The Major in Information Systems Courses

Note on Course Numbers
Each Carnegie Mellon course number begins with a two-digit prefix which designates the department offering the course (76-xxx courses are offered by the Department of English, etc.). Although each department maintains its own course numbering practices, typically the first digit after the prefix indicates the class level: xx-1xx courses are freshmen-level, xx-2xx courses are sophomore level, etc. xx-6xx courses may be either undergraduate senior-level or graduate-level, depending on the department. xx-7xx courses and higher are graduate-level. Please consult the Schedule of Classes (https://enr-apps.as.cmu.edu/open/SOC/SOCServlet) each semester for course offerings and for any necessary pre-requisites or co-requisites.

67-100 Information Systems Freshman Workshop
Fall: 1 unit
This class provides an overview of the Information Systems Program for freshman students. The Program's academic advisor facilitates discussion of the field of IS, the curriculum, and careers, as well as co-curricular experiences such as internships and study abroad. Guest lecturers include the IS faculty, IS alumni, the IS career consultant, and various campus representatives. Discussions will include students' progress in their first semester, as well as guidance in course planning, for creating their Spring semester schedule of classes, and their overall four-year plan.

67-101 Concepts of Information Systems
Spring: 6 units
This course provides an overview of the core concepts of information systems, and the impact of IS on the broader world. To this end, students will be exposed to the key concepts of people, process, and technology in information systems through lecture, case study, and project experience. Time in lecture will discuss topics such as the history of IS, the economics of information, as well as the key organizational and social issues. The class will study in detail the development of an IS project, and review some of the skills necessary for successful implementation of information systems. Finally, students will put these concepts into practice by working in small teams on an innovation project. This course is for Information Systems Freshmen only.

67-102 Concepts of Information Systems
Fall: 9 units
This course is an introduction to the world of Information Systems (IS). It introduces the core concepts of IS and its importance in the modern world around us. The course provides a general overview on the implications of information systems on organizations, by describing what an information system is; presenting some IS applications and discussing the implications of information systems on social and human aspects. The course also provides an initiation to essential information systems skills such as team work and project management.

67-103 Fundamentals of Web Design
Spring: 3 units
This course utilizes a hands-on approach to teaching the fundamentals of HTML5, CSS3 and Javascript (using jQuery). Each class starts with a brief presentation on a particular aspect of web design and then students use the remaining time to work through a technical challenge under the guidance of faculty and teaching assistants. This course is for Information Systems Freshmen only.

67-205 Principles of Front End Engineering
Spring: 6 units
Front-End Engineers create code that make websites interactive and exciting. That code is interpreted by a web browser or other client, using HTML, CSS, JavaScript, XML/XSLT, and Flash/Flex and differ from application development performed by Back-End Engineers. Freshmen or Sophomore status major Information Systems, Computer Science or Business. Prerequisites or co-requisite: 15110 Corequisite: 15-110.

67-211 Introduction to Business Systems Programming
Fall and Spring: 6 units
This course is an introduction to the COBOL programming language. In addition to the basic syntax of the language, the course presents several information systems applications and discusses their solution in COBOL. COBOL is the most widely used language in the business community. New versions of COBOL for Unix and PC’s have enhanced its status in the programming world. This class is a combination of lecture, readings, and programming. Students leave the course with an understanding of the COBOL syntax and the data file usage. The instruction emphasizes the importance of design and maintenance as well as coding in developing business applications.

Course Website: http://none

67-250 The Information Systems Milieux
Fall: 9 units
Information systems (IS) are changing work practices, reshaping organizations, transforming cultures, and giving new meaning to the ways we see the world. This course is designed to help students understand the role of IS in modern society and the means by which these systems are created. It provides not only a framework for understanding information and information systems, but also a language to identify their dynamic complexities and interdependencies. Topics include: current trends in IS, structured approaches to the creation of IS, corporate IS competitive advantage, business process improvements/reengineering, eCommerce and the digital economy, knowledge management, decisions support systems, and the implications of IS for people, organizations and society. Classes will use a combination of lectures, class discussions, reading assignments, case studies, group projects, and “hands-on” work in database design. This course is a required professional core course for sophomores in the IS major. Non-IS sophomores may enroll by special permission.

