BUSINESS INFORMATION TECHNOLOGY

Our Website (http://www.bit.vt.edu/)

Overview

The Department of Business Information Technology offers an undergraduate major in business information technology with options in computer-based decision support systems, operations and supply chain management, and cybersecurity management and analytics. The department also offers and staffs business courses such as business analytics and modeling, systems analysis, database management, and data governance, privacy and ethics. Specific Business Information Technology (BIT) courses are listed below.

The department participates in the Cooperative Education Program in which qualified students may alternate semesters of study with semesters of professional employment.

Business Information Technology

The curriculum in business information technology is designed to provide the student with expertise in the quantitative and technological aspects of management, specifically the extensive use of computers for solving business problems and making managerial decisions. The name business information technology implies the application of scientific principles and techniques, mathematics, and computing to the management function with the objective of increased efficiency and productivity. Thus, the student of business information technology not only learns various quantitative techniques and models to apply to managerial problems, but also a logical and scientific approach to managerial decision-making. The curriculum provides training both for individuals interested in pursuing careers in business or government and for individuals interested in pursuing graduate or professional degrees. Students majoring in business information technology may choose one of three options reflecting their particular career objectives and interests.

Option I - Decision Support Systems (BIT-DSS)

This option educates the student in the design, implementation, and use of computerized information systems, decision support systems, and artificial intelligence to support contemporary business managers in the decision-making process. Special emphasis is placed on increased productivity and effectiveness through the use of models, quantitative data, and analytics embedded within a computerized decision support system. Graduates of this program will be prepared to pursue careers in business and industry where information technology, data analytics and computer-aided decision-making is an essential component of the managerial function.

Option II - Operations and Supply Chain Management (BIT-OSM)

This option educates students in the management of activities directly related to the creation and distribution of goods and services. The curriculum of Option II is designed to provide students with expertise in the planning and control of business processes within a firm and across its global supply chain. Emphasis is placed on applying IT, analytics and process analysis skills to improve the quality and productivity of business firms and their supply chain partners. Graduates of this program will be prepared to pursue careers as operations managers, business process managers, project managers, supply chain analysts, and quality, logistics, inventory or procurement managers in business, industry, and government.

Cybersecurity Management and Analytics Major (BIT-Cyber for Northern Virginia)

This option emphasizes business processes and data analytics as applied to cybersecurity management. BIT-Cyber students will gain proficiency in the business management of cybersecurity within an organization, including knowledge management, setting cyber policies, risk management, incident business response, using data to understand attacks on business assets, and overall management of the cybersecurity function within a business. Graduates of the program will be prepared for jobs as analysts, auditors, managers and planners within the cybersecurity function.

- Business Information Technology Major with Computer Based Decision Support Systems Option (https://catalog.vt.edu/undergraduate/pamplin-college-business/business-information-technology/business-information-technology-bs-computer-based-decision-support-systems/)
- Business Information Technology Major with Operations and Supply Chain Management Option (https://catalog.vt.edu/undergraduate/pamplin-college-business/business-information-technology/business-information-technology-bs-operations-supply-chain-management/)
- Cybersecurity Management and Analytics Major (https://catalog.vt.edu/undergraduate/pamplin-college-business/business-information-technology/business-information-technology-bs-cybersecurity-management-analytics/)

Head: Q.J. Nottingham
Arthur Andersen & Co Alumni Professor: A. Wang
R. B. Pamplin Professor of Management Science: C.W. Zobel
Sonny Merryman Professor of Business Information Technology: L.Z. Khansa
Suzanne Parker Thornhill Professor of Business Information Technology: P.B. Lowry
Verizon Professor of Business Information Technology: V. Venkatesh
Professors: P. Ghandforoush, T.L. James, R.S. Russell, A.O. Vance, A.G. Wang
Associate Professors: A.S. Abrahams, I. Adjerid, J.K. Deane, B.J. Hoopes, Q.J. Nottingham, O. Seref
Assistant Professors: R. Aljafari, M.M. Gordon, A.Jang, J. Liu V. Mindel and W. Shen
Collegiate Professor: M.M.H. Seref, D.G. Simpson
Collegiate Associate Professor: A .Arnette, W.H. Baker, , J.M. Teets
Collegiate Assistant Professor: H. Zhang
Associate Professor of Practice: B.M. Fraticelli, J. Sudweeks
Assistant Professors of Practice: M. Flora, J.D. Kern, J.W. Monday, R. Raman, D.C. Simundza
Senior Instructor: L.L. Clark
Assistant Director of BIT-Cyber Program in Northern Virginia: K. Wrightsman
Career Advisor: Q.J. Nottingham (540-231-6596)

