

Information Technology and Management

IIT School of Applied Technology

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The mission of the Master of Information Technology & Management program is to educate and inform students to prepare them to assume technical and managerial leadership in the information technology field. The Information Technology and Management program applies a hands-on, reality-based approach to education that allows students to apply what they learn in class to solve real-life problems. 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 MITM degree on-line.

Degree Offered

Master of Information Technology & Management

Certificate Programs

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

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

Faculty

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

Carol Davids, Alva C. Todd Industry Professor and Director of the VoIP Laboratory, IIT School of Applied Technology. B.S.E.E. Cornell University, M.I.T.M. Illinois Institute of Technology. Voice over IP, voice and data networks, and digital and voice communications.

Dennis Hood, Adjunct Industry Professor. B.S. Rensselaer Polytechnic Institute, M.S. Stevens Institute of Technology. Project Management, process engineering, and information technology management.

Jeffrey Kimont, Industry Associate Professor. B.S.E.E. Midwest College of Engineering, M.S.C.S. North Central College. Object-oriented programming, client-server programming, agile programming, Web application development, embedded systems, intelligent device application development, cloud computing and grid computing.

William Lidinsky, Alva C. Todd Industry Professor and 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 and steganography.

Valerie Scarlata, Industry Associate Professor and Director, Graduate Admissions & Student Affairs, Information Technology and Management Degree Programs. B.A. Columbia College, M.I.T.M. Illinois Institute of Technology. Online design, Web application development, rich client applications, multimedia, human-computer interaction and instructional technologies.

Raymond E. Trygstad, Industry Professor, Associate Director and Director of Undergraduate Advising, Information Technology and Management Degree Programs, 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, open source operating systems and applications, and multimedia.

Laboratories and Research Centers

The IIT School of Applied Technology operates and administers over 200 computers and servers at the Main and Rice Campuses to support teaching, learning and research. Nine laboratories include Sun Solaris facilities, a networking/network security and computer forensics facility, a dedicated Voice over IP (VoIP) facility which includes an entire CISCO VoIP LAN as well as video and mesh wireless capabilities, and the world's first 10GBASE-T 10-gigabit Ethernet academic computing facility. The security/forensics, VoIP and 10GBASE-T laboratories provide additional facilities for student projects

and applied research, some of which is undertaken in conjunction with industry partners. All laboratories are normally 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.

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 1200 (combined score for tests taken prior to Oct. 1, 2002) or 900 quantitative + verbal and 2.5 analytical writing (for tests taken on or after Oct. 1, 2002) and may be required to submit a TOEFL score (see requirements within this bulletin). 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 the 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. Current prerequisites for the Master of Information Technology & Management include computer hardware and operating system literacy (ITM 301 or ITM 302 or equivalent course-work, 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). Students enrolled in undergraduate post-baccalaureate studies (see information at the front of this bulletin) may take these courses as part of that program. 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.

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 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; the 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 very low scores on the GRE Verbal (generally 10th percentile or lower) may be required to complete the IIT English Proficiency Review (EPR) Essay Examination. If students cannot pass this examination they will be required to enroll in ENG 053 and retake the EPR Essay Exam at course completion.

Master of Information Technology & Management

30 credit hours (Courses may be selected from 400-and 500-level courses; a minimum of 18 credit hours must be at the 500-level or higher.)

GPA of 3.0/4.0 or better

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 complete core courses or demonstrate their knowledge through equivalent coursework, certification or experience. These core courses will ensure an ability to program at a competent level using a contemporary programming language (ITM 411); basic knowledge of networking concepts, protocols and methods (ITM 540); knowledge of the Internet, including the ability to build Web sites and deliver them on a server (ITM 461); and the ability to create and admin-

ister databases using a modern database management system (ITM 421). Students enrolled in undergraduate post-baccalaureate studies (see page 28) may take these courses as part of that program, but they will not then be applied to their graduate degree.

The following course groupings 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 students advisor. Final determination of completion of a specialization will be made by a students graduate adviser. Students are not required to choose a specialization for degree completion and can mix courses from different specializations: a general program of study is also available.