67-260 Visualizing Complex Information
6 units
This studio course meets two times per week and teaches students how to display complex information in clear and compelling ways. Students will be taught the organizational principles of good information architecture. Assignments are centered around the visual display of complex information, with a strong emphasis on developing structures, or grids to support the display of data. Legibility, visual organization, and typographic hierarchy are tools that are implemented in all assignments. We will begin to explore the relationships between form content, and type image. Students will learn how to make appropriate creative decisions for large posters and small business cards, as well as multiple-page documents. Design is a process and students must show their work as it evolves. This process includes: analyzing text, organizing content, visual organization, generating pencil sketches, and producing computer iterations. Personal growth as it relates to assignments is paramount to the students’ success in this class, regardless of the level of experience coming in to the class. This course is intended for Information Systems sophomores. Others may enroll by instructor permission as space is available.

67-272 Application Design and Development
Spring: 9 units
This course provides students with the concepts and techniques to design and develop software applications, and to understand the design process. Students will learn the importance of user-centered design and will develop a prototype of a web application as a course project. In the process of developing the application, students will learn how to design and create relational databases, how to acquire competency in new programming languages quickly, how to use the Model-View-Controller pattern to develop software applications, how to ensure technical quality in software development, and how to apply principles of user-centered design. This course is a required professional core course and is open only to sophomores and juniors in the IS major who have completed 67-250 or equivalent.

Prerequisites: 15-121 or 15-122.

Course Website: http://none
67-301 Networks and Telecommunications
Spring: 9 units
This course will introduce students to the basics of telecommunications, including voice, data, video, and wireless, with an emphasis on data. The course will cover both technical and business aspects of networking, and will consider regulatory and industry factors affecting telecommunication networks. Students will be introduced to the concepts and terminology of networks, including layered network models, and to practical issues involved in designing, managing, and using networks and network applications. Learning will take place through assigned readings including current issues and events in networking, class participation, and homework assignments. Grades will be based on examinations, homework assignments, and contributions to classroom discussions. For Information Systems Juniors and Seniors. Prerequisite: 67-371.

67-304 Database Design and Implementation
Spring: 6 units
This course provides an introduction to database design and implementation with a primary focus on the relational model. By the completion of this course the student will be able to appropriately use database design and implementation tools (the relational model, E-R models, normalization, and SQL) and apply knowledge of both technical and business issues related to database design and implementation to generate and evaluate alternate solutions to business situations. The course will also cover database dependability, reliability, availability, recovery, architectures, and distributed databases. Current topics in databases such as object-oriented and object-relational databases as well as data warehousing and data mining will also be presented. Projects will be completed using a "significant" relational database management system such as Oracle, DB2 or Microsoft SQL Server. Prerequisites: 67-271 and 67-272.

67-306 Special Topics: Management of Computer and Information Systems
Intermittent: 6 units
This course will provide a thorough understanding of the many responsibilities for managing technology by the organization IT resource, executives, managers, and functional end users. Concentration on IT plan and budget development with associated management, IT roles and responsibilities, system development and operations best practices, security management, IT procurement with emphasis on service and product agreements, vendor relationships, project management, and business continuity/disaster recovery. Junior or senior class standing is required. Coursework in information systems, software design, project management, or related job experience is strongly preferred, but not required due to the managerial, rather than technical, nature of the course.

67-309 Special Topics
Spring: 6 units
Special Topics: Information Assurance and Security (Power to the Edge: Challenges to systems survivability in a net-centric world) This course is an overview of increasingly important aspects of systems development, operation and sustainment, namely information assurance, software assurance, survivability and security. As more and more functionality and dynamic decision-making are pushed down and out into the organization (power to the edge), assurance and security concerns, with their organizational and human dimensions, impact the fidelity of the data and the very survival of the organization. Topics include overview and definitions, defense in depth, legal and policy issues, principles of survivability and information assurance, risk management, insider threat, vendor and outsourcing issues, incident management and forensics. This class is a combination of lectures, readings, and discussion groups. Students will leave the course with an understanding of the various concepts and their impacts on systems and the organization itself. Pre-requisites: Junior or Senior class standing and at least one programming course (15-110 or equivalent)
Prerequisites: 15-100 or 15-110 or 15-111 or 15-112.

67-311 Database Design and Implementation
Intermittent: 9 units
Managing large databases is a core task in many information systems. In this class students will explore the underpinnings of databases as well as learn how to more effectively manage databases. Topics include relational algebra and advanced data modeling, advanced SQL queries, handling transactions, performance tuning, creating triggers, views and stored procedures, and much more. In the last part of the course we will explore NoSQL databases such as MongoDB and Redis, understanding their strengths and weaknesses as well as how to integrate them into web-based applications. Prerequisites: 67-272 or permission of instructor.
Prerequisites: 67-272 or 67-371.