Undergraduate Course Descriptions (BIT)

BIT 1984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

BIT 2104 - Careers in Business Information Technology (1 credit)
Career opportunities and job search strategies in the business information technology and operations fields with reference to the BIT courses that best help the student identify a career in his/her selected field. Includes career skills development and resume writing. Pass/Fail only.
Instructional Contact Hours: (1 Lec, 1 Crd)

BIT 2164 - Foundations of Contemporary Security Environments (3 credits)
Introduction to multiple analytical perspectives on contemporary security environments, including political, legal, ethical, technical, environmental and historical and cultural perspectives relative to the conception, design and implementation of security solutions, practices, and policies. Emphasizes applying and analyzing the effectiveness of diverse procedures, tools and policies used in security and privacy solutions, decision-making, risk management and operational policy to mitigate local, national, international and global threats.
Pathway Concept Area(s): 3 Reasoning in Social Sciences, 5F Quant & Comp Thnk Found., 11 Intercultural&Global Aware.
Instructional Contact Hours: (3 Lec, 3 Crd)
Course Crosslist: CS 2164, PSCI 2164

BIT 2405 - Introduction to Business Statistics, Analytics, and Modeling (3 credits)
Introduction to basic statistical (inference) tools, analytics techniques, and modeling necessary in managerial decision-making. The decision-making aspect of the course, while utilizing quantitative/computational thinking, will emphasize ethical reasoning. Topics include, but are not limited to, descriptive statistics, elementary probability theory, sampling and sampling distributions, portfolio management, hypothesis testing, regression analysis, analysis of variance, big data, and data analytics.
Prerequisite(s): MATH 1524 or (MATH 1225 and MATH 1226)
Pathway Concept Area(s): 5F Quant & Comp Thnk Found., 10 Ethical Reasoning
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 2406 - Introduction to Business Statistics, Analytics, and Modeling (3 credits)
Overview of analytic models and solution techniques in decision science. Discussion of descriptive and predictive analytics goals and methods. In addition to overview of mathematical modeling and solution techniques, discussions will include considerations of adapting analytics methods to various global and ethical business applications. Students should develop skills and appreciation of the use of data and analytics for problem solving.
Prerequisite(s): BIT 2405 or (STAT 3005 and STAT 3006) or STAT 3604 or (STAT 3615 and STAT 3616) or STAT 4604
Pathway Concept Area(s): 5A Quant & Comp Thnk Adv., 10 Ethical Reasoning
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 2554 - Linux, Shell Scripting, and Securing the OS for Business (3 credits)
Build foundational knowledge of the Linux operating system and file system concepts necessary for cybersecurity business professionals. Discuss the purpose, use, architecture, and navigation of the Linux file system. Build skill using a command line operating system for system administration and security management tasks. Employ file and directory management, process management, text manipulation, and permissions in the Linux operating system. Create shell scripts for process automation, configuration and process management, and security applications. Hands-on experience securing and hardening the Linux operating system.
Prerequisite(s): BIT 2405
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 2954 - Business Study Abroad (1-19 credits)
This course provides students with an international business experience. It is only offered as part of a program outside of the United States. Students will learn from the structured educational experience developed by the faculty leader. This course is intended for students who want to develop information technology or operations management related free electives. Pre: Instructors consent and the completion of 24 semester hours with a minimum GPA of 3.0 or departmental consent.
Instructional Contact Hours: Variable credit course

