

VIRGINIA INSTITUTE

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Master of Science in Information Technology Program Curriculum

1. Program Structure

MSIT Program Structure	No. of Courses	Quarter Credits
Core Courses	7	31.5
Concentration Courses	4	18
Experiential/Capstone	1	4.5
Total No. of Courses	12	54

2. Program Description/Objective

Program Description and Goals

The mission of Virginia Institute of Science and Technology is to prepare students for rewarding careers through quality educational programs that meet the changing needs of employers and the community. To meet the needs of a diverse community of learners, VIST provides education that balances technical, professional, and critical thinking components. Therefore, the proposed Master of Science in Information Technology (MSIT) program is consistent with the Institute's stated purpose and mission.

The VIST's Master of Science in Information Technology (MSIT) program is designed to provide students with the knowledge and skills essential to design, develop and lead Information Technology (IT) teams and projects effectively in today's global organizations. The MSIT program aims to produce qualified professionals for mid-level IT positions in small and mid-size companies. The MSIT program emphasizes real-world knowledge and practical experience to develop a solid theoretical foundation and real-world experience to contribute meaningfully to IT solutions in today's fast-paced, technologically driven global marketplace.

MSIT Program Objectives

Students who graduate from the MSIT program will be able to develop the following skills:

- IT Leadership & Management Skills

To demonstrate an ability to apply a significant amount of Information Technology knowledge within the domains of the MSIT program.

- Critical Thinking and Problem-Solving Skills

To demonstrate the ability to perform critical thinking needed to analyze, design and lead solutions for Information Technology problems using an analytical decision-making approach.

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- Communication and Team Management Skills

To demonstrate an ability to communicate effectively with all stakeholders and mobilize and lead teams for a common purpose with a clear understanding of the IT needs of the organization.

- Integrity, Responsibility, and Professionalism

To demonstrate the ability to understand and analyze integrity, responsibility, and professionalism as they apply to information technology issues within an organization and to apply ethical decision-making principles during day-to-day operations.

3. MSIT Program Structure

In the MSIT program, students must complete a total of 12 courses to gain 54-quarter credits for graduation. Details are as follows:

a. Core Courses (7 Courses / 31.5 credits)

The Core Courses (31.5 credits) consist of in-depth courses covering the many key facets of Information Technology (IT). All students are required to complete the 7 core courses listed below:

Course No.	Course Title	Credits	Prerequisite
MSIT511	Management of Information Technology	4.5	None
MSIT525	Information Systems Analysis and Design	4.5	None
MSIT528	Enterprise IT Application and Integration	4.5	None
CSIS536	Computing Operation Systems & Cybersecurity	4.5	None
MSIT540	Network Systems Design and Management	4.5	None
CSIS 636	Database System Management & Assurance	4.5	None
MSIT546	Cloud Computing Technology	4.5	None

b. Concentration Courses (4 courses / 18 quarter credits)

MSIT students who complete core courses can typically select a concentration field that provides them with further study in emerging and diverse IT areas. However, the academic advisor or the Director of Education may advise a student to take concentration courses before completing the core courses.

MSIT Program Concentrations

- i. IT Systems & Management (ITSM)
- ii. Information Assurance Specialist (IAS)
- iii. Data Management & Analytics (DMA).

Course No.	Course Title	Credits	Prerequisite
i. IT Systems & Management (ITSM)			

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LAM611	Project Management	4.5	None
ITSM612	Technology Entrepreneurship	4.5	None
LAM630	Management of Innovation and Technology Change	4.5	None
CSIS 570	Enterprise Security Technologies	4.5	None
ii. Information Assurance Specialist (IAS)			
IAM640	Information System Auditing and Monitoring	4.5	None
IAM647	System Assessment & Security Risk Analysis	4.5	None
CSIS650	System Architect and Cybersecurity	4.5	None
CSIS665	Disaster Recovery & High Availability	4.5	None
iii. Data Management & Analytics (DMA)			
DMA621	DBMS Design and Analysis	4.5	None
MAM622	Advanced Analytics & Modeling	4.5	None
DMA638	Big Data Analytical Intelligence	4.5	None
DMA651	Advanced Topics in Database Design & Management	4.5	None

4. Experiential/Capstone Project (4.5 credits/ 1 course)

Students must complete a knowledge-integrating experiential/capstone project in the last term after concluding all core and concentration courses.