67-317 Mobile Web Development and Usability Testing
Intermittent: 9 units
This course is offered only at Carnegie Mellon's campus in Qatar. Designing for mobile web applications enables businesses to harness the explosive growth and new opportunities on the mobile internet, besides enabling innovation in many ways. This course emphasizes a 'mobile first' approach to responsive web design, development, and user experience. Students gain a deep understanding of the mobile web development process, the grammar of building mobile web sites, emerging web standards, and state-of-the-art mobile usability testing methods. They gain first-hand exposure to developing with HTML5 and CSS3 and applying heuristic methods and testing tools such as Morae and Tobii eye tracker, to achieve an enhanced mobile user experience. Recent reports state that 80 percent of mobile websites in the US get traffic from other regions of the world. The course will address the need for facilitating a "global" user experience, through independent student projects that target a 'global or social' theme and deliver a complete solution involving design, development, and usability testing of a localized and responsive web site for deployment in Qatar. Prerequisites: 15-121 and 67-272.

67-319 Global Technology Consulting Groundwork
Spring: 3 units
This course is by invitation only for participants in the Technology Consulting in the Global Community program. For information on the program and how to apply, see http://cmu.edu/tcngc.

67-327 Web Application Security
6 units
This is a technical course designed to help students learn how to exploit web applications and to be better able as developers to defend against such exploits. The course covers the process of hacking a web application, starting with initial mapping and analysis, followed by identifying common logic flaws in web apps, database and network exploits, command and SQL injections, and the like. This hands-on course requires students to be familiar with a popular web application framework or language (such as Ruby on Rails, PHP, Django/Python, ASP.NET or the like). Prerequisite: 67-272 or permission of instructor.
Prerequisite: 67-272.

67-328 Mobile to Cloud: Developing Distributed Applications
9 units
Web 2.0, Mashups, Mobile Apps, and Cloud Computing are just a few of the new terms people are using to describe emerging technologies for building complex, distributed applications. Protocol standards, web services, open-APIS, increasingly more powerful mobile devices, and the Internet have enabled new possibilities for weaving complex applications using globally-distributed data and computing resources. Application development has largely left any single computer, and is distributed across a wide range of hardware and software platforms. This class will explore these developing technologies and models for structuring their complexity, while building projects that go from mobile to the cloud. Prerequisite: 67-272 or permission of instructor.
Prerequisite: 67-272.

67-329 Contemporary Themes in Global Systems
Spring: 9 units
Globalization and outsourcing of information systems (IS) is a mainstay of the business environment. The decision to outsource software services to providers in distant places has many risks and thus careful management of critical success factors is essential. Likewise, products and services are being developed and delivered by teams of people in diverse locations working together. Management of these sourcing models and human capital relationships will be an increasingly important skill for students expecting to fully participate in the emerging IS marketplace of the 21st century. This course introduces the effective fundamentals of global project management and the mechanics of sourcing arrangements including offshore outsourcing. Students will also examine the effects of human diversity and cross-cultural considerations in the creation, use, and management of information systems. A combination of readings, participation in class discussions, and non-technical collaborative projects will be expected of class participants. Students must have sophomore standing or higher and have not successfully completed 67-325 and 67-326.

67-330 Information Systems Planning
Spring: 6 units
This course will introduce students to the basic planning, design, and implementation of information systems. Students will be introduced to the concepts and terminology of information systems, including layered information system models, and to practical issues involved in designing, implementing, and using information system applications. Learning will take place through assigned readings including current issues and events in information systems, class participation, and homework assignments. Grades will be based on examinations, homework assignments, and contributions to classroom discussions. Information Systems Juniors and Seniors. Prerequisite: 67-371.

67-331 Global Information Systems
Intermittent: 6 units
This course provides an introduction to the foundations of global information systems. Students will gain an understanding of the various concepts and their impacts on systems and the organization itself. Pre-requisites: Junior or Senior class standing and at least one programming course (15-110 or equivalent)
Prerequisites: 15-100 or 15-110 or 15-111 or 15-112.

