

Information Technology

Information Technology (IT) is the "practitioner focused" discipline within the field of computing. The BSIT degree program, the applied computing degree at NJIT, provides a balanced approach to software and hardware applications and their conceptual underpinnings. Moreover, the program offers an array of specializations that prepare students to enter various areas of the information economy. IT courses are taught by faculty and industry professionals having years of IT experience. Students benefit from a hands-on approach that provides them with a real grasp of the actual technology, development tools, and paradigms in demand in the IT industry.

The four years of the program have been carefully structured to meet the following goals:

Code	Title	Credits
Year 1	Breadth and depth of information technology	
Year 2	Tools and applications of information technology	
Year 3	Software and hardware infrastructure of information technology	
Year 4	Management and synthesis of information technology	

All Information Technology majors are required to prepare a Program of Study Form, an approved copy of which must be on file with the Academic Advisor. The form should be prepared as early as possible in the student's career, and changes can be made in consultation with the advisor.

The curriculum is for freshmen entering NJIT in fall 2009. Students entering before that date may have a different program and should consult their Academic Advisor to learn which curriculum applies.

Information Technology Specializations

Students can choose from a partial or full array of specializations, each consisting of 9 courses. The specialization provides coherent set of courses, focusing on an application area of Information Technology relevant to the student's interest.

Criminal Justice and Law Specialization

The IT specialization in Criminal Justice and Law offers students the opportunity to study different aspects of criminal justice. Students take core courses in conjunction with Rutgers-Newark School of Criminal Justice and study the origins of both digital and traditional crime. Students will learn how new technologies can be implemented to investigate and prevent crimes. Skills learned in this specialization can lead to careers in law enforcement, forensics, or future study in law school.

Management Information Systems Specialization

Choose 9 (27 credits) from the following: The IT specialization in Management focuses on the design of information systems that improve business effectiveness. Students will be exposed to current technologies and their impact on organizations, and examine issues that will need to be addressed in the current and future technologically-oriented economy, both nationally and internationally.

Game Development Specialization

The Game Development specialization is designed to give students a command of programming in C and C++ as well as other scripting languages (such as Unreal Script, XML, Lua and Python are commonly used in game development) associated with game development. The students will learn how the system architecture for games is designed with various considerations in mind such as the target platform and 2D or 3D graphics. Students will learn how to design and create their own game engines as well as how to program the game logic that uses those engines. Upon graduation, a student from the Game Development specialization will have completed both game modification projects and a number of games they have programmed from scratch and implemented on multiple platforms.

Multimedia Specialization

The IT specialization in Multimedia offers students significant opportunities to build on fundamental principles of computer-aided graphic design, audio and video production as they are used in streaming media, web-based commerce, entertainment, education and public information services.

Network and Information Security Specialization

Network Security is a high priority for computing professionals in business organizations, government agencies, the military, and any proprietary setting. Students choosing this specialization will come to understand the evolution of computer security; applied computer operations and security protocols; data transmission and storage protection methods via cryptography; ways of identifying, understanding and recovering from attacks against computer systems; methods of security breach prevention; network systems availability; applications security, recovery and business continuation procedures; and counter systems penetrations techniques.

Web Applications Specialization

The IT specialization in Web Applications focuses on different aspects of the Information Systems lifecycle. Students will take courses in different areas of web and information systems including web design techniques and web application development. Students will learn how these technologies can be best utilized within organizations.

NJIT Faculty

D

Deek, Maura A., Senior University Lecturer

H

Halper, Michael H., Professor

K

Kettering, Joan M., Senior University Lecturer

S

Senesy, Stanley J., Senior University Lecturer

Sequeira, Marc T., University Lecturer

Statica, Robert, Senior University Lecturer

W

Watrous-deVersterre, Lori L., Senior University Lecturer

Programs

- Information Technology - B.S. (<http://catalog.njit.edu/undergraduate/computing-sciences/information-technology/bs/>)

Accelerated Programs (<http://catalog.njit.edu/undergraduate/academic-policies-procedures/special-degree-options/>)

- Information Technology - Accelerated B.S. and J.D. (<http://catalog.njit.edu/undergraduate/computing-sciences/information-technology/accelerated-bs-jd/>) (with Seton Hall School of Law)
- Information Technology Minor (<http://catalog.njit.edu/undergraduate/computing-sciences/information-technology/minor/>) (not for Computing Sciences majors)
- Information Technology Minor (<http://catalog.njit.edu/undergraduate/computing-sciences/information-technology/minor-computing-science-majors/>) (for Computing Sciences majors)

Information Technology Courses

IT 101. Introduction to Information Technology. 3 credits, 3 contact hours (3;0;0).

