

# Information Technology Auditing and Cyber Security, M.S.

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## FOX SCHOOL OF BUSINESS AND MANAGEMENT

Learn more about the Master of Science in Information Technology Auditing and Cyber Security.

### About the Program

The M.S. in Information Technology Auditing and Cyber Security (MS ITACS) program prepares students for Information Technology (IT) risk management, cyber security, and information systems auditing positions in business and critical infrastructure sectors of the economy identified by the U.S. Department of Homeland Security. The MS ITACS is a science, technology, engineering, and math (STEM) program aligned with the ISACA® model curriculum for Information Security Audit and Control, which enables our graduates to earn one year of work experience applicable toward the Certified Information Systems Auditor (CISA®) designation.

MS ITACS students take five common core courses focused on IT governance and risk management and specialized courses in one of two concentrations: Information Technology Auditing or Cyber Security. The IT Auditing concentration culminates in a capstone course leading to CISA® certification, while the capstone course for the Cyber Security concentration leads to Certified Information Systems Security Professional (CISSP®) certification, depending on the student's work experience. Qualified students with necessary prerequisites are able to take courses from both concentrations.

**Time Limit for Degree Completion:** 6 years

**Campus Location:** Main and/or Online

**Full-Time/Part-Time Status:** The MS ITACS program can be completed on a full- or part-time basis.

**Affiliation(s):** Research is supported by Fox School of Business and Management's Advanta Center for Research in Financial Institutions, Center for Healthcare Research and Management, Innovation and Entrepreneurship Institute, and Institute of Global Management Studies. Research interests of the Fox School faculty are also supported by numerous centers and institutes throughout Temple University.

**Accreditation:** All Fox School of Business and Management graduate programs are accredited by the Association to Advance Collegiate Schools of Business (AACSB International).

**Areas of Specialization:** Two areas of concentration are offered:

- Cyber Security
- Information Technology Auditing

**Job Prospects:** The Fox School Center for Student Professional Development provides students with career coaching and professional development resources that support the job search. The MS ITACS degree prepares graduates for employment in IT risk management, cyber security, and information systems auditing positions at accounting and consulting firms, banks and financial companies, businesses producing goods and providing services, computer software and hardware companies, information and data service providers, and governmental agencies and non-governmental organizations. The U.S. Bureau of Labor Statistics reports 32% job growth through 2028.

**Licensure/Certification:** Certification varies by area of concentration, as detailed below:

There is no official educational requirement in any state to be Certified Information Systems Auditor (CISA®) certified. The MS ITACS program's **IT Auditing** capstone course (MIS 5902) prepares IT Auditing Concentration students for taking the CISA® (Certified Information Systems Auditor) certification exam. The MS ITACS program does not require students to take the CISA® exam. This is optional.

Experience required for CISA® certification is a minimum of five years of professional work experience in information systems auditing, control, or security. A master's degree in information security or information technology from an accredited university can be substituted for one year of experience. For more information, visit <https://www.isaca.org/credentialing/cisa/get-cisa-certified>.

The MS ITACS program's **Cyber Security** capstone course (MIS 5903) prepares Cyber Security Concentration students for taking the CISSP® (Certified Information Systems Security Professional) certification exam. The MS ITACS program does not require students to take the CISSP® exam. This is optional.

Experience required for CISSP® certification is a minimum of five years of cumulative paid work experience in *two or more of the eight domains* of the CISSP® CBK. Earning a four-year college degree or regional equivalent, or a master's degree in information security or information technology from an accredited university, or an additional credential from the (ISC)²® approved list will satisfy one year of the required experience. Education credit will only satisfy one year of experience. For more information, visit <https://www.isc2.org/Certifications/CISSP/experience-requirements>.

**Non-Matriculated Student Policy:** Students with an undergraduate GPA of 3.0 or higher may be allowed to take classes under non-matriculated status in the ITACS graduate certificate program. Non-matriculated students may take a maximum of 9 credits. Any additional courses require the student to be matriculated in a program.

**Financing Opportunities:** Citizens and permanent residents of the United States are considered domestic students and are typically eligible for federal student loans as well as alternative loans through private lenders. The Fox School grants 5% tuition scholarships to alumni who are admitted to the program.

