITMD 519 Topics in Software Development
ITMD 534 Human/Computer Interaction
ITMD 565 Rich Internet Applications
ITMM 572 Process Engineering for Information Technology
        Managers
ITMD 553 Enterprise Intelligent Device Applications
ITMD 554 Mass-Market Intelligent Device Applications
ITMD 555 Open Source Intelligent Device Applications
ITMD 556 Intelligent Device Projects
ITMS 518 Coding Security
ITMT 531 Object Oriented System Analysis,
        Modeling and Design
TECH 565 Introduction to Social Commerce

Systems Analysis (21 hours)

Required courses (15 hours)

ITMD 511 Application Development Methodologies
ITMD 534 Human/Computer Interaction
ITMM 572 Process Engineering for Information
        Technology Managers
ITMT 531 Object Oriented System Analysis, Modeling and
        Design
ITMD 536 Software Testing and Maintenance

AND 6 hours from the following:

ITMD 532 UML Based Software Development
ITMM 574 Information Technology Management Frameworks
ITMM 575 Networking & Telecommunications Management
ITMS 578 Cyber Security Management
ITMM 586 Information Technology Auditing
INTM 522 Computers in Industry
TECH 581 Consulting for Technical Professionals

System Administration (21 hours)

Required courses (9 hours)

ITMO 540 Introduction to Data Networks and the Internet
ITMO 541 Network Administration and Operations
ITMO 556 Introduction to Open Source Software

AND 6 hours from the following:

ITMO 550 Enterprise End-User System Administration
ITMO 533 Enterprise Server System Administration
ITMO 553 Open Source Server System Administration

AND 6 hours from the following:

ITMO 517 Shell Scripting for System Administrators
ITMO 544 Cloud Computing Technologies
ITMO 533 Enterprise Server System Administration
ITMO 550 Enterprise End-User System Administration
ITMO 553 Open Source Server System Administration
ITMO 554 Operating System Virtualization
ITMO 557 Storage Technologies
ITMM 571 Project Management for Information
　　　　　Technology Management
ITMM 574 Information Technology Management Frameworks
ITMM 575 Networking & Telecommunications Management
ITMS 558 Operating System Security

Voice and Data Communication Technology (21 hours)

Required courses (12 hours)

ITMD 545 WebRTC
ITMO 540 Introduction to Data Networks and the Internet
ITMO 546 Telecommunications Over Data Networks
ITMO 556 Introduction to Open Source Software

AND 6 hours from the following:

ITMO 541 Network Administration and Operations
ITMO 542 Wireless Technologies and Applications
ITMO 547 Telecommunications Over Data Networks:
　　　　　Projects & Advanced Methods
ITMM 575 Networking & Telecommunications Management

AND 3 hours from the following:

ITMD 565 Rich Internet Applications
ITMM 571 Project Management for Information
　　　　　Technology Management
ITMO 541 Network Administration and Operations
ITMO 542 Wireless Technologies and Applications
ITMO 544 Cloud Computing Technologies
ITMO 547 Telecommunications Over Data Networks:
　　　　　Projects & Advanced Methods
ITMD 553 Enterprise Intelligent Device Applications
ITMD 554 Mass-Market Intelligent Device Applications
ITMD 555 Open Source Intelligent Device Applications
ITMS 543 Vulnerability Analysis and Control
ITMS 548 Cyber Security Technologies
ITMS 555 Mobile Device Forensics
TECH 565 Introduction to Social Commerce

Web Design and Application Development (21 hours)

Required courses (15 hours)

ITMD 534 Human/Computer Interaction
ITMD 562 Web Site Application Development
ITMD 565 Rich Internet Applications
ITMD 567 Web Systems Integration
ITMM 582 Business Innovation

AND 6 hours from the following:

ITMD 513 Open Source Programming
ITMD 515 Advanced Software Development

ITMD 519 Topics in Software Development
ITMD 553 Enterprise Intelligent Device Applications
ITMD 554 Mass-Market Intelligent Device Applications
ITMD 555 Open Source Intelligent Device Applications
ITMD 563 Intermediate Web Application Development
ITMD 564 Advanced Web Application Development
ITMD 566 Service-Oriented Architectures
ITMD 569 Topics in Application Development
COM 525 Research and Usability Testing
TECH 565 Introduction to Social Commerce

Department of Information Technology & Management

Master of Cyber Forensics and Security

30 credit hours.
GPA of 3.0/4.0 or better

At the conclusion of their studies, graduates of the Master of Cyber Forensics and Security degree should be able to:
- Design and implement a comprehensive enterprise security program using both policy and technology to implement technical, operational and managerial controls
.