67-332 Information Systems Management
Intermittent: 6 units
This course will introduce students to the basics of information systems management, including voice, data, video, and wireless, with an emphasis on data. The course will cover both technical and business aspects of networking, and will consider regulatory and industry factors affecting telecommunication networks. Students will be introduced to the concepts and terminology of networks, including layered network models, and to practical issues involved in designing, managing, and using networks and network applications. Learning will take place through assigned readings including current issues and events in networking, class participation, and homework assignments. Grades will be based on examinations, homework assignments, and contributions to classroom discussions. Information Systems Juniors and Seniors. Prerequisite: 67-371.
67-330 Technology Consulting in the Community
Spring: 9 units
In this course, the student develops technical consulting and management skills while collaborating on-site with a community leader of a non-profit community organization or school. This service-learning course has students analyze a complex organization, then design and implement a work plan that will expand the organization’s capacity to use information technology. Student consultants do not merely provide IT support, nor do they focus on system development. Rather, they focus on solving organizational problems using IT solutions. In doing so, they may develop a system, or adapt open source or commercial tools as appropriate to the situation. Throughout the semester, students develop a consulting report. They learn how to use this working document to collaborate with others and to think through and communicate a strategic technology plan. Students also experience how urban community organizations function, seeing the valuable benefits these organizations provide to society. Prerequisites: 76101 and (15121 or 70451). At least sophomore standing.
Prerequisites: 15-121 or 15-122 or 70-451.

67-331 Technology Consulting in the Global Community
3 units
PREREQ: Admitted ONLY BY Permission of Instructor.

67-344 Organizational Intelligence in the Information Age
Fall: 9 units
Across all organizations people find that the actions they take affect, and are affected by, the technology, norms, procedures, culture, and members of the organization. In order to navigate through this organizational world, agents need a better understanding of social and organizational intelligence. How do organizations (and the people who populate them) acquire and then process information? In what ways have new technologies affected the norms, procedures, and culture of organizations? How do leaders successfully guide their organizations through a world where new information and new technologies are constantly being produced? This course is about information assessment and analysis in organizations, and the way organizations are transformed by technology. This course is for Sophomores, Juniors, and Seniors.

67-360 Applied Analytics
9 units
Businesses and organizations are currently in a paradoxical situation where they are drowning in data but starving for knowledge. From tracking purchases at traditional retail stores to logging browsing patterns at online stores, modern business are adept at collecting data about their customers. The analytics challenge is how to interpret and distill this data into actionable knowledge. This class will introduce you to a range of technologies and methods for extracting business intelligence from data to anticipate customer needs and create new opportunities. We will examine how various business processes can be improved with case-studies and examples from the fields of fraud detection, movie-box office, credit scoring, customer churning and retention. These are some of the analytic strategies used by companies such as Google, Amazon, Netflix, and Facebook to better understand and target their customers. The overall objective of this class is to introduce you to practical business analytics skills which are in high demand in the current job market. The class will be hands-on with various analytics tools such as the SAS Enterprise Miner. This course may count toward the Decision Science and Rational Choice (old curriculum) and Quantitative Analysis and Research Methods (new curriculum). Students could also use it as an IS elective for the professional core or content area (Quantitative Analysis and Research Methods). Prerequisite: 15-121 or consent of the instructor.
Prerequisites: 15-111 or 15-121 or 15-122 or 15-211.

67-361 Big Data & Sustainability
6 units
Sustainability is one of the greatest global predicaments now facing us. Symptoms abound: climate change, depletion of water resources, deforestation, pollution, and on and on. There are no easy answers to these problems. Even framing the relevant questions is difficult. Choosing between competing alternatives runs the risk of addressing one problem at the expense of another. Only through thoughtful and careful analysis can informed, robust and helpful strategies be developed. Massive amounts of data are now available in a range of domains, e.g., telemetry, energy consumption, traffic patterns, healthcare etc. As a new resource, ‘Big Data’ is differentiated from traditional data by its volume, velocity, and variety. The dual combination of Big Data and technological advances in the general field of analytics and data mining currently provide an opportunity to potentially answer heretofore inaccessible questions. In the domain of sustainability, advances in sensor technology, metrology, physics based modeling, epidemiology, and ecological sciences provide an explosion of data yet to be mined. Relationships among these apparently disparate data sources have yet to be established and leveraged. In this introductory course, students will gain exposure to sustainability. We will then examine some classical analytic techniques and their limitations for the nature of problems related to sustainability. We will tie these two themes of the course together by exploring contemporary Big Data approaches to the intractable problems of sustainability. Units include: 1. Background on the problem domain (Sustainability); 2. Overview of classical Data Analytics and their limitations; 3. Introduction to Big Data and associated platforms (e.g. Apache Hadoop, IBM Watson); 4. Exploring the potential of Big Data approaches to the problems of Sustainability. For juniors and Seniors or by instructors approval.
Prerequisites: 15-112 and 36-201.