## Admission Requirements and Deadlines

### Application Deadline:

#### Fall:

- December 15 – Early Decision Deadline
- March 1 – Scholarship Deadline and International Deadline
- June 30 – Final Deadline

#### Spring:

- August 1 – Scholarship Deadline and International Deadline
- November 1 – Final Deadline

Applications are reviewed as they are received and can sometimes be considered after the deadline.

APPLY ONLINE to this Fox graduate program at <https://fox.secure.force.com/SiteLogin/>.

### Letters of Reference:

*Number Required: 2*

*From Whom:* Professional references from an immediate supervisor, current or past, are preferred. Academic references are acceptable.

**Bachelor's Degree in Discipline/Related Discipline:** A baccalaureate degree from an accredited university or college is required.

**Statement of Goals:** Essay prompts can be found in the online application portal.

### Standardized Test Scores:

GRE/GMAT: The GMAT or GRE may be required based on academic and professional background. Candidates with an undergraduate GPA below 3.0 are required to submit a valid GMAT or GRE test score. Please consult an admissions advisor with any questions.

Applicants who earned their baccalaureate degree from an institution where the language of instruction was other than English, with the exception of those who subsequently earned a master's degree in a country where the language of instruction is English, must report scores for a standardized test of English that meet these minimums:

- TOEFL iBT: 90
- IELTS Academic: 7.0
- Duolingo: 110
- PTE Academic: 68

**Resume:** Current resume or CV is required.

**Transfer Credit:** Upper-level graduate credits from an AACSB-accredited graduate business program, but not previously applied to a conferred degree, may be transferred into the M.S. program. The credits must be part of the required degree program at Temple University. To be transferred, the grade must be a "B" or better. The Admissions Committee makes recommendations for transferring credits to the department chair. The maximum number of credits a student may transfer is 6.

## Program Requirements

### General Program Requirements:

*Number of Credits Required Beyond the Baccalaureate: 30*

*Required Courses:*

## Information Technology Auditing Concentration

Code	Title	Credit Hours
<b>Core Courses</b>		
MIS 5202	IT Governance	3
MIS 5206	Protection of Information Assets	3
MIS 5214	Security Architecture	3
MIS 5687	Business Skills for ITACS Professionals I	1.5
MIS 5688	Business Skills for ITACS Professionals II	1.5
<b>IT Auditing Concentration Courses</b> <sup>1</sup>		
MIS 5201	IT Audit Process	3
MIS 5203	Systems and Infrastructure Lifecycle Management 1	3
MIS 5205	IT Service Delivery and Support	3
MIS 5208	Data Analytics for IT Auditors	3
<b>IT Auditing Elective</b> <sup>2</sup>		
Select one from the following:		3
MIS 5121	Enterprise Resource Planning Systems	
MIS 5170	Special Topics	
MIS 5182	Independent Study	
<b>IT Auditing Capstone Course</b>		
MIS 5902	IT Auditing Capstone	3
Total Credit Hours		30

<sup>1</sup> MIS 5122 Enterprise Architecture for IT Auditors (3 s.h.) may also be required of students who are admitted to the program but lack sufficient technical background.

<sup>2</sup> Students in the Information Technology Auditing concentration alternately may select up to two courses from the Cyber Security concentration and/or in Computer Science and/or Engineering Security as electives. This is done in consultation with the ITACS Program Director.

## Cyber Security Concentration

Code	Title	Credit Hours
<b>Core Courses</b>		
MIS 5202	IT Governance	3
MIS 5206	Protection of Information Assets	3
MIS 5214	Security Architecture	3
MIS 5687	Business Skills for ITACS Professionals I	1.5
MIS 5688	Business Skills for ITACS Professionals II	1.5
<b>Cyber Security Concentration Courses</b>		
MIS 5211	Ethical Hacking	3
MIS 5213	Intrusion Detection & Response	3
MIS 5215	Operating System Security	3
MIS 5216	Organizational Forensics	3
MIS 5217	Network Security	3
<b>Cyber Security Elective(s)</b> <sup>1</sup>		
Select one or more from the following, if desired: <sup>2</sup>		0
MIS 5170	Special Topics	
MIS 5182	Independent Study	
MIS 5212	Penetration Testing	
<b>Cyber Security Capstone Course</b>		
MIS 5903	Cyber Security Capstone	3
Total Credit Hours		30

- 1 Students in the Cyber Security concentration alternately may select up to two courses from the Information Technology Auditing concentration and/or in Computer Science and/or Engineering Security as electives. This is done in consultation with the ITACS Program Director.
- 2 Students earn credit for any elective course(s) taken. The Cyber Security concentration does not, however, require completion of an elective to earn the degree.