BIT 3414 - Operations and Supply Chain Management (3 credits)
Study of the process directly related to the creation and distribution of goods and services. Increasingly, these operations are taking place outside the boundaries of a traditional enterprise. This course teaches students how to analyze processes, ensure quality, create value, and manage the flow of information, products and services across a network of customers, enterprises and supply chain partners.
Prerequisite(s): BIT 2406 and ACIS 2116 and ECON 2006
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3424 - Introduction to Business Analytics Modeling (3 credits)
Introduction of modeling of problems encountered in business analytics. Statistical and optimization modeling, computer solution, and analysis of business problems. Uses spreadsheet and database software to facilitate the modeling and solution of these problems.
Prerequisite(s): BIT 2406
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3434 - Advanced Modeling for Business Analytics (3 credits)
Study of selected, advanced topics in decision modeling and business analytics. Emphasis on model formulation, solution techniques, interpretation of results and comprehensive approaches to problem-solving. Integer, multi-criteria, and non-linear programming as well as network analysis and heuristics. Includes case studies and use of Excel as the primary analytical tool.
Prerequisite(s): BIT 2406
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3444 - Advanced Business Computing and Applications (3 credits)
Study of selected advanced topics in business computing. Construction of business applications using an advanced application development environment such as Visual Studio.net. Coverage of computer terminology, HTML, and Internet applications. The course builds computer literacy and strong programming skills. Junior standing required.
Prerequisite(s): BIT 3424 and (CS 1054 or CS 1064 or CS 1114)
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3454 - Business Process Improvement (3 credits)
Examines the technical aspects of business process improvement focusing on improvement strategies, quality control, data analysis and mining, and maturity models. Emphasizes analytical techniques for business process design, control, and improvement.
Prerequisite(s): BIT 3414
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3464 - Enterprise Planning and Control Systems (3 credits)
The study of the design, analysis and implementation of enterprise-wide resource planning and control systems. The course examines decision support models for production planning, master scheduling, inventory control, shop floor control and related topics in planning and control. The course emphasizes the application of information technologies such as ERP, MRPII, CIM to operations planning and control.
Prerequisite(s): BIT 3414
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3474 - Data Management and Business Analytics in Python (3 credits)
Python for data wrangling and data analysis to support business decisions. Illustrate proficiency in Python, basic skills such as variables, functions, conditionals, loops, libraries, and data structures. Leverage Python skills to learn how to manage data. Learn how to clean, transform, and augment data, as well as how to use Python to obtain data, in particular to work with application programming interfaces (APIs) and do web scraping. Learn how to use Python to conduct data analysis and for plotting and visualization of data. Apply Python for time series data analysis and data modeling using libraries.
Prerequisite(s): CS 1064 and BIT 2406
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3484 - Advanced Business Analytics in Python and R (3 credits)
Python and R for advanced data analysis, including predictive analytics and machine learning, to support business decisions. Use Python and R to conduct exploratory data analysis. Learn how to handle data, sampling distributions, statistical experiments, and significance testing in Python and R. Apply simple and multiple linear regression and related concepts such as confidence intervals, dummy variables, correlation, multicollinearity, confounding variables, interactions and main effects, and outliers. Learn how to apply classification, specifically NaÏve Bayes, discriminant analysis, and logistic regression. Learn how to apply model evaluation techniques such as ROC curves, AUC, and lift. Introduction to and application of machine learning, including k-nearest neighbors, tree models, principal component analysis, and hierarchical clustering.
Prerequisite(s): BIT 3474
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3514 - Systems Analysis (3 credits)
Study of the current technologies for designing and developing computer-based business systems. Topics will include process, structural, behavioral, and conceptual data modeling methodologies such as Uniform Modeling Language (UML) and important design-related issues such as data flows and system capabilities. Design issues will be explored through class projects. This course duplicates BIT 4524.
Prerequisite(s): CS 1054 or CS 1064 or CS 1114
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3524 - Database Management and Design (3 credits)
Study of the design of databases and data structures for supporting business applications. Basic database structure and design, structured query language, database management systems, integration of backend database servers, data warehousing and mining, on-line analytical processing, and database application, security, and management. This course duplicates BIT 4514.
Prerequisite(s): BIT 2406
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3554 - Networks, Telecommunications and Security (3 credits)
Provides an introduction to computer networks and data communications in business. Topics include mechanisms for reliable data transfer, network topologies and technologies, and a comprehensive treatment of inter-networking. Additional topics include packet switching, and cloud, edge, and advanced networking. Security issues related to using computer networks are discussed, along with network design issues, and methodologies for network applications. Duplicates BIT 4554.
Prerequisite(s): BIT 2405 or ACIS 3504 or BIT 2164 or CS 2164 or PSCI 2164
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3614 - Election Security (3 credits)
Election system and historical voting in the U.S., their inherent vulnerabilities, and how to locate and prepare against poor election security practices. Trust and cultural significance of voting in a democratic America. The election system security standards and regulations including the Virginia Department of Elections Voting Systems Security Policies, Standards, Guidelines, and Locality Election Security Standards (LESS). Threats, vulnerabilities, and attacks on election infrastructures and how they may be evaluated and mitigated. Security controls for voting systems, voter registration databases, and associated IT infrastructure and systems used to manage elections while exploring cybersecurity careers in the public sector. Prepares selected students for a summer internship supporting the Cyber Navigator Program with a specific Virginia Locality. Primarily designed for students majoring or minoring in cybersecurity, the course is open to all students of any major.
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3664 - Cybersecurity Management I (3 credits)
Focuses on building general cybersecurity knowledge with an emphasis on cybersecurity management. This course will teach students about the categories of security controls. Students will be introduced to the necessity of cybersecurity through an introduction to cybersecurity concepts (e.g., threats, vulnerabilities, risk) and using basic tools to identify cybersecurity weaknesses (security assessments, passive and active reconnaissance, and vulnerability scanning). Students will learn about security policies and risk assessments and will perform a risk assessment. Students will be introduced to types of social engineering and malware tools and techniques. This class will introduce the legal and ethical aspects of security and privacy and the tools used to protect data privacy. Students will also learn to develop policies and procedures to manage hosts and explore how to harden one. This course will also introduce students to the management of internet of things (IOT) and cloud technologies, human resources security, incident response and forensics, physical and infrastructure security, and cybersecurity resilience.
Prerequisite(s): BIT 2554 and (BIT 3554 or ACIS 3554)
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3674 - Cybersecurity Management II (3 credits)
Focuses on building general cybersecurity knowledge with an emphasis on the management and implementation of technical cybersecurity controls. This course will build knowledge of and teach students how to implement symmetric and asymmetric encryption. Students will learn about authentication and access controls and how to implement them, as well as understand and implement the network security protocols, standards, and applications that help support them. The course will also teach students how about database security practices and how to implement them, as well as build their understanding of firewalls, intrusion detection and prevention, buffer overflows, software security, wireless network security, and mobile security.
Prerequisite(s): BIT 3664
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 3954 - Study Abroad (1-19 credits)
Instructional Contact Hours: Variable credit course