Core Courses (9 hours)

Required courses

ITM 411 Intermediate Software Development

AND 6 hours chosen from the following

ITM 421 Data Modeling and Applications

ITM 561 Internet Technologies & Web Design

ITM 540 Introduction to Data Networks and the Internet

Notes: Core courses may be waived upon presentation of evidence of equivalent coursework, certification or experience or successful completion of the placement examination. Approval of waivers will be made by the students adviser or the ITM Associate Director. If any one core course is waived, students must still complete nine hours of core course content. Core courses that also apply to specializations will still fulfill the core course requirement.

Computer and Information Security (18 hours)

Recommended courses (9 hours)

ITM 548 System and Network Security

ITM 578 Information Systems Security Management

AND 3 hours chosen from the following:

ITM 518 Coding Security

ITM 528 Database Security

ITM 538 Computer & Network Forensics

ITM 539 Steganography

ITM 543 Vulnerability Analysis and Control

ITM 549 System and Network Security: Projects & Advanced Methods

ITM 558 Operating System Security

ITM 588 Incident Response, Disaster Recovery and Business Continuity

AND 9 hours chosen from the following:

ITM 518 Coding Security

ITM 528 Database Security

ITM 538 Computer & Network Forensics

ITM 539 Steganography

ITM 543 Vulnerability Analysis and Control

ITM 549 System and Network Security: Projects & Advanced Methods

ITM 551 Distributed Workstation System Administration

OR

ITM 552 Client-Server System Administration

ITM 558 Operating System Security

ITM 579 Topics in Information Security

ITM 586 Information Technology Auditing

ITM 588 Incident Response, Disaster Recovery and Business Continuity

Voice and Data Communication Technology (18 hours)

Recommended courses (9 hours)

ITM 540	Introduction to Data Networks and the Internet	ITM 543	Vulnerability Analysis and Control
ITM 545	Telecommunications Technology	ITM 547	Voice Communications Over Data Networks: Projects & Advanced Methods
ITM 546	Voice Communications Over Data Networks	ITM 548	System and Network Security
		ITM 549	System and Network Security: Projects & Advanced Methods
		ITM 571	Project Management for Information Technology Management
		ITM 575	Networking and Telecommunications Management

AND 9 hours chosen from the following:

ITM 541	Network Administration and Operations
ITM 542	Wireless Technologies and Applications

IT Management and Entrepreneurship (18 hours)

Recommended courses (9 hours)

ITM 571	Project Management for Information Technology Management	ITM 575	Networking and Telecommunications Management
ITM 574	Information Technology Management Frameworks	ITM 578	Information Systems Security Management
ITM 581	IT Entrepreneurship	ITM 582	Business Innovation
		ITM 585	Legal and Ethical Issues in Information Technology
		ITM 586	Information Technology Auditing
		INTM 511	Industrial Leadership
		INTM 515	Advanced Project Management
		INTM 522	Computers in Industry
		INTM 534	Resource Management
		INTM 543	Purchasing

AND 9 hours chosen from the following:

ITM 531	Object Oriented System Analysis, Modeling and Design
ITM 532	UML Based Software Development
ITM 572	Process Engineering for Information Technology Managers
ITM 573	Building & Leading Effective Teams

Data Management (18 hours)

Recommended courses (9 hours)

ITM 421	Data Modeling and Applications	ITM 526	Data Warehousing
ITM 422	Advanced Database Management	ITM 527	Data Analytics
ITM 528	Database Security	ITM 529	Advanced Data Analytics
		ITM 531	Object Oriented System Analysis, Modeling and Design
		ITM 574	Strategic Information Technology Management
		ITM 578	Information Systems Security Management

AND 9 hours chosen from the following:

ITM 521	Client Server Technologies and Applications
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Web Design and Application Development (18 hours)

Recommended Courses (9 hours)

ITM 461	Internet Technologies & Web Design	ITM 515	Advanced Software Development
ITM 562	Web Application Development	ITM 519	Topics in Software Development
ITM 571	Project Management for Information Technology Management	ITM 541	Network Administration and Operations
		ITM 563	Internet Application Development
		ITM 565	Rich Internet Applications
		ITM 566	Service-Oriented Architectures
		ITM 569	Topics in Application Development
		COM 525	Research and Usability Testing

AND 9 hours chosen from the following:

ITM 411	Intermediate Software Development
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Systems Analysis (18 hours)

Recommended courses (9 hours)

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

AND 9 hours chosen from the following:

- ITM 511 Application Development Methodologies
 ITM 532 UML Based Software Development

- ITM 534 Human Computer Interaction
 ITM 535 Systems Architecture
 ITM 536 Software Testing and Maintenance
 ITM 574 Information Technology Management Frameworks
 ITM 575 Networking and Telecommunications Management
 ITM 578 Information Systems Security Management
 ITM 586 Information Technology Auditing
 INTM 522 Computers in Industry

Data Center Operations and Management

Recommended courses (12 hours)

- ITM 535 Data Center Architecture
 ITM 540 Introduction to Data Networks and the Internet
 ITM 554 Operating System Virtualization
 ITM 576 Data Center Management

AND 6 hours chosen from the following:

- ITM 526 Data Warehousing

- ITM 527 Data Analytics
 ITM 529 Advanced Data Analytics
 ITM 544 Cloud Computing Technologies
 ITM 546 Voice Communications Over Data Networks
 ITM 548 System and Network Security
 ITM 588 Incident Response, Disaster Recovery and Business Continuity

Software Development (18 hours)

Recommended courses (9 hours)

- ITM 515 Advanced Software Development
 ITM 532 UML Based Software Development
 ITM 571 Project Management for Information Technology Management

AND 9 hours chosen from the following:

- ITM 411 Intermediate Software Development
 ITM 412 Advanced Software Development
 ITM 511 Application Development Methodologies
 ITM 513 Open Source Programming

- ITM 518 Coding Security
 ITM 519 Topics in Software Development
 ITM 521 Client Server Technologies and Applications
 ITM 531 Object Oriented System Analysis, Modeling and Design
 ITM 534 Human Computer Interaction
 ITM 536 Software Testing and Maintenance
 ITM 567 Enterprise Web Application Development
 ITM 572 Process Engineering for Information Technology Managers

Systems Administration (18 hours)

Recommended courses (9 hours)

- ITM 541 Network Administration and Operations
 ITM 551 Distributed Workstation System Administration

OR

- ITM 552 Client-Server System Administration

AND 9 hours chosen from the following:

- ITM 456 Introduction to Open Source Operating Systems
 ITM 544 Cloud Computing Technologies

- ITM 551 Distributed Workstation System Administration
OR
 ITM 552 Client-Server System Administration
 ITM 554 Operating System Virtualization
 ITM 558 Operating System Security
 ITM 571 Project Management for Information Technology Management
 ITM 574 Information Technology Management Frameworks
 ITM 575 Networking and Telecommunications Management

Management Information Systems (18 hours)

Recommended courses (9 hours)

ITM 421 Data Modeling and Applications
ITM 422 Advanced Database Management I
ITM 571 Project Management for Information Technology

AND 9 hours chosen from the following:

ITM 526 Data Warehousing
ITM 527 Data Analytics
ITM 528 Database Security
ITM 529 Advanced Data Analytics

ITM 531 Object Oriented System Analysis, Modeling and Design
ITM 532 UML Based Software Development
ITM 554 Operating System Virtualization
ITM 572 Process Engineering for Information Technology Managers
ITM 574 Information Technology Management Frameworks
ITM 586 Information Technology Auditing
INTM 515 Advanced Project Management
INTM 522 Computers in Industry

Digital Systems Technology (18 hours)

Recommended courses (9 hours)

ITM 533 Operating System Design Implementation
ITM 555 Intelligent Device Applications
ITM 593 Embedded Systems

AND 9 hours chosen from the following:

ITM 511 Application Development Methodologies
ITM 540 Introduction to Data Networks and the Internet

ITM 541 Network Administration and Operations
ITM 542 Wireless Technologies and Applications
ITM 544 Cloud Computing Technologies
ITM 545 Telecommunications Technology
ITM 546 Voice Communications Over Data Networks
ITM 556 Intelligent Device Project
INTM 522 Computers in Industry

Master of Information Technology & Management: General Course of Study

These are selected groupings of courses allowing students enrolled in the Master of Information Technology & Management degree to develop a broad overview knowledge of information technology. Suggested courses in each area are marked with an asterisk (*) with one alternative course listed for each area; more alternatives may be possible at the discretion of the students advisor.