**Culminating Events:**

The MS ITACS program culminates in a capstone that prepares students to take the appropriate professional certification examination:

- Certified Information Systems Auditor (CISA®)
- Certified Information Systems Security Professional (CISSP®), with a minimum of five years' experience

## Contacts

### Program Web Address:

<https://www.temple.edu/academics/degree-programs/information-technology-auditing-and-cyber-security-ms-bu-itac-ms>

### Department Information:

Fox School of Business and Management  
1801 Liacouras Walk  
701 Alter Hall (006-22)  
Philadelphia, PA 19122  
foxinfo@temple.edu  
215-204-5890  
215-204-7678  
Fax: 215-204-1632

### Submission Address for Application Materials:

<https://fox.secure.force.com/SiteLogin/>

### Department Contacts:

*ITACS Academic Director:*  
David Lanter, Ph.D., CISA, GISP  
david.lanter@temple.edu  
215-204-3077

*Specialized Master's Programs Coordinator:*  
Rachel Carr  
Associate Director for Specialized Master's Programs  
foxms@temple.edu  
215-204-7678

## Courses

**MIS 5001. Information Technology Management. 1 to 3 Credit Hour.**

Organizations that strategically select, manage, and deploy digital business models prosper in the global economy. Students will use systems and business process thinking to create and analyze strategies for technology-enabled organizational and industry transformation. They will propose innovative solutions for new and existing business initiatives to leverage enterprise, consumer, and social technologies.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5101. Business Intelligence. 3 Credit Hours.**

Data is a core building block of modern organizations; transforming data into information and knowledge enables firms to compete effectively. In this course, students learn best practices for acquiring, assessing, and analyzing data to solve business problems. Students also learn the technologies that comprise an organization's information infrastructure. Students gain hands-on experience with these concepts through case studies and exercises utilizing various hands on access to technology. Students will also gain skills in understanding the principles of transaction-oriented data, and how information is stored and retrieved from a data source, apply data mining and business intelligence techniques to solve specific business problems, communicate analysis results back to management for ongoing quality assurance and process improvement, understand and select appropriate data visualization techniques to effectively communicate results.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5102. Process Improvement and Innovation. 3 Credit Hours.**

An information system is only valuable to an organization when it enables and supports a useful business process. Students learn to assess, design, and analyze processes that foster innovation. Core concepts include designing effective solutions, identifying metrics for assessment, and communicating plans to management. Students apply these skills through analysis of business problems for actual firms. Throughout the course, students will gain a deeper understanding of the role of process in the functioning of an organization and how to innovate around that process by redesigning workflows and matching requirements with organizational systems. Students will also be able to identify key stakeholders and learn the fundamentals of project management.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**

MIS 5001|Minimum Grade of B-|May not be taken concurrently

OR MIS 5302|Minimum Grade of B-|May not be taken concurrently

OR MIS 5402|Minimum Grade of B-|May not be taken concurrently.

**MIS 5103. Network Architectures for Business. 3 Credit Hours.**

This course covers the information architecture of the internet-enabled organization, including the use and development of client server and distributed systems. It provides detailed analysis of networking and telecommunications, including data, voice, image, video, network hardware, and topology. Concepts, models, architectures, and standards for the design, implementation, integration, security, and management of distributed internet- and intranet-enabled systems and networks are discussed. The course provides an understanding of the role of the information architecture and distributed systems on organizational design and management strategy.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**

MIS 5001|Minimum Grade of B-|May not be taken concurrently

OR MIS 5302|Minimum Grade of B-|May not be taken concurrently

OR MIS 5402|Minimum Grade of B-|May not be taken concurrently.