- Comprehensively 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.
- Technically secure enterprise information assets and resources to deter, detect, and prevent the success of attacks and intrusions.

Core Courses (15 hours)
Required courses
ITMS 538 Cyber Forensics
ITMS 543 Vulnerability Analysis and Control
ITMS 548 Cyber Security Technologies
ITMS 578 Cyber Security Management
LAW 273   Evidence

Note: Core course requirements may be waived upon presentation of evidence of equivalent coursework, certification or experience. Approval of waivers will be made by the student's adviser or the ITM Associate Chair.

Elective Courses (15 hours) Select at least twelve hours from the following:
Any 500-level ITMS course not listed in required courses above. ITMS 579, Topics in Cyber Security, may be taken more than once.
ITMM 585 Legal and Ethical Issues in Information Technology
ITMM 586 Information Technology Auditing
ITMO 556 Introduction to Open Source Software
ITMT 594 Special Projects in Information Technology
ITMT 597 Special Problems in Information Technology

AND select at least two hours from the following:
LAW 240   National Security Law
LAW 478   Computer and Network Privacy and Security: Ethical, Legal, and Technical Considerations
LAW 495   Electronic Discovery

Note: LAW electives not listed above may be substituted as approved by the student's adviser or the ITM Associate Chair.

Certificate Programs

Certificate programs offer working professionals an opportunity to increase their knowledge and skills in the specific areas of information technology. A certificate representing proven academic performance is presented after the required coursework is completed with a GPA of 3.0/4.0. Some courses may be later applied toward the Master of Information Technology and Management degree or the Master of Cyber Forensics and Security degree for those who apply and are accepted to the degree program. Applicants should have a bachelor's degree, from an accredited college or university; the degree need not be in an information technology or computer related field. Prerequisites may be required for some courses in certificates; these prerequisites will not be applied to the certificate. Courses included in certificates that are prerequisites for graduate degrees may not be applied toward the degree.

Advanced Software Development Certificate

This program is designed for students seeking knowledge that will enhance their skills as a software developer.

Required Courses

ITMD 515   Advanced Software Development
ITMM 571 Project Management for Information
    Technology Management

AND any two of the following nine courses:

ITMD 511 Application Development Methodologies
ITMD 513 Open Source Programming
ITMD 519 Topics in Software Development
ITMD 532 UML Based Software Development
ITMD 534 Human/Computer Interaction
ITMD 536 Software Testing and Maintenance
ITMD 553 Enterprise Intelligent Device Applications
ITMD 554 Mass-Market Intelligent Device Applications
ITMD 555 Open Source Intelligent Device Applications
ITMD 556   Intelligent Device Projects
ITMS 518 Coding Security

Students who have already completed coursework, training, or certification equivalent to ITMM 571 may substitute a fourth course from the above list.

Cyber Security Management Certificate

This program is designed for students seeking knowledge that will prepare them for careers in the management of information security.

Required Courses

ITMS 548 Cyber Security Technologies
ITMS 578 Cyber Security Management

AND any two of the following four courses:

ITMS 543 Vulnerability Analysis and Control
ITMS 579 Topics in Cyber Security
ITMM 586 Information Technology Auditing
ITMS 588 Incident Response, Disaster Recovery and
    Business Continuity

ITMS 579 Topics in Cyber Security may be applied to this certificate twice.

Cyber Security Technologies Certificate

This program is designed for students seeking knowledge that will prepare them for careers in computer and network security technologies and to deal with the challenging computer and network security problems facing society.