Web Design and Application Development

- *ITM 461 Internet Technologies & Web Design
- ITM 562 Web Site Application Development
- ITM 574 Strategic Information Technology Management

Data Management

- *ITM 421 Data Modeling and Applications
- *ITM 531 Object Oriented System Analysis, Modeling and Design
- ITM 521 Client Server Technologies and Applications

Information Technology Management

- *ITM 571 Project Management for Information Technology
- ITM 574 Information Technology Management Frameworks
- ITM 586 Information Technology Auditing

Networking and Communications

- *ITM 540 Introduction to Data Networks and the Internet
- *ITM 548 System and Network Security
- ITM 541 Network Administration and Operations

Systems Administration

- *ITM 551 Distributed Workstation System Administration

OR

- *ITM 552 Client-Server System Administration

Software Development

- *ITM 411 Intermediate Object Oriented Programming
- *ITM 571 Project Management for Information Technology Management
- ITM 532 UML Based Software Development Computer & Information Security

Computer & Information Security

- *ITM 578 Information Systems Security Management
- ITM 528 Database Security
- ITM 548 System and Network Security

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. 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. Courses taken may be later applied toward a degree program. Applicants should have a bachelors 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.

Computer and Network 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

ITM 543 Vulnerability Analysis and Control
ITM 548 System and Network Security

AND any two of the following six courses:

ITM 518 Coding Security
ITM 528 Database Security
ITM 538 Computer & Network Forensics
ITM 539 Steganography
ITM 549 System and Network Security: Projects & Advanced Methods
ITM 558 Operating System Security

Information 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

ITM 548 System and Network Security
ITM 578 Information System Security Management

AND any two of the following four courses:

ITM 543 Vulnerability Analysis and Control
ITM 579 Topics in Information Security
ITM 586 Information Technology Auditing
ITM 588 Incident Response, Disaster Recovery and Business Continuity
ITM 579 Topics in Information Security (may be applied to this certificate twice.)

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

ITM 540 Introduction to Data Networks and the Internet
ITM 545 Telecommunications Technology
ITM 546 Voice Communications Over Data Networks

AND select any one of the following three courses:

ITM 541 Network Administration and Operations
ITM 547 Voice Communications Over Data Networks: Projects & Advanced Methods
ITM 575 Networking & Telecommunications Management

Students who have already completed coursework, training, or certification equivalent to ITM 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

ITM 571 Project Management for Information Technology Management

ITM 581 IT Entrepreneurship

ITM 582 Business Innovation

AND select any one of the following eleven courses:

ITM 572 Process Engineering for Information Technology Managers

ITM 573 Building & Leading Effective Teams

ITM 574 Information Technology Management Frameworks

ITM 575 Networking and Telecommunications Management

ITM 578 Information Systems Security Management

ITM 585 Legal and Ethical Issues in Information Technology

INTM 511 Industrial Leadership

INTM 515 Advanced Project Management

INTM 522 Computers in Industry

INTM 534 Resource Management

INTM 543 Purchasing

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

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

ITM 421 Data Modeling and Applications

ITM 422 Advanced Database Management

ITM 527 Data Analytics

AND any one of the following four course:

ITM 526 Data Warehousing

ITM 528 Database Security

ITM 529 Advanced Data Analytics

ITM 531 Object Oriented System Analysis, Modeling and Design

Students who have already completed coursework, training, or certification equivalent to ITM 421 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

ITM 461 Internet Technologies & Web Design

ITM 562 Web Application Development

AND select any two of the following six courses:

ITM 564 Advanced Web Application Development

ITM 565 Rich Internet Applications

ITM 566 Service-Oriented Architectures

ITM 569 Topics in Application Development

ITM 571 Project Management for Information Technology Management

COM 525 Research and Usability Testing

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

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:

- ITM 535 Data Center Architecture
- ITM 540 Introduction to Data Networks and the Internet
- ITM 554 Operating System Virtualization
- ITM 576 Data Center Management

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

- ITM 544 Cloud Computing Technologies
- ITM 548 System and Network Security
- ITM 588 Incident Response, Disaster Recovery and Business Continuity