**MIS 5104. Network Centric Applica. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5105. Emerging Technologies. 3 Credit Hours.**

This seminar reviews emerging technologies that will prepare students to effectively leverage new technologies to create business opportunities through innovation. The specific topic of this course varies by semester to accommodate new trends and technologies.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5106. Object Oriented Computing. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5107. Knowledge Mgmt/Bus Intel. 3 Credit Hours.**

This course reviews knowledge management principles and technologies focusing on business applications.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5108. Digital Business Strategy. 3 Credit Hours.**

Information Technology leadership is a critical function in organizations. This course teaches the skills of effective technology strategists. Students develop the business case for new technology initiatives, evaluate the success of existing initiatives and develop plans for technology-enabled organizational change. Through a series of case study analyses, students develop technological and organizational skills required of IT leaders.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**

MIS 5001|Minimum Grade of B-|May not be taken concurrently

OR MIS 5302|Minimum Grade of B-|May not be taken concurrently

OR MIS 5402|Minimum Grade of B-|May not be taken concurrently.

**MIS 5109. User Experience Design. 3 Credit Hours.**

Today the user experience is the whole system; it is the interface and the experiences that define success, the code and business model are often secondary. Users only bother with activities that are obvious, simple, and pleasing. Perhaps the most challenging and interesting part of digital is the user experience (UX). This course focuses on understanding, evaluating, and designing user experiences. In the context of practical projects, we will learn the human, social, organizational, business model, and technical aspects of UX design. The goals of this course include understanding the role of usability and design principles, evaluating user experiences, and building a complete user experience using innovation to achieve the UX goals.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5112. Business Design and Innovation. 3 Credit Hours.**

Digital business opportunities are no longer limited to the technology itself; they also include the experiences and ecosystems around them. To succeed in this new economy, today's leaders require a broad set of skills that incorporate creative thinking and innovation. Students will learn the tools and methods of Business Design to address real-world business problems. They will apply design inquiry techniques to craft original solutions to a series of practical scenarios.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5121. Enterprise Resource Planning Systems. 3 Credit Hours.**

This course introduces students to the essential concepts of an ERP. The course looks at how a business' key transactions are executed and accounted for in an ERP. IS and accounting controls to assure confidentiality, integrity and authenticity are examined. Finally, the course looks at how transaction processing data is transformed into data for management analysis and legal entity reporting.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5122. Enterprise Architecture for IT Auditors. 3 Credit Hours.**

This course surveys the technology concepts and components that are critical for the IT auditor to understand. It uses an enterprise architecture framework to explore issues of business process, business data, applications and the infrastructure that are necessary to run those applications.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5123. Business Essentials for IT Audits. 1 to 3 Credit Hour.**

This course gives incoming students from technical disciplines the basic business background that they will need throughout the ITACS curriculum. Students will learn how to read basic financial statements, the components that make up a business model, how applications support both revenue generation and operations, and the role of a control environment. Topics include the income statement, balance sheet, cash flow statement, business model, value proposition, market segmentation, the sales process, business processes and controls.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5161. Inf Sys Applications-Org. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5162. Database Mgt Sys & Model. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5163. Sys Anal/Rapid App Dev. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5164. Inf Tech Prin-Network-BS. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5170. Special Topics. 1 to 6 Credit Hour.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**MIS 5178. Inf Architect & Network. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5179. Inf Systems Mgt & Proces. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5182. Independent Study. 1 to 6 Credit Hour.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**MIS 5190. Special Topics in MIS. 1 to 6 Credit Hour.**

Special topics in current developments in the field of information systems are covered.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**MIS 5201. IT Audit Process. 3 Credit Hours.**

This course introduces students to the essential concepts of IT auditing. Students will learn standards and guidelines for performing an IT audit. Topics will include concepts of internal controls. Students will learn to plan and manage an audit as well as how to report on evidence collected during the audit.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5202. IT Governance. 3 Credit Hours.**

Understanding how IT organizations are structured and managed is essential to effective IT auditing. In this course students will learn how IT organizations are managed and the issues which make IT management so challenging. Students will learn how strategic planning is performed within IT organizations. A number of tools, techniques, and frameworks such as COBIT will be discussed which will help make the auditor effective in this environment.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5203. Systems and Infrastructure Lifecycle Management 1. 3 Credit Hours.**

Examines how an organization builds an enterprise architecture within an environment of internal control. Topics cover include information system planning, management and usage, the development, acquisition and maintenance of these technologies and their impact on the organization's business processes.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5204. Systems and Infrastructure Lifecycle Management 2. 3 Credit Hours.**

A closer examination of the controls needed during software development and the external acquisition of systems as well as the concept of application controls and how they are used.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**Pre-requisites:**

MIS 5203|Minimum Grade of B-|May not be taken concurrently.

