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://erm-apps.as.cmu.edu/open/SDG/SDGServlet) 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.

67-102 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.

67-202 The Softer Side of Software
Intermittent: 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.

67-211 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 website/app.
Prerequisites: 15-140 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.

67-261 Information Design Fundamentals
Fall: 9 units
Information Design Fundamentals builds from a foundation in visual composition and typographic layout; to visual/verbal communication through the interplay of images, text, and typeface. Students apply this core understanding to information design problems that consider both qualitative and quantitative data developed for descriptive and strategic purposes that take the form of timelines, maps, hierarchies, and networks. While exercises concentrate on mastery of the tools and usability testing, projects importantly incorporate user studies methods as the first design step in order to help users perform tasks that meet their goals in ways that minimize barriers.

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: (15-121 or 15-122 or 15-112) and 67-250

67-265 Design Fundamentals I: Shaping Interactions and Experiences
Fall: 9 units
This is an introductory course in interaction design, user experience, and the process of designing for people and technologies. The course introduces students to basic human-centered design research and concept development in the development of digital, service, and user experiences. Students also develop component skills in user interface design. Coursework promotes design thinking and practice for application in tech fields. Offered only on the Qatar campus.

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 15-112) and 67-262
67-276 Building Better Web Applications  
Fall: 3 units  
This class introduces students to new technologies that will help improve web application performance and responsiveness. Classes will begin with a time of instruction followed by hands-on activities to reinforce learning principles.  
Prerequisite: 67-272

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  
Intermittent: 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  
Intermittent: 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 systems, 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 class you 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: (15-122 or 15-121) and 67-272

67-315 A Web For Everyone  
Spring: 9 units  
This course provides a strong foundation in user-centered design and the engineering of web accessibility. The student will gain expertise in methodologies and toolkits for designing, prototyping, and evaluating a web site ensuring that the content is equally accessible to people with disabilities. Upon successful completion of this course, the student will be able to discuss standards and metrics for use in web development projects and be proficient in different stages of the project life cycle including data gathering methods, analysis techniques, requirements specifications, application of universal design principles, prototyping, and testing for usability and WCAG (Web Content Accessibility Guidelines) compliance. A term-long individual project will involve analysis of an organization's website for compliance with WCAG guidelines, the development and implementation of an improved prototype, and usability studies of the prototype.  
Prerequisites: 67-272 or 67-240

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/ctingc.

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 apps, database and network exploits, command and SQL injections, and the like. This hands-on course will provide 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: Building Distributed Applications  
Fall: 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 (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 explores the challenges of sourcing models, 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 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: 70-451 or 15-121 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, we are now able 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 object of study is the 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 usability 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 through card sorting for organization, stress testing for navigation, and label testing for language use. The architecture of the site will then be explored for the visual/verbal communication design needed to help users perform tasks that meet their goals, which students will confirm through usability testing. Students will not only gain a stronger understanding of why “I am not the user;” they will also gain insights concerning the complex features that inform a fully functional site.
Prerequisites: 67-265 and 67-262

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.

67-352 Electronic Business
Intermittent: 9 units
The objective of this course is to give students a good understanding of how e-business is conducted and managed including opportunities, limitations, issues, and risks. E-business applications require certain technological infrastructures and other support mechanisms in areas of business-to-consumer, business-to-business, and consumer-to-consumer. Topics will cover the technologies, skills and business concepts that surround the emergence of electronic business and the impacts of applying these information technologies to different commercial processes from both an operational and strategic perspective. The course will also explore the problems surrounding electronic business such as security, privacy, intellectual property rights, legal liabilities and global issues. The course provides a contemporary exposure to concepts and practices associated with a new and dynamic digital environment in the real business world. The information technologies associated with the delivery of Internet sites as well as internal operations will be discussed. After completion of this course, students are expected to have appropriate level of knowledge, skills, and concept of the digital operations in a modern business world.
Prerequisites: 67-272 or 67-371

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 example, 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.

67-354 Information Systems and Sustainability
Intermittent: 9 units
Environmental, economic, and societal challenges are affecting the sustainability of many communities around the globe. Given its multidisciplinary foundation, IS presents an important potential for enabling adaptation and mitigation to these challenges. IS innovation could also play a prominent role in transforming unsustainable problem spaces into sustainable and resilient systems. What is needed is sustainability minded IS professionals to lead such transformation. This course introduces students (future IS leaders) to the fundamentals of sustainability in the 21st century. It includes topics on Green IS, Smart Cities, and the Information Economy. The course invites students to proactively reflect on sustainability issues and their effects on policy and leadership. In such reflection, students are encouraged to consider various case-based scenarios where they evaluate challenges to sustainability and developed innovative, strategic, practical, and rigorously supported IS based solutions.
Prerequisite: 67-250

67-357 Healthcare Analytics and Big Data
Intermittent: 9 units
The objectives of this course are: (1) to provide a sound understanding of how healthcare analytics helps to re-engineer the complex processes that drive return on investment and lower medical costs and (2) how the big data revolution is accelerating value and innovation in healthcare. Topics in healthcare business intelligence (BI) to be covered include how data quality and data governance improve the quality of healthcare, architectural implications of BI, technology management, and how BI facilitates evidence-based medicine and effective clinical decision support. Besides gaining hands-on lab experience with BI technologies and tools used in real-world healthcare organizations, students will also work on a group project to understand better the challenges that big (and unstructured) data present to traditional clinical database systems.
Prerequisites: (70-451 or 67-250) and 15-121 and 36-201 and 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 skills 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++) and will need to come up to speed
with the Pythonic way of problem solving.
Prerequisite(s): (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
Information Systems (IS) Consulting Project is a junior level team-based
course that focuses on working as a team to build a solution to meet the
needs of a client. With your teammates, you will work with an actual client
to design, build, and deliver an information system solution while following
a disciplined software project life cycle approach. By term’s end, your
team must provide a sustainable solution that fits the client’s objectives,
organization constraints and capabilities
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.

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

67-442 Mobile Application Development in iOS
Fall: 9 units
This course provides students with the concepts and techniques to design
and develop mobile applications with iOS and to understand the design
and development process involved. Students will develop a series of smaller iOS
applications in weekly lab sessions as well as larger application as part of
a course project. In the process of developing these applications, students
will develop a strong understanding of the Swift programming language,
iOS application development, mobile-centered design, and how to ensure
technical quality in software development. This course is open only to
juniors and seniors in the IS major who have completed 67-272.
Prerequisite: 67-373

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 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. 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.

67-509 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.