Systems Analysis Certificate

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

Required Courses

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

AND select any one of the following five courses:

- ITM 511 Application Development Methodologies
- ITM 532 UML Based Software Development
- ITM 534 Human Computer Interaction
- ITM 536 Software Testing and Maintenance
- INTM 522 Computers in Industry

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

Advanced Software Development Certificate

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

Required Courses

- ITM 515 Advanced Software Development
- ITM 571 Project Management for Information Technology Management

AND select any two of the following seven courses:

- ITM 511 Application Development Methodologies

- ITM 513 Open Source Programming
- ITM 518 Coding Security
- ITM 519 Topics in Software Development
- ITM 532 UML Based Software Development
- ITM 534 Human Computer Interaction
- ITM 536 Software Testing and Maintenance

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

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 courses:

- ITM 551 Distributed Workstation System Administration
- ITM 552 ClientServer System Administration

AND select any two of the following five courses:

- ITM 456 Introduction to Open Source Operating Systems
- ITM 544 Cloud Computing Technologies
- ITM 554 Operating System Virtualization
- ITM 558 Operating System Security
- ITM 571 Project Management for Information Technology Management

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 IIT to complete graduate degree re-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

Course Descriptions

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

ITM 411

Intermediate Software Development

This course covers a broad spectrum of object-oriented programming concepts and application programming interfaces. The student considers the details of object-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. Hands-on exercises reinforce concepts taught throughout the course. Prerequisite: ITM 311. (2-2-3)

ITM 412

Advanced Structures and Systems Programming

Structured programming continues with advanced concepts including strings, arrays, pointers, data structures, file manipulation, and dynamic memory management. Students create more complex applications that work with user input, manipulate user supplied text or text obtained from a file, apply standard library routines for working with literal text, use pointers to store complex structures within arrays, and read and write data from files, the console, and the terminal. The object-oriented programming (OOP) paradigm is covered in depth including the philosophy of OOP, classes and objects, inheritance, template classes, and making use of class libraries. Prerequisite: ITM 312. (2-2-3)

ITM 421

Data Modeling and Applications

Basic data modeling concepts are introduced. Hands-on database design, implementation, and administration of single-user and shared multi-user database applications using a contemporary relational database management system. (2-2-3)

ITM 422

Advanced Database Management

Advanced topics in database management and programming including client server application development are introduced. Expands knowledge of data modeling concepts and introduces object-oriented data modeling techniques. Students will learn the use of Structured Query Language in a variety of application and operating system environments. Prerequisite: ITM 421. (C) (3-0-3)

ITM 456

Introduction to Open-Source Operating Systems

Students learn to set up and configure an industry-standard open source operating system, including the actual installation of the operating system on the student workstation. Also addressed are applications and graphical user interfaces as well as support issues for open source software. Prerequisite: ITM 302 or permission of instructor. (2-2-3)

ITM 460

Fundamentals of Multimedia

Students are introduced to computer-based multimedia theory, concepts and applications. Topics include desktop publishing, hypermedia, presentation graphics, graphic images, animation, sound, video, multimedia on the World Wide Web and integrated multimedia authoring techniques. Prerequisite: Permission of instructor. (2-2-3)

ITM 461

Internet Technologies & Web Design

This course will cover how the Internet is organized, addressing, routing, DNS, protocols, TCP/IP, SMTP, the use of Internet applications, and the creation of Web pages using HTML and graphical applications. Networked multimedia distribution technologies are also explored. The design of effective Web site including page layout, user interface design, graphic design, content flow and site structure as well as management of Web site resources including intranet management and design considerations are addressed. Students design and create a major Web site with multiple pages and cross-linked structures. (C) (2-2-3)

ITM 492

Embedded Systems and Reconfigurable logic design

This course covers embedded system design as well as reconfigurable logic design using a hardware description language (VHDL). Students will discover hardware, software and firm-ware design trade-offs as well as best practices in current embedded systems development. Real-time operating system (RTOS) topics will be considered to further emphasize embedded hardware-software impacts. A final project will integrate course topics into a System On a Chip (SOC) design including intellectual property (IP) implemented in a Field-programmable Gate Array (FPGA) and driven by application code loaded from either the development platform or from onboard firmware. Prerequisite: Knowledge of digital logic and C or instructor consent. (4-4-6)