**MIS 5205. IT Service Delivery and Support. 3 Credit Hours.**

Learn how the operational aspects of an IT organization deliver on the value proposition of the organization. Learn about the technical infrastructure and how this infrastructure provides a reliable and secure platform for applications. Learn about service center management and how these teams are utilized to deliver value to the organization.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5206. Protection of Information Assets. 3 Credit Hours.**

Information is an organization's most precious asset. Inadvertent disclosure of sensitive information can have significant operational and financial impact on the organization. Loss of information or access to it can also have serious adverse impacts on the organization. In this course students learn the importance of managing the information assets of the organization including logical IT security, physical, and environmental security. Disaster recovery and mitigating risk through insurance are also discussed.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5208. Data Analytics for IT Auditors. 3 Credit Hours.**

MIS 5208 examines the emerging approach of continuous-audit. This approach relies heavily on data analytics to examine datasets produced by audit and security controls (for instance, network log files). Basic data analysis concepts are presented and then applied to security or audit problems. Audit specific tools like ACL will be used in addition to general tools like Excel.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.



**MIS 5209. Securing Digital Infrastructure. 3 Credit Hours.**

This course examines issues related to securing the components of a company's infrastructure. It reviews network, firewall, and basic operating system security issues. It presents the material theoretically and practically through many in class and homework exercises.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5211. Ethical Hacking. 3 Credit Hours.**

This course introduces students to the hacking strategies and tactics used by ethical or "White Hat" hackers. Methods of vulnerability exploitation to be used primarily in the process of Security Penetration will be explored in theory and in hands on exercises. The course will require simple programming using Open Source scripting languages and hacking tool kits. For that reason some knowledge of and experience with computer programming is required.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5212. Penetration Testing. 3 Credit Hours.**

This course introduces students to Penetration Testing. Methods of vulnerability assessment and exploitation are examined as a means of identifying areas requiring improved security and recommended changes. The ethical, business governance and legal implications of penetration testing are examined. Specific techniques are examined in detail with the intent of giving the students a practical understanding of how Penetration Tests are conducted and laboratory-based experience in their actual conduct.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5213. Intrusion Detection & Response. 3 Credit Hours.**

While all businesses work to be as secure as possible, it is agreed that no organization can be completely secure. Preventing attacks, quickly identifying successful attacks, detecting advanced persistent threats and monitoring systems activity in order to deter intrusions can result in significant business benefit. This course examines the variety of tools and techniques used to do this work.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5214. Security Architecture. 3 Credit Hours.**

Examines the methodology by which an organization aligns its business strategy with its security operations. Both the current and desired future states of the business' security efforts are described so that resources can be directed to the security efforts most needed to support the business.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5215. Operating System Security. 3 Credit Hours.**

This course introduces students to operating system security and tools to secure and audit an organization's computer operating systems. Methods of securing operating systems will be explored in theory and through hands on exercises. The course will teach students programming techniques and how to use specific operating system and Open Source scripting languages. Knowledge of and experience with introductory computer programming is required, as is demonstrated ability to use operating systems and navigate file systems in Microsoft Windows and/or Linux is required. In this course, we will focus on securing operating systems. The first part of the course will focus on processes used to secure the MS Windows operating system. The second part of the course will apply those same techniques to the Linux operating system. The course will discuss techniques and tools used to help reduce weaknesses in default installations/configurations of different operating systems.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5216. Organizational Forensics. 3 Credit Hours.**

The focus of the course is on helping students gain a broad understanding of the field of study and how technology and law interact to form forensic science. Students will learn how computer forensics techniques are used to investigate digital data to gather evidence relating to criminal or other legal incidents and events. This course helps students understand how to find vulnerabilities, discover intrusions and respond to computer incidents. Students will learn how attackers undermine and exploit systems so they can help prepare an organization to detect and respond to them. Legal issues involved in responding to computer attack are explored, including employee monitoring, working with law enforcement and handling evidence. Students will learn how to prepare to handle incidents, and participate in the process of incident identification, containment, eradication, recovery and lessons learned.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5217. Network Security. 3 Credit Hours.**

