The Major in Information Systems Courses

About Course Numbers:
Each Carnegie Mellon course number begins with a two-digit prefix that designates the department offering the course (i.e., 76-xxx courses are offered by the Department of English). 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. Depending on the department, xx-6xx courses may be either undergraduate senior-level or graduate-level, and xx-7xx courses and higher are graduate-level. Consult the Schedule of Classes (https://tenapps.cmu.edu/occ/SCS/serveit/) each semester for course offerings and for any necessary pre-requisites or co-requisites.

67-100 Information Systems First Year Colloquium
Fall: 2 units
This IS Colloquium will provide a broad introduction to the Information Systems Program, an exciting program newly joint between Carnegie Mellon's Dietrich College and Heinz College. The IS Colloquium is open only to first-year IS students and is led by an IS academic advisor who facilitates discussions on the field of IS, the program curriculum, and careers, in addition to co-curricular experiences such as internships and study abroad. Because the flexible nature of the IS program encourages students to explore their own interests, we place an emphasis on highlighting a variety of areas within the field of IS. Guest lecturers will include leaders in IS research including Dietrich and Heinz faculty and IS alumni. Additional speakers include the IS career consultant and various campus representatives. Discussions will include students' progress in their first semester, as well as guidance in course planning, creating student Spring semester class schedules, and their overall four-year plan.

67-202 The Softer Side of Software
Spring: 6 units
Even the best technologist has to rely on soft skills in their lives and jobs—whether they want a team member to take their constructive feedback or an angel investor to understand why their product is better than the competition. Classes will cover delivering engaging presentations, writing emails co-workers want to read, conducting meetings and workshops, delivering criticism and more. This mini course requires students to participate in a combination of short readings, in-class simulations, theater exercises, individual and group projects to practice soft skills. This course has some space available to students outside of the Information Systems program.

67-204 Blockchains in Industry
All Semesters: 3 units
Industry experts characterize blockchains as breakthrough technology that has the same transformative power as that of the Internet. Blockchains have the potential to solve a variety of problems that benefit from a decentralized model of trust. This course will help students understand fundamental blockchain concepts and develop industry case studies of blockchain applications to finance, insurance, energy, healthcare, real estate, etc.

67-211 Business Oriented Sys:History, Des & Dev-Lens of CoBOL Programming Language
Fall: 6 units
Using computers to process business information began in the early 1960's. This course examines the technology evolution of business systems from the basic transaction processing of early business systems to today's event driven, web-based, big data systems. Students explore the unique aspects of business systems such as longevity, maintainability, good information reporting practices, and development methods. Lecture material includes important historical milestones, business systems terminology, and business oriented problem-solving approaches. Students will apply lessons learned in the lectures to programming assignments where they will gain a practical understanding of data representations, persistent storage structures, and algorithms common to business systems. The programming assignments use CoBOL, a standardized language designed for business systems development. Some minimal programming experience in any language is necessary. Good listening skills and class interaction are required.

67-240 Mobile Web Design & Development
Fall and Spring: 9 units
The Mobile Web Design and Development course provides a solid web design and development foundation focusing on responsive and user-centered design, and client-side components. Students explore the current standards and best practices of web design. Throughout the course, students work with HTML5, CSS3, Twitter Bootstrap, and Javascript, and learn how the various web components function together. The course utilizes a hands-on approach to guide students through learning and understanding the design and development process. This course is primarily designed for students with minimal technical experience. By the end of the course, students will be able to plan, design, and implement a basic functioning mobile web site/app.
Prerequisites: 15-104 Min. grade C or 15-112 Min. grade C

67-250 The Information Systems Milieux
Spring: 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 the enterprise and the means by which these systems are created, utilized and maintained. The course will focus on enterprise information architecture including the components of enterprise strategy, business, application, information, and infrastructure layers. This course provides not only a framework for understanding information systems, but also a language to identify their dynamic complexities and interdependencies.

67-262 Database Design and Development
Fall: 9 units
Data driven decision making is a core process of organizations. In this class students will study the principles of database management systems, their design, and development. Recent alternatives to the classical relational model will also be examined. This course is a required professional core course and is open only to sophomores in the IS major who have completed 67-250 or equivalent.
Prerequisites: (15-122 or 15-121 or 15-112) and 67-250

67-265 Design Fundamentals: Shaping Interactions and Experiences
Fall: 9 units
This course introduces students to human-centered compositional practices that attract users to the pre-task environment/interface and invite them to stay. Once attracted, users need a useful, usable, and desirable task environment that is developed by exploring color theory, basic typography, and meaning-making through image, word, and typography resulting in collaborative meaning between the three. With this knowledge in hand, students design and prototype an interactive solution to a problem that real users face, employing user studies and usability testing in order to create an effective solution.