Course No.	Course Title	Credits	Prerequisite
MSIT690	Capstone Project	4.5	Completed all core and concentration courses.

5. MSIT Courses Descriptions

MSIT511 – Management of Information Technology (4.5 credits)

In this course, students will understand how IT affects business strategy and how managers can apply IT as well as lead the organization to improve by leveraging IT. Given the high accountability placed on managers in this global transparent-interconnected economy, critical issues such as IT ethics, social responsibility, and security, are also discussed. The teaching approach allows students to leverage business cases to understand IT theory. Students are encouraged to focus their graded assignments on situations relevant to their learning needs.

Prerequisite: None

MSIT525 – Information Systems Analysis and Design (4.5 credits)

This course introduces the various information and communications technologies. Students will research and practice using modern productivity applications. Students will examine how information systems are used to solve problems, make better business decisions, and apply these concepts to analyze business cases.

Prerequisite: None

MSIT528 – Enterprise IT Application and Integration (4.5 credits)

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In this course, the Enterprise Architecture (EA) is designed to be the first exposure to foundational enterprise architecture (EA) concepts and practices. The course sets the “common language” for EA discussions for professionals new to the EA field as well as functional business people, customers, suppliers, and others that desire an overview of enterprise architecture and the benefits it can bring to an organization.

Prerequisite: None

CSIS536 – Computing Operation Systems & Cybersecurity (4.5 credits)

Operating systems are an essential part of any computer system. Operating systems vary significantly, but their fundamental principles remain the same. This course examines operating system design concepts, data structures and algorithms, and systems programming basics. In this course, students will be introduced to the concepts of operating systems, see how they manage resources such as memory, peripherals, and schedule CPU time, learn how to use the system call interface and how to create processes and synchronize them, learn how applications communicate, understand the memory hierarchy and see how virtual memory is managed, understand how files are managed and stored, and much more. The topics to be covered include: computer and operating system structures; process and thread management; process synchronization and communication; memory management; virtual memory; file system; I/O subsystem and device management; and selected examples in networking, protection, and security

Prerequisite: None

MSIT540 – Network Systems Design and Management (4.5 credits)

This course is designed to provide students with the concepts and fundamentals of network management. Topics to be covered include data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication, network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols, various types of networks (LAN, MAN, WAN, SAN, and Wireless networks) and their protocols, system & service monitoring – reachability and availability, resource measurement/monitoring – capacity planning/availability, performance, change management, and configuration monitoring and security - ensuring that the network is protected from unauthorized users.

Prerequisite: None

CSIS 636 - Database System Management & Assurance (4.5 credits)

This course provides a managerial understanding and approach to the technical subject of database management. The course will illustrate the important role that database systems play in an organization and provide students with a background to understand the subject and a foundation upon which to build management decisions. In addition, this course is designed to investigate how database management system techniques are used to design, develop, implement, and maintain modern database applications in organizations. Upon completion of this course, the student will be able to define essential database vocabulary, effectively apply data relationships and normalization techniques, describe the transformation of database design from a conceptual user model (e.g., an ERD) to a normalized relational model, explain and apply Structured Query Language (SQL) in a database environment, describe the methods available for minimizing DBMS risks and security failures, characterize the roles

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and responsibilities of the Database Administrator (DBA), and apply fundamental database concepts to an information systems problem.