This course introduces students to network architectures, network security concepts, threats and the methods used to protect network communication, which determine an organization's "Security Posture". Students will perform an in-depth examination of the OSI model and TCP/IP protocol in order to understand the technologies behind protecting network communications (firewalls, routers, switches, virtual private networks, intrusion prevention and detection systems, and highly available architectures). With this fundamental understanding of network communication, students will explore the inherent vulnerabilities related to network communications and the challenges of implementing an enterprise security architecture that aligns with business goals, IT strategy, and Governance.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5282. Independent Study. 1 to 3 Credit Hour.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**Pre-requisites:**

MIS 5001|Minimum Grade of B-|May not be taken concurrently.

**MIS 5287. Business Skills for ITACS Professionals. 3 Credit Hours.**

In this course students practice a variety of business skills that are necessary to be effective as an IT auditor. These skills include managerial communications and public speaking skills, interviewing skills, negotiation and personal selling skills, business writing, industrial psychology/behavioral science skills, project/time management and team building skills. The course is delivered through a series of workshops and simulations and include observations of business practices at host IT companies.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5411. Business Intelligence and Data Visualization. 3 Credit Hours.**

The first part of this course will focus upon the strategic role of information technology from the perspective of a non-technical manager. Key topics include IT strategy, systems thinking, disruptive innovations and digital transformation, digital business models, cybersecurity, cloud computing, IT governance and ethics. The second part of this course follows completion of an Excel module, and will explore the principles of data literacy and analysis through tools that enable turning data into insight through analysis and visualization. Students will also learn to evaluate visualizations by applying key principles of presenting data effectively.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5601. Database Analytics. 1.5 to 3 Credit Hour.**

This course provides a foundation for, and practice in, designing database systems and analyzing business data to enhance firm competitiveness. Concepts introduced in this course aim to develop an understanding of the different types of business data, various analytical approaches, and application of these approaches to solve business problems. Students will have hands-on experience with current, cutting-edge tools such as MySQL and SAS Enterprise Miner.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may be repeated for additional credit.

**MIS 5602. Applied Predictive Analytics. 1.5 to 3 Credit Hour.**

Students will learn how to select relevant variables for analysis, apply the appropriate analytic technique, and interpret the practical implications of the results. Topics also include unstructured "big" data, sentiment analysis, and articulating results to a business audience. Students will have hands-on experience with current, cutting-edge tools such as SAS Enterprise Miner. This course will cover advanced topics needed to resolve more complicated business problems including but not limited to data cleansing and reporting. The foundation, set in MIS 5101, will be strengthened and expanded with more concepts and applications appropriate for solving more challenging business problems and effectively communicating and presenting the output needed to resolve the problem.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may be repeated for additional credit.

**MIS 5603. Social Media Innovation. 1.5 to 3 Credit Hour.**

In Social Media Innovation, students will review concepts and principles related to social and digital media. Through a combination of readings, discussion, presentations and projects, we examine (i) why social media is often a crucial channel for business success; (ii) how organizations are and should be using social media to achieve their goals; and (iii) the role of centralized, decentralized, and crowd-sourced information online. At the end of the course students will have gained deeper knowledge on understanding the tenants of social business governance, be able to analyze how modern marketers navigate the major platforms, explore social media listening and data management best practices, and identify approaches for successful social media campaign planning and implementation.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5651. Digital Innovation in Marketing Capstone. 6 Credit Hours.**

In this fully immersive, experiential capstone, students will design and measure the efficacy of a digital marketing strategy across multiple channels, evaluate the suitability for new digital marketing technology such as mobile apps, and manage a portfolio of digital marketing assets such as mobile apps, websites, social media and others. Students will design a fully formed digital marketing campaign around their own team generated idea. Students will spend the semester applying knowledge gained in all previous coursework including building the collateral, analyzing data, developing a UX - culminating in one final presentation of their work.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5687. Business Skills for ITACS Professionals I. 1.5 Credit Hour.**

In this course you will increase the business and interpersonal skills necessary to be a competent and successful ITACS Professional. Those skills will include presenting, networking, self-awareness in group settings, interviewing, and leadership.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5688. Business Skills for ITACS Professionals II. 1.5 Credit Hour.**