Required Courses

ITMS 543 Vulnerability Analysis and Control
ITMS 548 Cyber Security Technologies

AND any two of the following seven courses:

ITMS 518 Coding Security
ITMS 528 Database Security
ITMS 538 Cyber Forensics
ITMS 539 Steganography
ITMS 549 Cyber Security Technologies: Projects &
    Advanced Methods
ITMS 555 Mobile Device Forensics
ITMS 558 Operating System Security

Data Center Operations and Management Certificate

This program is designed for students seeking knowledge that will prepare them for a career in data center operations.

Required Courses

ITMT 535   Data Center Architecture
ITMO 540   Introduction to Data Networks and the Internet
ITMO 554   Operating System Virtualization
ITMM 576   Data Center Management

Students who have already completed coursework, training, or certification equivalent to ITMO 540 may substitute a fourth course from the list below.
ITMO 544 Cloud Computing Technologies
ITMO 557 Storage Technologies
ITMS 548 Cyber Security Technologies
ITMS 588 Incident Response, Disaster Recovery and
    Business Continuity

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Data Management and Analytics Certificate

This program is designed for students seeking knowledge that will prepare them for careers in data management and analytics.

Required Courses

ITMD 421 Data Modeling and Applications
ITMD 523 Advanced Topics in Data Management
ITMD 527 Data Analytics

AND any one of the following four courses:

ITMD 526 Data Warehousing
ITMD 529 Advanced Data Analytics
ITMD 531 Object Oriented System Analysis, Modeling and Design
ITMS 528 Database Security

Students who have already completed coursework, training, or certification equivalent to ITMD 421 may substitute a fourth course from the above list.

Digital Voice and Data Communication Technologies Certificate

This program is designed for students seeking knowledge that will prepare them for careers in digital voice and data communications.

Required Courses

ITMD 545 WebRTC
ITMO 540 Introduction to Data Networks and the Internet
ITMO 546 Telecommunications Over Data Networks

AND any one of the following three courses:

ITMO 541 Network Administration and Operations
ITMO 547 Telecommunications Over Data Networks: Projects & Advanced Methods
ITMM 575 Networking & Telecommunications Management

Students who have already completed coursework, training, or certification equivalent to ITMO 540 may substitute a fourth course from the above list.

Information Technology Innovation, Leadership and Entrepreneurship Certificate

This program is designed for students seeking knowledge that will prepare them to be leaders, innovators and entrepreneurs in the field of information technology.

Required Courses

ITMM 571 Project Management for Information Technology Management
ITMM 581 IT Entrepreneurship
ITMM 582 Business Innovation

AND any one of the following courses:

Any ITMM elective
INTM 511 Industrial Leadership
INTM 515 Advanced Project Management
INTM 522 Computers in Industry
INTM 534 Resource Management
INTM 543 Purchasing
TECH 581 Consulting for Technical Professionals

Students who have already completed coursework, training, or certification equivalent to ITMM 571 may substitute a fourth course from the above list. Only one INTM course may be applied to the certificate.

System Administration Certificate

This program is designed for students seeking knowledge that will prepare them for a career as a systems administrator.

Complete one of the following two six-credit-hour course sequences:
ITMO 550 Enterprise End-User System Administration
AND
ITMO 533 Enterprise Server System Administration
OR
ITMO 556 Introduction to Open Source Software
AND
ITMO 553 Open Source Server System Administration

AND any two of the following five courses:

ITMO 544 Cloud Computing Technologies
ITMO 554 Operating System Virtualization
ITMO 557 Storage Technologies
ITMS 558 Operating System Security
ITMM 571 Project Management for Information Technology Management

Systems Analysis Certificate

This program is designed for students seeking knowledge that will prepare them for a career as a systems analyst.

Required Courses

ITMT 531 Object Oriented System Analysis, Modeling and Design
ITMM 571 Project Management for Information Technology Management
ITMM 572 Process Engineering for Information Technology Managers

AND any one of the following six courses:

ITMD 511 Application Development Methodologies
ITMD 532 UML Based Software Development
ITMD 534 Human/Computer Interaction
ITMD 536 Software Testing and Maintenance
INTM 522 Computers in Industry
TECH 581 Consulting for Technical Professionals

Students who have already completed coursework, training, or certification equivalent to ITMM 571 may substitute a fourth course from the above list

Web Design and Application Development Certificate

This program is designed for students seeking knowledge that will prepare them for careers in Web design and application development.