67-362 Big Data Analytics
Spring: 6 units
With a technology oriented perspective this course will introduce you to some of the tools and techniques for making the most of Big Data. Candidate tools we will study and use include Hadoop, Google's BigQuery, IBM's BigInsights etc. Students will emerge with a hands-on foundation of modern analytics and will be equipped for further explorations in this emerging discipline. Enrollment by instructor permission only. P/N option not available.
Prerequisites: 15-112 and 36-201.

67-370 Intelligent Decision Support Systems
Spring: 9 units
In this course we will study various methods for augmenting human decision making. We will focus on the key ideas of several business intelligence technologies and the value they can bring to an enterprise. The technologies we will study include classic symbolic AI methods (rule-based systems, case-based reasoning), connectionist approaches (neural nets), evolutionary approaches (genetic algorithms), inductive approaches of machine learning (nearest neighbor, support-vector machines), data mining (constructing decision trees and association rules), and collective intelligence methods (collaborative filtering). While this is not a programming intensive course, we will be using several software systems and libraries implementing these methods. By running experiments with these systems and libraries we will focus on how these technologies can support decision making in tasks such as classification, clustering, prediction, optimization, design, and recommendation. This course may count toward the Decision Science and Rational Choice (old curriculum) and Quantitative Analysis and Research Methods (new curriculum). Students could also use it as an IS elective for the professional core or content area (Quantitative Analysis and Research Methods).
Prerequisite: 15-121.

67-371 Fundamentals of System Development
Fall: 9 units
This is an introductory course in software systems analysis and design and project management. The course covers contemporary themes and issues involved in developing high quality software systems that meet users' expectations. Students will learn the basic theory, techniques and skills that systems analysts need to develop and document requirements and project plans for complex information systems projects. Since software system development practice is a rapidly evolving area, a cross-section of current, as well as time tested best practices methods will be presented. The course consists of these main components: overview of systems analysis and design, lifecycle and process issues, requirements articulation with use cases, object models and diagramming and documentation tools and techniques, and project management, including issues of software quality and metrics. Concepts will be mastered through a combination of assigned readings, class attendance, homework assignments and minor projects. This course is a professional core requirement, and is open only to IS juniors who have completed 67-272.
Prerequisite: 67-272.
**67-373 Software Development Project**

Spring: 12 units  
In this course, students design and implement a usable information system for a client. The client may be affiliated with the university, government, business, or non-profit agency. Students will be assigned to teams to work on these projects, and will produce operational, fully documented and tested, computer-based information systems. The projects will be supervised by CMU faculty and, when possible, by project clients.  
Prerequisites: 67-272 and 67-371.  
Course Website: http://none

**67-390 Independent Study in Information Systems**

Fall  
Independent studies are opportunities to engage in research with a faculty member to advance your learning in certain areas of interest. Information Systems students may enroll in independent study for 3, 6, 9, or 12 units of academic credit by obtaining a faculty sponsor who will oversee the academic component of the coursework, monitor progress, and assign a final grade.

**67-474 Tech Startup Launchpad**

Spring: 9 units  
This course provides hands-on learning about what it is like to start and launch a technology startup company. You will work within a team of students to turn your idea into a real company. You will learn and apply modern concepts practiced today in top innovation hubs around the globe: lean startup, minimum viable product, customer development, product-market fit, agile product development, business model generation, competitive landscape, etc. The goal of this course is not to write a business plan, prepare a venture capital presentation, or write tedious progress reports. You will learn what it takes to quickly develop your idea into a prototype, turn it into a minimum viable product and launch it, while you concurrently 1) talk to and cultivate potential customers, and 2) develop and iterate on your business model. This course is designed for BA, CS, IS seniors; non-IS seniors should obtain instructor permission to enroll in this class.  
Prerequisite: 67-272.

**67-475 Innovation in Information Systems**

Fall: 12 units  
In this capstone team-based course, students design and implement an information systems solution to meet a real-world need or opportunity. Innovation, entrepreneurship, planning, project management, and risk taking will all be emphasized. Students will be challenged to produce “proof of concept” systems or prototypes that are fully documented, tested, and ready to present for external evaluation.  
Prerequisite: 67-373.  
Course Website: http://none