In this course, you will increase the business and interpersonal skills necessary to be a competent and successful ITACS Professional. Those skills build upon those covered in the previous semester and will include presenting, networking, self-awareness in group settings, interviewing, and leadership.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5801. Managing Information in the Enterprise. 3 Credit Hours.**

This course provides an introduction to the strategic role of information technology in today's digital centric world. You will learn how to apply systems thinking to analyze and understand organizational IT strategy and usage. You will also learn how to apply theories of innovation to analyze the disruptive potential of technology. Organizations that strategically select, manage, and deploy digital business models prosper in the global economy. Students will use systems and business process thinking to create and analyze strategies for technology-enabled organizational and industry transformation. They will propose innovative solutions for new and existing business initiatives to leverage enterprise, consumer, and social technologies.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5882. Independent Study. 1 to 6 Credit Hour.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**MIS 5890. Special Topics. 1 to 6 Credit Hour.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**MIS 5901. Capstone in Information Technology. 3 Credit Hours.**

Open only to M.S. in MIS students who must have completed all 4 core courses and 2 electives. For this capstone experience, students select a topic in their area of interest and write a research paper or implement an information system.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5902. IT Auditing Capstone. 3 Credit Hours.**

In this course students are given the opportunity to demonstrate the capabilities they have developed in other portions of the program. This course makes extensive use of case studies and role playing exercises. Students will explore a comprehensive case study which exposes them to each of the domains covered in the curriculum.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 5903. Cyber Security Capstone. 3 Credit Hours.**

This is the final course in the ITACS cyber security track. The course has two purposes. First, it reviews all of the topics covered in earlier courses and further prepares the students for the SSCP exam. Second, it requires students to integrate what they have learned and research an emerging topic in the field of IT assurance.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 9001. Qual & Interpret Meth-IS. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 9002. Inf Sys Found & Theory. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 9003. Foundations of Electronic Commerce Research. 3 Credit Hours.**

This course offers an overview of electronic commerce research in the domain of Information Systems (IS). An impressive body of work on electronic commerce has developed over the last two decades in IS research, and this course aims at reviewing and integrating this large body of research toward identifying gaps in the literature and proposing new opportunities for research that students can pursue as part of independent research projects. This course overviews the electronic commerce literature in IS research under a framework based on the main entities involved in electronic commerce - businesses and consumers that interact with the aid of Internet technologies, resulting in three broad research areas - (1) Business to Consumer (B2C), (2) Consumer to Consumer (C2C), and (3) Business to Business (B2B). These three broad research areas are further categorized into sixteen specialized topics and sub-areas, which help summarize the literature and integrate the body of work.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Degree Restrictions:** Must be enrolled in one of the following Degrees: Doctor of Philosophy.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 9004. Adv Research Methods-IS. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may not be repeated for additional credits.

**MIS 9011. Proseminar in Management Information Systems. 1 to 3 Credit Hour.**

This course is required for all first year PhD in Business Administration - MIS students. It offers an overview of electronic commerce research in the domain of Information Systems (IS) under a framework based on the main entities involved in electronic commerce - businesses and consumers that interact with the aid of Internet technologies, resulting in three broad research areas - (1) Business to Consumer (B2C), (2) Consumer to Consumer (C2C), and (3) Business to Business (B2B). These three broad research areas are further categorized into sixteen specialized topics and sub-areas, which help summarize the literature and integrate the body of work. An impressive body of work on electronic commerce has developed over the last two decades in IS research, and this course aims at reviewing and integrating this large body of research toward identifying gaps in the literature and proposing new opportunities for research that students can pursue as part of independent research projects.

**Field of Study Restrictions:** Must be enrolled in one of the following Majors: Business Administration.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Degree Restrictions:** Must be enrolled in one of the following Degrees: Doctor of Philosophy.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School, Sport Tourism Hospitality Mgt.

**Repeatability:** This course may be repeated for additional credit.

**MIS 9090. Contemp Topics & Res-IS. 1 to 6 Credit Hour.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Repeatability:** This course may be repeated for additional credit.

**MIS 9183. Directed Study in MIS. 3 Credit Hours.**

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Degree Restrictions:** Must be enrolled in one of the following Degrees: Doctor of Philosophy.

**College Restrictions:** Must be enrolled in one of the following Colleges: Business & Mngmnt, Fox School.

**Repeatability:** This course may be repeated for additional credit.