Prerequisite: None

MSIT546 – Cloud Computing Technology (4.5 credits)

This course provides a hands-on, comprehensive study of Cloud concepts and capabilities across the various Cloud service models, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), and Business Process as a Service (BPaaS). The course also covers the Cloud security model and associated challenges and delves into the implementation and support of High-Performance Computing and Big Data support capabilities on the Cloud. Through hands-on assignments and projects, students will learn how to configure and program IaaS services. They will also learn how to develop Cloud-based software applications on top of various Cloud platforms, how to integrate application-level services built on heterogeneous Cloud platforms, and how to leverage SaaS and BPaaS solutions to build comprehensive end-to-end business solutions on the Cloud.

Prerequisite: None

LAM611 – Project Management (4.5 credits)

This course is designed to equip students with project management skills and the tools necessary to become successful managers in any field of work. This course will cover all phases of project management, including the initiation, planning, implementing, controlling, and closing of projects. Emphasis will be on project organization, scheduling, cost control, value earned analysis, risk management, and quality control.

Prerequisite: None

ITSM612 – Technology Entrepreneurship (4.5 credits)

This course focuses on the technology entrepreneurs use in their efforts to create new businesses and innovate. Students learn to recognize and discuss Technology Entrepreneurs and New Technology Ventures, Innovation and Entrepreneurship Policy, Concepts of Targeting New Technologies, and more structure and planning in technology and entrepreneurship through case studies, class collaboration and presentations.

Prerequisite: None

LAM630 - Management of Innovation and Technology Change (4.5 credits)

The objective of this course is to explore ways to create environments that are conducive to technological innovation. Students examine practices, models, and approaches of both established and new organizations. Topics covered: the innovative process, managing technical people, the impact of organizational design on innovation, knowledge management and exploring new technologies.

Prerequisite: None

CSIS 570 – Enterprise Security Technologies (4.5 credits)

This course is designed to give students the ability to use advanced security technologies to perform penetration testing and ethical hacking to identify vulnerabilities within a network or website and properly secure it from hackers. This course is the must-have course for every well-rounded security professional. In this course, students will learn proper planning, scoping, and recon, then dive into advanced techniques for scanning, target exploitation, password attacks, and wireless and web apps. Students will be exposed to comprehensive penetration testing, ethical hacking know-how, and various

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real-world network penetration test scenarios. Finally, students will conduct an end-to-end penetration test, applying the knowledge, tools, and principles from throughout the course and discover and exploit vulnerabilities in a realistic sample target organization.

Prerequisite: None

IAM640 - Information System Auditing and Monitoring (4.5 credits)

This course is designed to provide a risk-driven method for tackling the enormous task of designing an enterprise security validation program. After covering a variety of high-level audit issues and general audit and real-time monitoring best practices, the students will have the opportunity to dive deep into the technical "how to" for determining the key controls that can be used to provide a level of assurance to an organization. Tips on how to repeatedly verify these controls and techniques for continuous monitoring and automatic compliance validation will be given from real-world examples. The course contents will cover audit planning and techniques, more effective risk assessment for control specification, firewall and perimeter auditing, a proven six-step audit process, time-based auditing, effective network population auditing, how to perform useful vulnerability assessments, uncovering "Back Doors," building an audit toolkit, detailed router auditing, technical validation of network controls, web application auditing, and audit and real-time monitoring tools.

Prerequisite: None

IAM647 - System Assessment & Security Risk Analysis (4.5 credits)

This course is designed for students to learn to identify Threat, Risk, and Vulnerability, as applied to enterprise IT systems. It incorporates the physical safeguards and policies necessary to meet the requirements for the protection of data in a fixed site. Students will conduct a Site Security Analysis of a given facility based on skills and information learned in class. Gap Analysis, Gap Closure, and Countermeasures will be discussed and documented, in an effort to counter identified Vulnerabilities. In this course, students will also learn the practical skills necessary to perform regular risk assessments for their organizations. The ability to perform risk management is crucial for organizations hoping to defend their systems. Risk management should be the foundational tool used to facilitate thoughtful and purposeful defense strategies.

