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., 15-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: 11-xxx courses are undergraduate-level, 21-xxx courses are graduate-level, etc. Depending on the department, 22-xxx courses may be either undergraduate senior-level or graduate-level, and 23-xxx courses and higher are graduate-level. Consult the Schedule of Classes (https://tenapps.as.cmu.edu:8143/Subject/IMC) 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.

67-102 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 and 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
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.

67-212 Natural Language Processing with Python
Intermittent: 9 units
This course describes basic techniques of processing human language in text format. In the course we will cover everything you need to learn in order to become a world class practitioner of NLP with Python. The course has theoretical and hands-on components. In the theoretical component, this course will discuss challenges in processing human languages, and review the basics of statistics and probability theory and their application to language problems. In the hands-on part, students will use Python programming and Natural Language Toolkit library for Python to process large volumes of text using various techniques. The processing will range from simple fundamental steps such as stemming, lemmatization, tokenization and part-of-speech tagging to full-fledged applications such as search, document/topic classification, and sentiment analysis. Students will learn how to use state-of-the-art NLP libraries such as Spacy, NLTK and will understand machine learning with Scikit-Learn to conduct text classification, such as automatically building machine learning systems that can determine positive versus negative movie reviews, or spam versus legitimate email messages. Prerequisite: 15-112

67-239 Agile Software Frameworks
Spring: 9 units
This course has been designed for students seeking to acquire a working knowledge of agile project management methodologies, tools, and techniques with a focus on: Understanding, validating and defining the work to be done Estimating the effort required Planning the work Tracking and controlling progress Reflecting The course is organized around Scrum, the most popular agile development method, and Milestone Driven Agile Execution, a method developed by the instructor, that combines milestone planning with Scrum to use in environments which require known delivery dates. The teaching approach combines traditional lectures with active learning, so students taking the course must be prepared to work in groups during class. Each lecture is typically followed by a class activity in which the concepts learned are put into practice. Prerequisite: 67-250

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.

67-261 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: (15-122 or 15-121 or 15-112) and 67-250

67-265 Design Fundamentals: Shaping Interactions and Experiences
Fall: 9 units
The 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

67-276 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
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 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: (15-112 or 15-110) and 67-250

67-315 A Web For Everyone
Intermittent: 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 2.1 guidelines, design and development 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/tcingc/ (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 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: 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-APs, increasingly more powerful mobile devices, and the Internet have enabled new possibilities for weiving 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 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 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, students will now be 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
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, students will now be 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.

67-339 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 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 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: 67-262 and 67-265

The Major in Information Systems Courses
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.

67-357 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 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 or 36-200) 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 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++) 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

67-353 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 Sustainability in the Digital Age
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 of these challenges. IS innovation could and should 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 develop innovative, strategic, practical, and rigorously supported IS based solutions. Prerequisite: 67-250

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 classification. Prerequisite: 67-272

67-332 Electronic Business and Design Thinking
Intermittent: 9 units
The objective of this course is to give students a good understanding on 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: 67-250 or 70-110

67-352 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, 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.

67-440 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

The Major in Information Systems Courses
**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

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**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

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**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

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**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

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**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.

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**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.

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**67-738 Information & Grid Design**

Fall: 9 units

Whether you create, oversee, or want practice in solving problems through grid systems for websites, responsive applications, social presentations, or data visualizations, this course provides the skills needed to communicate using the interplay of image, text, and typography in grid environments.

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**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

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**67-749 Information & Grid Design**

Fall and Spring

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

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**67-749 Information Systems: Artificial Intelligence**

Spring: 9 units

In this course, students will study and implement fundamental techniques and algorithms of Artificial Intelligence (AI). The course will cover topics such as search algorithms, planning, knowledge representation, logical reasoning, machine learning, natural language processing, and computer vision. Students will learn how to apply these techniques to solve real-world problems.

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**67-751 Information Systems Internship**

Fall and Spring

Practical experience in Information Systems.