The foundations of information technology (IT), including basic computer architecture, various kinds of computer hardware, and networking technology, are introduced. Various data representation schemes, such as the binary number systems, are covered. Different levels of software are examined, including aspects of the operating systems from the perspective of the IT professional. The software development process is discussed. Database management software and SQL are dealt with, as are applications and languages developed around the internet and Web infrastructure. Overall, fundamental knowledge required of today's IT professional is obtained along with an appreciation of IT's impact on business and society. Hands-on experience with some important elements of the IT field is gained through various laboratory assignments.

IT 114. Advanced Programming for Information Technology. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 113 or CS 115. Problem solving techniques and program design knowledge are expanded with an eye toward IT-related applications. Various kinds of data structures are introduced, including classic containers such as lists, stacks, queues, and trees. Sorting and searching techniques are examined. The fundamentals of client/server programming and the use of sockets are covered. Recursion and its various applications are studied. The built-in class library features of an object-oriented programming language are exploited throughout.

IT 120. Introduction to Network Technology. 3 credits, 3 contact hours (3;0;0).

An introduction to the basics of networking in a modern operating system environment. Emphasis is placed on the application and management of networking technology. Topics to be covered include: the OSI model, network hardware and technologies, network protocols, wired and wireless networks, TCP/IP. Whenever possible, concepts will be explained through the use of hands-on exercises that reinforce the lecture material.

IT 201. Information Design Techniques. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 100 or CS 101 or CS 103 or CS 104 or CS 106 or CS 113 or CS 115 or BNFO 135. This course presents an introduction to the theory and practice of information design. Topics covered include the theoretical foundations of information design, graphic design, content design, interaction design, usability, multimedia design, sound and video, animation, and an introduction to 3D modeling.

IT 202. Internet Applications. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 100 or CS 113 or CS 115 or a course in a high-level programming language as approved by department. Core web technologies that underlie web-based multi-tier software architecture and applications are presented. Emphasis is on the latest versions of the languages of the web, and these are explored in a hands-on, guided development approach. The major topics include markup and styling languages such as HTML and CSS, client-side scripting languages such as JavaScript including the use of AJAX, server-side scripting languages using PHP, and database management via SQL. Web server concepts for hosting and deploying activities and projects are covered. The overall focus is on the out-of-the-box content of the various languages and technologies covered, but libraries will also be explored.

IT 220. Wireless Networks. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 120 or CS 356. This course introduces the students to the applied topic of Wireless Networks, focusing on applied methods, tools and technologies, as well as practical experience in designing & implementing wireless networks. Topics include hardware, software, data, applications, communication, design & installation of wireless networks, together with the implementation, performance, security and limitations of such systems.

IT 230. Computer and Network Security. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 120 or CS 356. This course introduces the applied topic of Computer Security, presenting the evolution of computer security, the main threats, attacks & mechanisms, applied computer operations & security protocols, main data transmission & storage protection methods via cryptography, ways of identifying, understanding & recovery from attacks against computer systems, various methods of security breach prevention, network systems availability, applications security, recovery & business continuation procedures and counter systems penetrations techniques and the role of the US Government in security of national computer infrastructure.

IT 240. Scripting for System Administration. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 113 or CS 115. This course will introduce task automation using shell scripting in a multi-OS environment using the Shell and the Perl programming languages. Topics covered will include scripting commands, control structures, functions, scalar data and lists, regular expressions, hashing, automating administration functions and debugging. Lessons will be enhanced through the use of hands-on exercises to strengthen comprehension.

IT 265. Game Architecture and Design. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 100 or CS 101 or CS 103 or CS 104 or CS 106 or CS 113 or CS 115 or BNFO 135. Course introduces students to the core concepts and design methodologies integral to designing and developing games and other Entertainment Software.