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: (15-122 or 15-121) and 67-262
67-279 Introduction to Geographical Information Systems  
Intermittent: 6 units  
Geographical Information Systems (GIS) allow us to visualize information that uses location. Through displaying layers of information in computer generated maps, we can see, analyze, understand and explore spatial patterns and relationships in new and novel ways. People in many different fields use Geographical Information Systems in their work: for visualizing the environment, human development, demographics, traffic and transportation, public health and many more. In this course, students will learn the basics of GIS through hands-on experience with popular mapping tools. Sources of data, principles of coordinate and projection systems and elementary geo-analysis techniques will be included. Upon completion of the course, students will have the background to begin using GIS techniques in their own areas of interest and will be prepared for further study in advanced GIS courses.

67-306 Special Topics: Management of Computer and Information Systems  
Spring: 6 units  
The course provides the overall knowledge of how Information Technology departments are managed in organizations of all sizes. It is about the technology people, the necessary best practice processes, and how innovation occurs transforming organizations in the way they operate and compete.

67-308 Innovation Studio: Health Care Information Systems  
Intermittent: 9 units  
Healthcare information systems are intended to improve patient outcomes while reducing the cost of clinical care. However, with the highest per person healthcare expenditures, the United States ranks low in healthcare quality compared to other countries. Although healthcare information systems are improving, challenges persist because information workflow, human interface design, and interoperability are not emphasized. In this course, students will learn to solve real-world healthcare information systems challenges in a team-based format.

67-309 Special Topics: Information Assurance and Security  
Fall: 6 units  
Special Topics: Information Assurance is an introduction course for Information Systems students that focuses on information security concepts. This course will be a broad introduction to many aspects of information security that affect computer systems, your everyday life on the internet, your activities - and those of others, and the practices of all organizations using and building information systems. You will learn an introduction to the practice of securing information systems, how organizations manage risk to their information assets, what threats there are to the security of an information system, strategies for organizational resilience, applicable US cyber laws, and how organizations respond to real incidents. You will hear about some of the major cyber incidents that have shaped the way security is performed by organizations on the internet today, and you will participate through class discussions and homework analyzing important recent cyber issues, real incidents, and internet-scale events. By the end of the course, students will be able to analyze systems for security using the language of security professionals and analyze the implications of real world attacks on security systems by applying core information security concepts. 
Prerequisites: (15-112 or 15-110) and 67-250

67-315 A Web For Everyone  
Prerequisite: 67-272 Min. grade C or permission of instructor.

67-317 Mobile Web Development and Usability Testing  
Intermittent: 9 units  
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. 
Prerequisites: (15-122 or 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/tcingc/.

67-324 Accelerating Innovation and Entrepreneurship  
Fall: 9 units  
Mastering innovation processes and incorporating entrepreneurial methods into one’s career is a cornerstone of success. Whether one endeavors into a startup or large company, successfully incorporating innovation and entrepreneurship will propel a career in software development, consulting, financial services, and many others. Innovation and entrepreneurship is a discipline with established tools and methods that must be properly harnessed in order to translate ideas into commercial successes. This course will expose and educate students to the discipline of innovation and entrepreneurship that will be portable to most any career and industry focus. After the completion of this course students will be able to understand and differentiate among ‘right sized’ innovation and entrepreneurial methodologies.

67-327 Web Application Security  
Fall: 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 applications, 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.

67-328 Mobile to Cloud: Building Distributed Applications  
Fall: 9 units  
Web 2.0, Mashups, Mobile Apps, and Cloud Computing are just a few of the new technologies 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 (with ‘C’ or higher) or permission of instructor.

Prerequisite: 67-272 Min. grade C
67-329 Contemporary Themes in Global Systems
Fall: 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.