ITM 495

Topics in Information Technology

This course will cover a particular topic, varying from semester to semester, in which there is particular student or staff interest. Prerequisite: consent of instructor. (Credit : Variable)

ITM 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: ITM 412 or significant software development experience. (2-2-3)

ITM 513

Open Source Programming

Contemporary opensource 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 opensource programming project. Prerequisite: ITM 411. (2-2-3)

ITM 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: ITM 411.
(2-2-3)

ITM 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 a final project will reinforce the theories taught. A final project involves design and implementation of a secure product. Prerequisite: ITM 411.
(3-0-3)

ITM 519

Topics in Software Development

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

ITM 521

Client Server Applications and Technologies

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. Prerequisite: ITM 421.
(2-2-3)

ITM 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. Prerequisite: ITM 421.
(3-0-3)

ITM 527

Data Analytics I

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. Prerequisite: ITM 422 or permission of instructor.
(3-0-3)

ITM 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. Prerequisite: ITM 421.
(3-0-3)

ITM 529

Advanced Data Analytics

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: ITM 527 or permission of instructor.
(3-0-3)

ITM 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)

ITM 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: ITM 412 or significant object-oriented programming experience.
(3-0-3)

ITM 533

Operating System Design and 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 XP and LINUX are briefly discussed as case studies.
(3-0-3)

ITM 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 tradeoffs, 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)

ITM 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: ITM 540 and ITM 554.

(3-0-3)

ITM 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: ITM 471 or ITM 571.

(3-0-3)

ITM 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 online instruction in educational settings. Focus will be given to modern programming environments and models for developing instructional materials.

(3-0-3)

ITM 538

Computer Network 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)

ITM 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: ITM 538.

(2-2-3)

ITM 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, Bluetooth, 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)

ITM 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: ITM 440 or ITM 540.

(2-2-3)

ITM 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 thirdgeneration (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: ITM 441 or ITM 541.

(3-0-3)

ITM 543

Vulnerability Analysis and Control

ethical hacking, penetration testing, 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: ITM 440.

(2-2-3)

ITM 544

Cloud Computing Technologies

Computing applications hosted on dynamically scaled, virtual resources available as services are considered. Collaborative and noncollaborative "cloudresident" 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. Prerequisites: ITM 301 and ITM 311.

(2-2-3)

ITM 545

Telecommunications Technology

Introduction to voice and data communications infrastructure design and implementation. Current infrastructure including components of voice networks (such as carrier switches, PBXs, SS7, T1 trunks, and switched versus dedicated circuits), the Public Switched Telephone Network (PSTN), communications industry structure, telephone-data system interfaces and interaction, and convergence of voice and data communications systems will be examined, along with possible alternative approaches. Also examined will be components of data networks such as modems, multiplexers, virtual circuits, hubs, bridges, and routers and their relationships to voice communication systems. Future directions in the evolution of voice and data communications technology will be highlighted.

(3-0-3)

ITM 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. Ex-amples of network elements that are currently available as products will be examined. Prerequisite: ITM 440 or ITM 540.

(3-0-3)

ITM 547

Telecommunications over Data Networks: Projects and Advanced Methods

Students create projects that exercise and expand their understanding of digital voice communication protocols, features and architectures. Instructional materials and lectures are provided as needed to support projects. These projects will develop a digital voice application or feature, or test a current digital voice product and architecture. 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 operation when applicable, create a written description of the work and deliver a formal presentation to an audience appropriate to the scope and scale of the work completed. Prerequisite: ITM 546.

(3-0-3)

ITM 548

System and Network Security

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, fire-walls, 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: ITM 440 or ITM 540.

(2-2-3)

ITM 549

Systems and Network Security: Projects and Advanced Methods

Prepares students for a role as a network security analyst and developer and give 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 the design and development of secure networks. This course includes a significant real world team project the results in an fully operational security system. Students should have previous experience with object-oriented and/or scripting languages. Prerequisite: ITM 448 or ITM 548. (C)

(2-2-3)

ITM 551

Distributed Workstation System Administration

Students learn to set up and maintain PC workstations and servers and to administer PC servers and networks. Topics include hardware requirements; software compatibility; and system installation, configuration and options and post-installation topics; administrative practices required for file system security; process management; performance monitoring and tuning; storage management; back-up and restoration of data; and disaster recovery and prevention. A group project or research paper will demonstrate mastery of the subject. Prerequisite: ITM 301.