Required Courses

ITMD 461 Internet Technologies & Web Design
ITMD 562 Web Application Development

AND any two of the following seven courses:

ITMD 534 Human Computer Interaction
ITMD 553 Enterprise Intelligent Device Applications
ITMD 554 Mass-Market Intelligent Device Applications
ITMD 555 Open Source Intelligent Device Applications
ITMD 563 Intermediate Web Application Development
ITMD 564 Advanced Web Application Development
ITMD 565 Rich Internet Applications
ITMD 566 Service-Oriented Architectures
ITMD 567 Web Systems Integration
ITMD 569 Topics in Application Development

Students who have already completed coursework, training, or certification equivalent to ITMD 461 may substitute a fourth course from the above list.

Accelerated Courses

The program may offer accelerated courses for credit in several areas of information technology & management. (Students should see the definition of accelerated courses within the front of this bulletin.)

Accelerated courses provide an opportunity for degree-seeking students at lIT 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.

Department of Information Technology & Management

Course Descriptions

Numbers in parentheses indicate class, lab and credit hours, respectively.

Information Technology & Management: Development

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 client interfaces. 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.
(2-2-3)

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: [(ITMD 411) OR (ITMD 412) OR (ITMD 510) OR (ITMD 512)]
(2-2-3)

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: [(ITMD 312)]
(2-2-3)

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: [(ITMD 411) OR (ITMD 510)]
(2-2-3)

ITMD 515
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: [(ITMD 411) OR (ITMD 510)]
(2-2-3)

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. Prerequisite: consent of instructor. This course may be taken more than once but only 9 hours of ITMD 519 credit may be applied to a degree.
(Credit: Variable)

ITMD 521
Client Server Technologies & Applications

This course covers both concepts and practical applications of client server systems, a common form of distributed system in which software is split between server tasks and client tasks. Both central and distributed server models will be studied, with particular focus on middleware, systems planning, and data access. The course includes hands-on development of client-server applications in database systems.
(2-2-3)

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.
(3-0-3)

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. Prerequisite: consent of instructor. This course may be taken more than once but only 6 hours of ITMD 525 credit may be applied to a degree.
(Credit: Variable)

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 and demonstrated in detail.
(3-0-3)

ITMD 527
Data Analytics
This is a hands-on course that focuses on the creation, maintenance, and analysis of large financial and business databases including concepts such as simulated equities, insurance, and banking database systems. The student is expected to have a working understanding of relational database concepts as well as SQL.
(3-0-3)

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: [(ITMD 527)]
(3-0-3)

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: [(ITMD 510) OR (ITMD 512)]
(3-0-3)

ITMD 534
Human/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.
(3-0-3)

ITMD 535
Human/Computer Interaction Design
Advance study in human-computer interaction, with a particular focus on the design of application and web interfaces.
Prerequisites: [(ITMD 434) OR (ITMD 534)]
(3-0-3)

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.
Prerequisites: [(ITMM 471) OR (ITMM 571)]
(3-0-3)

ITMD 545
WebRTC
This course covers a 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 is established using the WebRTC API's and architectures. Students will use JavaScript and development environments to create basic data, and media applications based on the WebRTC technologies and will record the impact of their applications on the performance and behavior of the networks that carry them.
Prerequisites: [(ITMD 411) OR (ITMD 510) AND (ITMO 440) OR (ITMO 540) AND (ITMO 456) OR (ITMO 556)]
(3-0-3)

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.
(2-2-3)

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.
(2-2-3)

ITMD 555
Open Source Intelligent Device Applications
Intelligent device application development is covered with mainstream 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.
(2-2-3)

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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: [(ITMD 453) OR (ITMD 553) OR (ITMD 454) OR (ITMD 554) OR (ITMD 455) OR (ITMD 555)]
(Credit: Variable)