IT 266. Game Modification Development. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 113 or CS 115. This course introduces students to the basic concepts of game programming and development. Students will learn how to reprogram a professional game engine, or Modification (Mod) development as it is referred to in the industry. Students will work with C intensively. Students will work on their own game projects utilizing the professional game engine.

IT 270. 3D Modeling and Animation. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 100 or CS 101 or CS 103 or CS 104 or CS 106 or CS 113 or CS 115 or BNFO 135. This class introduces students to the concepts of 3D modeling and animation, and putting those concepts into action by working with software. This class will be a hands-on, project focused course, using industry standard 3D modeling tools. Students will learn how to mesh model, texture, rig, and animate characters and scenes. Topics will include photo-realistic and low polygon approaches to content creation.

IT 286. Foundations of Game Production. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 100 or CS 101 or CS 103 or CS 104 or CS 106 or CS 113 or CS 115 or BNFO 135. This class introduces students to many of the tools and design methodologies needed for electronic game production. This class will focus heavily on scripting, level design and content control as applied to game development. Students will learn an industry standard game engine and its tool chain. Students will work on projects to develop the levels, controls and scripts in order to create a new game experience with a professional game.

IT 302. Advanced Internet Applications. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 202 or IS 218. Previous knowledge and experience in core web development will be expanded by covering advanced web development concepts and tools. Skills necessary for the design and development of complex web applications that meet industry standards are explored. This course encompasses key facets of web application development, including the utilization of front-end frameworks as Angular, React, and Vue), the use of various libraries, seamless integration with cloud-based backend services, backend frameworks such as Express, and the incorporation of NoSQL databases. Practical applications in the form of hands-on projects and assignments will be given throughout.

IT 303. Model View Controller Software Architecture. 3 credits, 3 contact hours (3;0;0).

Prerequisite: IT 202 or instructor approval. The Model View Controller(MVC) software architecture or pattern separates the concerns of application or domain logic, interface design, and the view of the system presented to the user, with the objective of more effective design, development and testing. This course covers environments and frameworks for modeling, developing and programming Internet Applications with emphasis on the Model View Controller paradigm. Design and development, applicability of principles, integrated test-driven development applicability of major external libraries like JQuery and Prototype, deployment, scaling and security issues will be examined. Case studies will be used to illustrate the concepts and frameworks considered. A substantial development project will be required.

IT 310. E-Commerce Technology. 3 credits, 3 contact hours (3;0;0).

An overview of the technologies relevant to electronic commerce. Communications and networking, web authoring tools, system security, databases and archiving, EDI, transaction processing, and factory/warehouse data networks. Provides competency to appraise tools such as HTTP servers, secure transaction software and firewalls, low and high-end database systems, heterogeneous networks, NNTP Servers, client software, procurement systems, and intelligent agents. Covers e-commerce models including agent-based and Java-based, electronic contracts and the electronic exchange of technical data, electronic cash systems and user security.

IT 311. Co-op Work Experience I. 3 credits, 3 contact hours (0;0;3).

Prerequisites: Completion of the sophomore year, approval of the program coordinator, and permission of the Office of Cooperative Education and Internship. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the Co-op office. Mandatory participation in seminars and completion of a report. Note: Normal grading applies to this COOP Experience.

IT 320. Virtual Instrumentation. 3 credits, 3 contact hours (3;0;0).

Cross-listed with OPSE 310. Prerequisite: CS 113 or CS 115. Covers the basics of virtual instrumentation including use of IEEE GPIB, RS232 interfaces, and data acquisition boards. Interface a computer to various instruments for data acquisition and instrument control using a state-of-the-art software platform such as National Instrument's LABVIEW. Emphasis is on the practical aspects of interfacing a computer to various instruments including timing issues, real-time data acquisition and instrument control, instrument status, and acquisition speed.

IT 330. Computer Forensic. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 120 or CS 356. This course introduces students to the applied topic of Computer Forensic, the study of obtaining and analyzing digital information from computers that have been used to commit illegal actions (computer crime), for use as evidence in civil, criminal, or administrative cases.