(4-4-6)

ITM 552

Client Server System Administration

Students learn to setup and configure a contemporary operating system, including the actual installation of the operating system on the student workstation, in a networked client-server environment. User account management, security, printing, disk configuration, and backup procedures are addressed, with particular attention to coverage of TCP/IP and TCP/IP applications. System installation, configuration and administration issues as well as network file systems, network access and compatibility with other operating systems are also addressed. A group project or research paper will demonstrate mastery of the subject. Prerequisite: ITM 302.

(4-4-6)

ITM 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 first-hand experience of this technology. Prerequisite: ITM 301 or ITM 302 or permission of instructor.

(2-2-3)

ITM 555**Intelligent Device Applications**

Intelligent device application development is covered with various technologies on mobile and robotic platforms. Utilizing contemporary toolkits, the student considers design and development on emulated and real “smart” devices including smart phones, personal digital assistants, sensors, actuators and robots. Numerous exercises reinforce concepts gained throughout the course. A term project will integrate course topics into a comprehensive intelligent device application. Prerequisite: ITM 311.

(2-2-3)

ITM 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. Prerequisite: ITM 555.

(2-2-3)

ITM 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: ITM 301 or ITM 302.

(2-2-3)

ITM 562**Website Application Development**

Programming the Common Gateway Interface (CGI) for Web pages is introduced with emphasis on creation of interfaces to handle Webbased 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 proc-ess data flows from online forms with basic database structures. Prerequisite: ITM 461.

(2-2-3)

ITM 564**Advanced Web Site 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: ITM 562.

(2-2-3)

ITM 565**Rich Internet Applications**

Students learn to create interactive rich Internet applications using Web development frameworks, applications and techniques that primarily operate on the clientside. These applications often exhibit the same characteristics as desktop applications and are typically delivered through a standardsbased Web browser, via a browser plugin, 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)

ITM 566**Service-Oriented Architecture**

This course covers IT enterprise systems employing web services technologies in SOA and ESB architectural patterns. The student considers SOA which defines and provisions IT infrastructure and allows for a loosely -coupled data exchange over disparate applications participating in business processes. The simplification of integration and flexible reuse of business components within SOA is greatly furthered by ESB. Lab exercises using contemporary toolkits are utilized to reinforce platform-agnostic course topics. Prerequisite: ITM 411 and ITM 461.

(2-2-3)

ITM 569**Topics in Application Development**

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. This course may be taken more than once but only 9 hours of ITM 569 credit may be applied to a degree.

(Credit: Variable)

ITM 571**Project Management for Information Technology Mangement**

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.

(3-0-3)

ITM 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 reengineering 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: ITM 471 or ITM 571.

(3-0-3)

ITM 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: ITM 471 or ITM 571.

(3-0-3)

ITM 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)

ITM 575

Network and 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: ITM 541. (3-0-3)

ITM 576

Data Center Management

This course is an indepth 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: ITM 535. (3-0-3)

ITM 578

Information System 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)

ITM 579

Topics in Information Security

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. This course may be taken more than once but only 9 hours of ITM 569 credit may be applied to a degree. (Credit: Variable)

ITM 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)

ITM 582

Business Innovation

This course is designed to teach innovative thinking through theory, methods, and practice of innovation. The course incorporates Einsteins thinking, and Edisons 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 devel-oping 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)

ITM 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)

ITM 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 handson exercises. (3-0-3)

ITM 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 realworld organization such as a business or a government body or agency. (3-0-3)

IT 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. (2-2-3)

ITM 594**Special Projects in Information Technology**

Capstone project. Prerequisite: written consent of instructor.
(Credit : 1 to 6)

ITM 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)

ITM 596**Graduate Honors Study in Information Technology**

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

ITM 597**Special Problems in Information 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**

Introduction to Contemporary Operating Systems and Hardware I

ITM 302

Introduction to Contemporary Operating Systems II

ITM 311

Introduction to Software Development

ITM 312

Introduction to Systems Software Programming