ITMD 562
Web Site Application Development
Programming the Common Gateway Interface (CGI) for Web pages is introduced with emphasis on creation of interfaces to handle Web-based 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 major Web site with including basic CGI programs with Web interfaces and process data flows from online forms with basic database structures.
(2-2-3)

ITMD 563
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.
Prerequisites: [(ITMD 411) OR (ITMD 510)]
(2-2-3)

ITMD 564
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: [(ITMD 463) OR (ITMD 563)]
(2-2-3)

ITMD 565
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.
(2-2-3)

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.
Prerequisites: [(ITMD 411) OR (ITMD 510)]
(2-2-3)

ITMD 567
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) OR (ITMD 562) and (ITMD 465) OR (ITMD 565)]
(2-2-3)

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 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. Prerequisite: consent of instructor.
(Credit: variable)

Information Technology & Management: Management

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 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.
(3-0-3)

ITMM 571
Project Management for Information Technology Management
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, as well as new and emerging methods such as Agile and Extreme Project Management.
(3-0-3)

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.
Prerequisite: [(ITMM 470) OR (ITMM 570)]
(3-0-3)

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: [(ITMM 470) OR (ITMM 570)]
(3-0-3)

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.
(3-0-3)

ITMM 575
Networking & Telecommunications Management
This course addresses the design, implementation, and management of computer networks and enterprise telecommunication 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.
Prerequisite: [(ITMO 541)]
(3-0-3)

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: [(ITMO 535)]
(3-0-3)

ITMM 577
Case Studies in the 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.
(3-0-3)

ITMM 581
IT 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.
(3-0-3)

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 require that innovation become a leading tool for developing a competitive edge. Innovation has been considered a competency of educated design engineering, and the selected few employees possessing this skill has become insufficient today. Corporations and organizations need innovation to develop customer-specific solutions in almost real time.
(3-0-3)

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 professionals currently employed in these roles.
(3-0-3)

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.
(3-0-3)

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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.
(3-0-3)

Information Technology & Management: Operations

ITMO 517
Shell Scripting for System Administrators
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.
Prerequisite(s): [(ITMO 456) OR (ITMO 556)]
(3-0-3)

ITMO 533
Enterprise Server System Administration
Students learn to set up and 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 440) OR (ITMO 540)]
(2-2-3)

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.
(2-2-3)

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, Net-BIOS, 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: [(ITMO 440) OR (ITMO 540)]
(2-2-3)

ITMO 542
Wireless Technologies and Applications
This course will present the foundation of wireless technologies and examine state-of-the-art wireless systems and services, including digital cellular systems (DCS), wireless asynchronous transfer mode (ATM), infrared data transfer (IrDA), wireless local area network technologies including 802.11a/b/g (wireless Ethernet) and Bluetooth, and third-generation (3G) systems such as wireless code division multiple access (W-CDMA) and cdma2000. Security for wireless systems including encryption and authentication issues will also be addressed.
Prerequisite: [(ITMO 440) OR (ITMO 540)]
(3-0-3)

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.
(2-2-3)

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, on-net to PSTN 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.
Prerequisite: [(ITMO 440) OR (ITMO 540)]
(3-0-3)

ITMO 547
Telecommunications Over Data Networks: Projects & 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 classroom 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: [(ITMO 546)]

(Credit: variable 1 to 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.
(2-2-3)

ITMO 553
Open Source Server 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, and more. as well as support issues for open source software.
Prerequisite(s): [(ITMO 456) OR (ITMO 556) and (ITMO 440) OR (ITMO 540)]
(2-2-3)

ITMO 554
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 firsthand experience of this technology.
(2-2-3)

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 distri-

butions are covered with emphasis on the two leading major distribution forks.
(2-2-3)

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.
(3-0-3)

Information Technology & Management: Security

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 to evaluate the level of a systems data exposure. Coding Standards, best practices, guidelines and style will further enhance the student's ability to develop secure code. Homework assignments and projects will reinforce theories taught.
Prerequisite: [(ITMD 411) OR (ITMD 510)]
(3-0-3)