BIT 3984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

BIT 4164 - Future of Security: Integrative Solutions for Complex Security Systems (3 credits)
Identification and analysis of complex, real-world security problems and threats to people, organizations, and nations across multiple domains, roles and future scenarios. Crisis communication, decision making tools, ethical principles and problem-solving methods to respond, assess options, plan, scope, and communicate before, during and after conflicts, disasters and attacks. Use of an experiential learning facility, and participation in a reality-based team simulation of cascading security and disaster events.
Prerequisite(s): PSCI 2164 or BIT 2164 or CS 2164
Pathway Concept Area(s): 1A Discourse Advanced, 10 Ethical Reasoning
Instructional Contact Hours: (3 Lec, 3 Crd)
Course Crosslist: CS 4164, PSCI 4164

BIT 4424 - Business Information Visualization and Analytics (3 credits)
Basic perception and design principles and techniques for information visualization, with an emphasis on the application of visualization software for data exploration and the development of analytical skills for business. Includes hands-on exposure to information visualization and statistical software.
Prerequisite(s): BIT 2406
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4434 - Computer Simulation in Business (3 credits)
In-depth study of the application of computer simulation techniques to business decision making and process improvement. The theory of computer simulation and statistical analysis of results are included. Attention is focused on using simulation software stressing application to specific problems.
Prerequisite(s): BIT 3414
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4444 - Web-Based Decision Support Systems (3 credits)
Study of current technologies for designing and constructing interactive, Internet-based systems for supporting business decisions. Topics may include the operation of the Internet, server-side programming, client-side programming, server-side scripting, XML, XHTML, database integration, COM, CGI, and others. Design issues will be explored through a class project.
Prerequisite(s): BIT 3444
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4454 - Business Analysis Seminar in IT (3 credits)
Comprehensive treatment of Decision Support Systems (DSS) as managerial tools, particularly in an e-commerce environment. Emphasis is at the builder and user level. A primary emphasis is on problem solving through the integration of various quantitative techniques as well as on IT concepts. The course includes a comprehensive project using state-of-the-art software.
Prerequisite(s): BIT 3434 and BIT 4444 and BIT 3524
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4464 - Advanced Supply Chain Management (3 credits)
Advanced study of efficient methods for streamlining the production and delivery of products and services across functions, enterprises and global boundaries. Topics include the facilities, functions, technologies, and activities involved in creating and delivering products and services, especially in a digital marketplace. Designing and managing a network of suppliers across enterprises is discussed, along with the information systems, risk management and planning issues involved.
Prerequisite(s): BIT 3414
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4474 - Global Operations and Information Technology (3 credits)
This course includes concepts and issues critical in the globalization of business operations and information technology. Topics covered include the organization of global operations, cultural and national comparisons, planning global operations, facilities location, product development, technology transfer, global communication links, transborder data flow, international information systems, and other emerging operations and information technology issues.
Prerequisite(s): BIT 3414
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4484 - Project Management (3 credits)
Study of efficient methods for planning and controlling projects. Topics include project management and scheduling tools, project quality assurance, risk and cost control, resource constrained scheduling, definition and requirements analysis, task integration, and managing alliances. The application of information technology to project management and control is emphasized throughout the course.
Prerequisite(s): BIT 3414
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4544 - Artificial Intelligence, Machine Learning, and Deep Learning in BIT (3 credits)