IT 331. Privacy and Information Technology. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 100 or CS 101 or CS 103 or CS 104 or CS 106 or CS 113 or CS 115 or BNFO 135. This course will introduce the legal, social and technical issues involving information privacy. Topics covered will include the historical development of information privacy law; law enforcement, technology and surveillance; government databases and records; privacy and business records and financial information; privacy and the media; health and genetic privacy and international privacy law.

IT 332. Digital Crime. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 100 or CS 101 or CS 103 or CS 104 or CS 106 or CS 113 or CS 115 or BNFO 135. Comprehensive, multidisciplinary overview of the methods and means by which technology is used by the criminal in today's society. An examination of the historical, legal, technological and sociological aspects of cybercrime. The course covers the challenges of a new era of technology has brought to combating crime of all types, including terrorism. Topics covered will include: the sociology of the white collar criminal, the criminal justice system and law enforcement, computer security and deterrence/prevention.

IT 335. Introduction to .NET Framework. 3 credits, 3 contact hours (3;0;0).

Prerequisite: IT 202 or equivalent. This course introduces students to .NET Framework, a new computational environment that supports more than 25 programming languages and is platform and device independent. Problem solving and system development topics are integrated into the course by using C# languages as a vehicle to illustrate the concepts.

IT 340. Introduction to System Administration. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 120 or CS 356. This course will introduce the tasks and techniques required to perform as a system administrator of Linux systems. Topics to be covered include booting, process control, the file system, managing users and resources, backups, configuration management, networking, the network file system, email servers, security, hardware devices, interoperability, and daemons. Whenever possible, lectures will be augmented with hands-on exercises.

IT 342. Cloud Administration. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 120. The fundamentals of cloud administration are presented. Included are cloud storage, compute engine, networking, identity and access management (IAM), billing, and security. Applications built into the cloud will also be covered. Experience using a major cloud service provider is a crucial component of the course, and hands-on labs and assignments in such a context will be given throughout.

IT 360. Computer Graphics for Visual Effects. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 113 or CS 115. This course introduces students to computer graphics and interactive visual techniques. Students will learn the theory and implement code of 2D and 3D graphics algorithms for visual effects. Topics include image processing, visualization, crowd simulation, physics-based simulation, particle systems, constraints, and artificial intelligence for visual effects. Mathematical concepts such as vector and matrix operations that underlie the general concepts will be covered.

IT 366. 2D Game Programming. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 266 and either IT 114 or CS 114. This course introduces students to the core concepts and skills necessary for the development of games utilizing 2D graphics. Students will learn how to set up and program their own 2D graphics based game engine. The engine will integrate 2D graphics, audio, input handling and network socket programming. Students will learn how to utilize their own custom 2D graphics and sounds into their projects. Once complete, students will have created two fully functional games.

IT 380. Educational Software Design. 3 credits, 3 contact hours (3;0;0).

Prerequisite: IT 201. Educational Media Design employs the instructional principles of constructivist pedagogy as the process used to develop a solution to develop courseware for K-12 audience. The course builds on the participatory design model of software engineering in order to develop integrated learning environments that support visual and verbal literacy; enables student to be able to plan, organize, and systematically develop instructional materials. This course implements instructional design theory and pedagogy in order to create an actual application for a computer-based environment. Same as STS 318.

IT 382. Game Design for XR. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 201 or IT 266 or IT 286. The course presents the concepts that address hardware and software technologies and principles of perception for mixed reality (virtual and augmented reality) applications. During the course, the students will have an opportunity to build a virtual or augmented reality application and test it with Oculus, Vive, Magic Leap, or HoloLens. During this course, students will learn to design and develop immersive experiences with VR/AR headsets, stereo displays, and large projection screens. They will incorporate body and eye trackers, follow and discuss the latest AR/VR trends, explore why some games make people feel immersed, and others make people sick. Students will also explore the differences and similarities between computer and human vision. This course is hands-on; It will be utilizing Unity 3D or Unreal Engine. The end of the year project will showcase all the different skills and knowledge acquired throughout the semester.

IT 383. Advanced Topics in Game Design for XR. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 201 or IT 266 or IT 286. This course concentrates on game development in cross-reality (XR). Specifically, the course looks at various user interface recommendations for virtual and augmented space including navigation, selection, and manipulation techniques. The course reviews current industry standards, design practices, evaluation approaches, and various types of documentation. By the end of the course, students will design, build, and evaluate a project they can use in their portfolio.