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.
(3-0-3)

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.
(2-2-3)

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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: [(ITMS 538)]
(2-2-3)

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 use of open source and freeware tools; students will learn in a closed environment to probe, penetrate and hack other networks.
Prerequisite: [(ITMO 440) OR (ITMO 540)]
(2-2-3)

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 be extended into a fully operational security system in a follow-on course.
Prerequisite: [(ITMO 440) OR (ITMO 540)]
(2-2-3)

ITMS 549
Cyber Security Technologies: Projects & Advanced Methods
Prepares students for a role as a network security analyst and developer and gives students 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 the design and development of secure networks. This course includes a significant real world team project the results in a fully operational security system. Students should have previous experience with object-oriented and/or scripting languages.
Prerequisite: [(ITMS 448) OR (ITMS 539) OR (ITMS 548)]
(2-2-3)

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, NAND 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.
Prerequisite: [(ITMS 538)]
(2-2-3)

ITMS 557
Introduction to Cyber Warfare
Cyber warfare is defined as "warfare waged in cyberspace," which can include defending information and computer networks, 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 industry ability to conduct business operations? What does the current threat environment look like? The course will include extensive discussions and student presentations.
(3-0-3)

ITMS 558
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: [(ITMO 456) OR (ITMO 556)]
(2-2-3)

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.
(3-0-3)

ITMS 579
Topics in Cyber 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. Prerequisite: consent of instructor.
(Credit: variable)

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. Regular homework assignments and completion of a research paper are required for this course.
Prerequisite: [(ITMS 478) OR (ITMS 578)]
(3-0-3)

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; business continuity plans; and crisis management teams and plans. Reporting, response planning and budgeting are all addressed. Students working in teams will prepare an incident response, disaster recovery, business continuity, or crisis management plan for a real-world organization such as a business or a government body or agency.
(3-0-3)

Information Technology & Management: Theory and Technology

ITMT 514
Enterprise Application Architectures
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 system integration issues will be addressed.
Prerequisite: [(ITMD 411) OR (ITMD 510)]
(3-0-3)

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.
(3-0-3)

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 learned about operating systems design to practical implementation, by modifying and extending the MINIX Operating System, MS Windows and Linux are briefly discussed as case studies. Requires knowledge of C++.
(3-0-3)

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.
Prerequisites: [(ITMO 440) OR (ITMO 540) and (ITMD 554)]
(3-0-3)

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.
(3-0-3)

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. Students should have completed ITMO 301 or an equivalent computer architecture course and have C/C++ programming experience.
(2-2-3)

ITMT 594
Special Projects in Information Technology
Capstone project. Prerequisite: written consent of instructor
(Credit: 1 to 6)

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.
Prerequisite: consent of instructor
(Credit: variable)

ITMT 596
Graduate Honors Studies in Information Technology
Graduate honors project, thesis or whitepaper.
Prerequisites: Graduate Honors status and consent of instructor
(0-12-6)

ITMT 597
Special Problems in Information Technology
Independent study and project.
Prerequisite: Consent of instructor.
(Credit: variable)

Technology

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)

Department of Information Technology & Management

TECH 565
Introduction to Social Commerce
Introduction and basic knowledge of social commerce to help the student 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 the student in a start-up or company/corporate setting.
(3-0-3)

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 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 the tools commonly used by consulting professionals.
(3-0-3)

TECH 597
Special Problems in Technology
Independent study and project.
Prerequisite: Consent of instructor.
(Credit: variable)

Undergraduate Courses Available to Graduate Students in Information Technology & Management (as Prerequisites Only)

ITM 301 (as a prerequisite only)
Introduction to Contemporary Operating Systems and Hardware I

ITM 311 (as a prerequisite only)
Introduction to Software Development

ITM 312 (as a prerequisite only)
Introduction to Systems Software Programming

ITM 361 (as a prerequisite only)
Introduction to Web Development

ITMD 421 (as a prerequisite only)
Data Modeling and Applications

ITMD 461 (as a prerequisite only)
Internet Technologies & Web Design