Prerequisite: None

CSIS650 – System Architect and Cybersecurity (4.5 credits)

This course covers the issues in designing and engineering large enterprise software systems. Technologies such as Web Services and Cloud Computing provide platforms for building such systems, and architectures such as service-oriented architecture (SOA), event-driven architecture (EDA), and representational state transfer (REST) are idioms for structuring such systems. Key topics within this course include secure development methodologies/models; assurance techniques (certification, validation, etc.); secure programming issues/practices and tools; software assurance and Security analysis - tools and techniques; secure design, testing, and systems security engineering (e.g., protocol verification, model-based techniques, etc.); and supply chain security, life-cycle security, security risk analysis.

Prerequisite: None

CSIS 665 – Disaster Recovery & High Availability (4.5 credits)

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Knowledge of Disaster Recovery and Business Continuity provides a strategic imperative and a competitive advantage in an environment where students must plan for the unexpected, maintain operations, and meet regulatory demands. This course covers recovery time and recovery point objectives (RTO and RPO). Built upon the concepts of risk analysis and business impact planning, this course is designed to provide a foundation and guide to coordinated organizational emergency response and event management during and after a disruptive occurrence. This course will also give the student a full examination of the scope of critical infrastructure vulnerabilities; the dependence of critical infrastructures on the Internet, and Internet security problems; elementary concepts of business continuity; high availability architecture; system design and solution roadmap; data center design and disaster recovery; and data center operations. The subject material requires at least a working knowledge of computer networks and business decision-making.

Prerequisite: None

DMA621 – DBMS Design and Analysis (4.5 credits)

This course incorporates analysis and design using new and evolving data management models, such as object-relational databases, Big Data management and visualization, and other emerging developments in the field. Tools and methods for managing different types of data are examined, such as nonstructured data, graphical approaches to data presentation, extract-transform-load (ETL) technologies, data warehousing and data mining. Entity relationship modeling and validation methods are developed for complex data relationships, and the role of metadata and database architectures such as the ANSI/SPARC three-schema model are included. Methods for database design and analysis in light of developments in Cloud storage, the Internet of Things (IoT), and Cyber Security are explored.

Prerequisite: None

MAM622 - Advanced Analytics & Modeling (4.5 credits)

Students in this course demonstrate advanced practice in applying the analytic life cycle, examine approaches to data visualizations, apply their analytic skills to current organizational problems and apply analytic solution scoring and project management skills for effective team performance.

Prerequisite: None

DMA638 – Big Data Analytical Intelligence (4.5 credits)

This course is designed to help students to discover insights in an analytic, visually interactive, and rapid, iterative manner, learn what's the design methodology, what's the integrated platform of big data technologies, how to identify and model social communities, relationships, idea propagation, and network dynamics. How to identify Big Data opportunities and use cases, how to define delivery roadmap and actionable plan with conceptual solution architecture that maximizes return on investment (ROI). In addition, this course will introduce students to various tools and frameworks for big data analytical intelligence, and the architecture and programming aspects of these frameworks as used in the proposed design methodology.

Prerequisite: None

DMA651 – Advanced Topics in Database Design & Management (4.5 credits)

This advanced course explores database system design and management based on emerging practices and research in the field. This course typically covers such topics as Hadoop and Big Data management; spatial temporal and real-time databases; data visualization and data analytics; query planning and optimization; transaction processing and concurrency control; data warehousing, online

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analytical processing (OLAP), and data mining; data security and cloud storage; data backup and recovery.

Prerequisite: None

MSIT 690 -- MSIT Capstone (4.5 credits)

The capstone course is designed to be offered in the final term of a student's major. This course is planned to tie together the key learning objectives that faculty expect the student to have learned during the MSIT program at VIST within the student's concentration. This capstone course aims to give students an opportunity to present their cumulative knowledge and skills in a simulated IT environment. Students will integrate key IT concepts they learned throughout their study in this role.

Prerequisite: MSIT students must complete the Capstone Project after finishing all core courses and their chosen elective courses (concentration). Students should consult their academic advisor about options that best fit their career goals. Generally, the Capstone Project should be completed in the last quarter of the program before graduation.