IT 400. Information Technology and the Law. 3 credits, 3 contact hours (3;0;0).

This course will provide an introduction to legal concepts, principles and terminology as applied to modern information technology. The historical background and foundations of the various principles of U.S. Statutory and Common Law will be considered and will be used to explore how such principles may be applied to encompass and govern modern legal interactions in the U.S. and internationally. Through assignments and class discussion, which will often involve the Socratic Method, students will be expected to spot potential legal issues and make logical arguments for and against various legal propositions.

IT 411. Co-op Work Experience. 3 credits, 3 contact hours (0;0;3).

Prerequisites: Completion of the sophomore year, approval of the program coordinator, and permission of the Office of Cooperative Education and Internship. Students gain major-related work experience and reinforcement of their academic program. Work assignments facilitated and approved by the Co-op office. Mandatory participation in seminars and completion of a report. Note: Normal grading applies to this COOP Experience.

IT 420. Computer Systems and Networks. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 120 or CS 356. This course provides students with an understanding of methods, tools, and technologies required to work with computer systems and networks. It includes a detailed discussion of Internet/intranet issues, including standards, connectivity, performance, protocols, network configurations, network design, wireless technology, management, and simulation through practical cases, covering both hardware and software systems.

IT 430. Ethical Hacking for System Administrators. 3 credits, 3 contact hours (3;0;0).

Prerequisite: IT 340 or equivalent. This course will explore the various means that an intruder has available to gain access to computer resources. Traditional security analysis often falls short due to the rapidly evolving threats that exist. The course was developed to teach how system and network vulnerabilities are found and exploited and what steps can be taken to mitigate the risk.

IT 466. 3D Game Programming. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 266 and either IT 114 or CS 114. This course introduces the core concepts and skills necessary for the development of games utilizing 3D graphics. Students will learn how to set up and program their own 3D graphics-based game engine using industry standard graphics libraries. Students will learn how to load and display custom 3D models created using existing 3D modeling tools. Students are expected to create fully functional 3D games and associated tools to work with them.

IT 485. Special Topics in Information Technology I. 3 credits, 3 contact hours (3;0;0).

Prerequisites: junior standing and/or advisor approval. The study of new and/or advanced topics in an area of information technology and its application not regularly covered in any other IT course. The precise topics to be covered, along with prerequisites, are announced in the semester prior to the offering of the course. A student may register for no more than two semesters of special topics courses.

IT 486. Special Topics in Information Technology II. 3 credits, 3 contact hours (3;0;0).

Prerequisites: same as for IT 485. A continuation of IT 485.

IT 487. Advanced Game Production. 3 credits, 3 contact hours (3;0;0).

Prerequisites: IT 286 or IT 266. This course will build on tools and techniques presented in Foundations of Game Production and guide students through the development of a senior game development project. This will be a hands-on class that will challenge students to apply the knowledge from previous game development courses to build a professional level game demo. Upon completion of the course, students will have built a game that is ready for publication on a distribution platform.

IT 488. Independent Study in Information Technology. 3 credits, 3 contact hours (0;0;3).

Prerequisites: open only to Information Technology majors who have the prior approval of the program director and the IT faculty who will guide the independent study taking the form of investigations, research, and reports on advanced topics in information technology. Students must prepare, in collaboration with their faculty mentor and in the semester prior to enrolling in this course, a detailed plan of topics and expected accomplishments for their independent study. This must have the approval of both the program director and the faculty mentor. A student may register for no more than one semester of independent study.

IT 490. Systems Integration. 3 credits, 3 contact hours (3;0;0).

Prerequisites: CS 113 or CS 115, IS 331 or CS 331, and IT 340. The course will introduce the major design, implementation & distributed deployment issues regarding system integration, Network Operating Systems (NOS), cross-platform database integration, e-commerce and e-business applications implementation, cross-servers & multiple locations e-sessions migration, and the related communications security.

IT 491. IT Capstone Project. 3 credits, 3 contact hours (3;0;0).

Prerequisites: senior standing. An opportunity for students to integrate the knowledge and skills gained in previous information technology work into a team research project. The project involves investigation of current literature as well as implementation of either a part of a large application or the whole of a small system.