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 document. 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 70-451 or 15-122

67-331 Technology Consulting in the Global Community
Fall
This course is by invitation only for participants in the Technology Consulting in the Global Community program. Admitted ONLY BY Permission of Instructor

67-335 Introduction to Data Analysis
All Semesters
This course teaches the basic techniques and practical skills required to make sense out of a variety of data, with the help of the most acclaimed software tools in the data science world: pandas, numpy, scipy, scikit-learn, etc. Thanks to a new set of software tools that allows to easily process and analyze data at scale, it is now possible to extract invaluable insights from the vast amount of data generated daily. As a result, both the business and scientific world are undergoing a revolution which is fueled by one of the most sought after job profiles: the data scientist.

67-338 Information & Grid Design
Fall: 9 units
Whether you create, oversee, or want practice in solving problems through grid systems for websites, responsive applications, slide presentations, or data visualizations, this course provides the skills needed to communicate using the interplay of image, text, and typography in grid environments.

67-339 User-Centered Web Design
All Semesters: 9 units
User-Centered Web Redesign builds on the student's knowledge of design fundamentals, adding a stronger focus on user studies and usability testing. Our goal is to develop and redesign the website created as the final projects in Database Design and Development in order to synthesize design thinking as a system that not only functions on the back end but also on the front. Students engage in user studies by first developing an hypothesis of the user that they test through interviews and observations, leading to a revised hypothesis that more fully appreciates the user's goals, tasks, and internal barriers. Students will use these insights to develop site architecture 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 document. 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 70-451 or 15-122

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.

67-353 IT & Environmental Sustainability
Intermittent: 6 units
Sustainable living and sustainable development are serious challenges facing individuals, communities, organizations and countries around the world. Addressing these challenges is a multidisciplinary effort, in particular, while Information and Communications Technologies have been among the most transformative developments in recent decades, they have the potential to address some of society’s most urgent needs. For examples, intelligent use of IS/IT can help enable smarter cities, more efficient transportation systems, smarter energy systems, more efficient logistics and ‘greener’ product life cycle design. In this course, students will reflect on the challenges of sustainability and the potential role IS/IT may play in enabling adaptation and mitigation of these challenges.

67-355 System Quality and Testing
Spring: 9 units
The System Quality and Testing course adopts the view that software quality is not only the absence of defects but it encompasses all the characteristics that bear on the its ability to satisfy stated and implied needs. Software quality is then defined from different perspectives: product quality, quality in use and process quality through the use of specific quality models. The course systematically explores different quality characteristics and the techniques most appropriate to verify them. Specific topics include test case design, test automation, code reviews, testing ML applications, technical debt, cost of software quality, planning for quality, and defect classifications. Prerequisite: 67-272

67-364 Practical Data Science
Spring: 9 units
From empirical, to theoretical, to computational science, we are at the dawn of a new revolution—a fourth paradigm of science driven by data. Like archaeological remnants, data, by its very nature, is a marker of what happened in the past. How can data be used to better understand this past and what is happening in the present? How can data be leveraged to forecast what will happen in the future? Better still, how can data be used to mold what should happen in the future? In this course we will study descriptive, predictive, and prescriptive methods by which data can be used to gain insight and inform actions of people and organizations. The real excitement of data science is in the doing. This is an application oriented course requiring skill in algorithmic problem solving. We will use Python based data science tools. While prior programming experience with Python will be helpful the course will strive to be self-contained. If you have not programmed in Python before, you need to be comfortable programming in some language (e.g., Ruby, R, Java, C++, etc.) and will need to come up to speed with the Pythonic way of problem solving. Prerequisites: (36-201 Min. grade C or 36-200 Min. grade C) and 15-112 Min. grade C

67-373 Information Systems Consulting 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. Prerequisite: 67-272

67-390 Independent Study in Information Systems
Fall and Spring
Independent studies are opportunities to engage in research with an IS 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 an IS faculty sponsor who will oversee the academic component of the coursework, monitor progress, and assign a final grade. This is available by Special Permission.
67-391 Independent Study in Information Systems
Fall and Spring
Independent studies are opportunities to engage in research with an IS faculty member to advance your learning in certain areas of interest. Information Systems students may enroll in independent study for 3, 6, 9, 12 units of academic credit by obtaining an IS faculty sponsor who will oversee the academic component of the coursework, monitor progress, and assign a final grade.