Learn concepts and techniques related to artificial intelligence (AI), machine learning (ML), and deep learning (DL). Learn the fundamentals of AI, ML, and DL algorithms and how to apply them to problems of interest to majors in the business information technology (BIT) department. Understand and apply supervised (classification, regression) and unsupervised (clustering) machine learning, and applications of these techniques in business. Apply deep learning, for example, recurrent neural networks (RNN), generative adversarial networks (GAN), and convolutional neural networks (CNN).
Prerequisite(s): BIT 3484
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4604 - Data Governance, Privacy and Ethics (3 credits)
Examination of data analytics and automated decision making issues, across multiple technology contexts, through the lens of the humanities and ethics. Privacy, autonomy, data ownership, equality, and accountability. Decision making and exploration of questions of data ethics and data fairness throughout the data life cycle.
Prerequisite(s): BIT 2405 or CMDA 2014 or CS 1114 or CS 1054 or CS 1064
Pathway Concept Area(s): 2 Critical Thinking Humanities, 10 Ethical Reasoning
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4624 - Cybersecurity Analytics for Business (3 credits)
Application of advanced analytics to cybersecurity in a business setting. Categorization of cyber threats and solutions. Data mining, visualization and machine learning applied to large data sets for anomaly detection, threat prediction, and incident response analysis. Investigation of adversarial machine learning. Selection of appropriate analytics techniques and security platforms. Consideration of business and ethical issues.
Prerequisite(s): BIT 3674 or BIT 4614 or CS 4264
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4644 - Digital Forensics and Incident Response Management (3 credits)
Focuses on building knowledge about the field of digital forensics and incident response. Students will learn about cybercrime and the digital forensics process. The course will build knowledge of, and teach students how to implement, digital forensics techniques and tools. Students will learn about file systems, and how to work with Windows, Linux, and Macintosh file systems and forensic tools to acquire and analyze forensic evidence. Students will learn how to apply forensic tools and techniques to network, mobile, internet of things (IOT), cloud, email, social media, and dark web data and services. The course will also build knowledge about how to manage incident response capabilities such as computer security incident response teams (CSIRTs), incident response planning, guidance for processing crime and incident scenes, and how to compile forensic reports and integrate forensically obtained knowledge into future incident response planning.
Prerequisite(s): BIT 3674 or BIT 4614
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4654 - Penetration Testing and Ethical Hacking for Business (3 credits)
Focuses on building competence in penetration testing for business. This course will teach principles of ethical hacking, such as system reconnaissance, enumeration, vulnerability scanning, and exploitation. Students will learn how to find and exploit vulnerabilities in web applications, operating systems, wireless networks, as well as perform social engineering and physical security assessments. Students will also perform penetration tests and learn to write reports for managerial audiences.
Prerequisite(s): BIT 3674 or BIT 4614
Instructional Contact Hours: (3 Lec, 3 Crd)

BIT 4854 - Analytics in Action (3 credits)
Problem-solving framework and analytic techniques for solving messy, unstructured, high-impact, real-world organizational/societal problems within an interdisciplinary, intercultural, experiential learning context. Definition of problem scope, objectives, need for change, ethical concerns, and diversity and inclusion issues; identification of stakeholders and their values; evaluation of decision tradeoffs; problem decomposition and hypothesis formulation; project planning and administration; data versus user requirements, ethical and inclusive decision making, data collection, preparation, and analysis; team roles and management; professional communication of insights, policy and action recommendations.
Corequisite(s): BDS 2005, CMDA 2014
Pathway Concept Area(s): 1A Discourse Advanced, 11 Intercultural&Global Aware.
Instructional Contact Hours: (3 Lec, 3 Crd)
Course Crosslist: MGT 4854

BIT 4954 - Study Abroad (1-19 credits)
Instructional Contact Hours: Variable credit course

BIT 4964 - Field Study (1-19 credits)
Instructional Contact Hours: Variable credit course

BIT 4974 - Independent Study (1-19 credits)
Instructional Contact Hours: Variable credit course

BIT 4984 - Special Study (1-19 credits)
Instructional Contact Hours: Variable credit course

BIT 4994 - Undergraduate Research (1-19 credits)
Instructional Contact Hours: Variable credit course