67-440 IdeATe Mobile Application Design & Development
Spring: 9 units
TBD

67-443 Mobile Application Design and Development
Fall: 12 units
This course provides students with the concepts and techniques to design and develop innovative mobile applications. Students will develop a series of smaller mobile applications in weekly lab sessions (using either iOS or Android frameworks). In addition, student teams will build a larger mobile application, as part of a semester-long project, that fills a demand not effectively met in the current market. In the process of developing these applications, students will gain a strong understanding of mobile application development, mobile-centered design, the process of creating and testing innovative application design, and larger principles of software engineering. In weekly labs, students can choose either the Swift/iOS or Kotlin/Android track to complete course work, but lectures will primarily use Swift to illustrate larger points of software architecture and engineering. This course is open only to juniors and seniors in the IS major who have completed 67-373 or by special permission of the instructor. Prerequisites: (67-373 and 67-272) or 95-712

67-445 Seminar in IS: Intelligent Agents
Spring: 9 units
The purpose of this seminar is to study behavioral interactions with and perceptions of intelligent agents. This research seminar is intended for junior and senior students in Information Systems and other university departments who wish to engage in research at the intersection of Information Systems, Artificial Intelligence, and Psychology. All students are expected to have some prior knowledge in Statistics (36-201 or 36-309 or similar courses). For each topic, students will be reading, analyzing, discussing, and presenting several papers. This discussion-based course has two main objectives: 1) to facilitate in-depth discussions of current research articles and essential topics in this domain, and 2) to build and expand students' research skills through in-depth analysis of papers, critiques, presentations and discussions. Prerequisites: 36-201 or 36-309

67-475 Innovation in Information Systems
Fall: 12 units
This course is a senior level team-based capstone experience that aims to capture the challenge and excitement of creating a solution that adds value - whether a process, product or service - and to provide students with an opportunity to experience the innovation process. In this course, we will focus on exploring various types of innovation (e.g. design thinking, blue ocean, business innovation, etc.). This course will also help you develop a new set of tools aimed at framing challenges, addressing the right problems, and thinking outside of the box to solve present and future business challenges. The purpose of this course is not merely to create a new app but to identify a real problem or business need, and to apply structured tools in order to solve the problem. To substantiate their thinking, teams will talk to stakeholders and users; observe people in their native environments; consider real physical, technical, and social constraints; and understand how to identify and resolve users' needs and pain points. Prerequisite: 67-373

67-476 Innovation in Information Systems: Health Care
Spring: 9 units
Healthcare information systems are intended to improve patient outcomes while reducing the cost of clinical care. However, with the highest per person healthcare expenditures, the United States ranks low in healthcare quality compared to other countries. Although healthcare information systems are improving, challenges persist because of information silos, human interface design, and interoperability are not emphasized. In this course, students will learn to solve real-world healthcare information systems challenges in a team-based format. Juniors and Seniors

67-490 Practicum in Information Systems
Intermittent
This course is offered only at Carnegie Mellon's campus in Qatar. The practicum in information systems allows students interested in applying skills acquired in the field of information systems in the context of a working environment. Students will complete a project and be accountable to a stakeholder that is external to their program of study. They may shadow and observe practices in the field of information systems, and also perform tasks as assigned. A hands-on experience is expected. By completing this course, students practice desirable skills for employability, such as time management, project management, team work, and professional development.

67-505 Information Systems Internship
Fall and Spring
Practical experience in Information Systems.

67-509 Independent Study in Information Systems
Fall and Spring
Independent studies are opportunities to engage in research with an IS 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 an IS faculty sponsor who will oversee the academic component of the coursework, monitor progress, and assign a final grade.

67-738 Information & Grid Design
Fall: 12 units
Whether you create, oversee, or want practice in solving problems through grid systems for websites, responsive applications, slide presentations, or data visualizations, this course provides the skills needed to communicate using the interplay of image, text, and typography in grid environments.

67-743 Mobile Application Design and Development
Fall: 12 units
This course provides students with the concepts and techniques to design and develop innovative mobile applications. Students will develop a series of smaller mobile applications in weekly lab sessions (using either iOS or Android frameworks). In addition, student teams will build a larger mobile application, as part of a semester-long project, that fills a demand not effectively met in the current market. In the process of developing these applications, students will gain a strong understanding of mobile application development, mobile-centered design, the process of creating and testing innovative application design, and larger principles of software engineering. In weekly labs, students can choose either the Swift/iOS or Kotlin/Android track to complete course work, but lectures will primarily use Swift to illustrate larger points of software architecture and engineering. Prerequisite: 95-702