

# 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://enr-apps.as.cmu.edu/open/SOC/SOCServlet/>) each semester for course offerings and for any necessary pre-requisites or co-requisites.

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### 67-100 Information Systems First Year Colloquium

Fall: 1 unit

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.

### 67-200 Information Systems Research Colloquium

Fall: 1 unit

The Information Systems Research Colloquium will educate students on research opportunities both in IS and beyond. By the end of the course, students should be able to: · Articulate what undergraduate research looks like at Carnegie Mellon University, and particularly identify the breadth of research opportunities in the field of Information Systems · Demonstrate how to communicate with faculty whose work aligns with individual interests · Describe several career and continuing education opportunities for Information Systems students The Information Systems Research Colloquium is open only to sophomore IS student as well as recent transfer students and is led by an IS academic advisor who facilitates discussions on the various research topics both through IS and other campus constituents.

### 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.

### 67-206 Information Systems Community Engagement

Fall and Spring: 6 units

This course is designed to provide an experiential learning experience to students in the IS program. Students will develop an iterative testing model to improve and conduct CMU Information Systems outreach program to Pittsburgh Public School. Students will engage with the community, have conversations with community partners and educators, and demonstrate knowledge of civic engagement, cultural identity, and diversity/inclusion. Experiential learning through engagement in the Pittsburgh Public Schools community will help CMU students make an impact on younger students, inspiring them to potentially pursue CMU IS or other interdisciplinary technology careers.

### 67-220 Digital Accessibility - Ensuring Universal Access to the Information Society

Fall: 9 units

Digital accessibility addresses a user's ability to easily access an electronic document, a website, or a computer application unhindered by visual, auditory, motor or cognitive impairments or temporal disabilities arising from age, illness etc. Students who takes this course will gain a deep understanding of the diverse problems faced by people with disabilities in their interactions in a digital space and how the use of assistive technologies help them surmount the related accessibility barriers (CT1 and CT3). They will learn about inclusive design principles and how to author content with consideration of design decisions that impact digital accessibility. Besides gaining an understanding of user-centered design principles, the students will learn how to apply Web Content Accessibility Guidelines (WCAG) to design and develop a website (CT2). To cap it, students will learn how to test, evaluate and report conformance of a website with usability principles and accessibility standards. (CT3)

### 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, user-centered design, and client-side components. 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. In this course, students work on in-class activities, individual assignments and a group project with a client using the current standards and best practices of web design and development. 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: 15-110 Min. grade C or 15-112 Min. grade C or 15-104 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.

Prerequisites: 15-122 or 15-112 or 15-121

### 67-265 Design Fundamentals: Shaping Interactions and Experiences

Fall: 9 units

This course offers hands-on experience based on theoretical grounding linked to fundamental design practices. The first fundamental idea is stakeholders need an interesting and organized pre-task environment as a precursor to engaging with a task. A pre-task environment is one that invites stakeholders to engage with and stay in a designed space because they can see that they will enjoy performing tasks that meet their goals. This useful, usable, and desirable task environment is developed by exploring compositional guidelines, color theory, and basic typography. With pre-task knowledge in hand, students explore meaning-making that emerges through the synthesis of image, word, and typeface as they design and prototype interactive solutions to problems that real users face, employing user studies and usability evaluations to create effective solutions.

**67-272 Application Design and Development**

Spring: 12 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.

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.

**67-285 Across the Universe from Intelligent Agents to Users**

Spring: 9 units

The goal of this course is to introduce students to how intelligent agents and similar systems impact and are perceived by users. In this course, we explore different dimensions relating to intelligent agents' design, usability, and user perceptions such as humanness, trust, privacy, bias, human values, emotions, and so on. To do so, we review research articles at the intersection of Information Systems, Psychology and Artificial Intelligence. The course aims to introduce students to the research process and equip them with the necessary tools to design and explore research questions that address pressing issues in the realm of user-agent interaction.

**67-306 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.

**67-309 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: 15-110 or 15-112

**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 URL below.

Course Website: <http://cmu.edu/tcingc>. (<http://cmu.edu/tcingc.html>)**67-328 Full-Stack Application Development**

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.

Prerequisites: 67-272 Min. grade C or 67-240 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.

**67-331 Technology Consulting in the Global Community**

Fall

This course is only for participants in the Technology Consulting in the Global Community program. Admitted ONLY BY Permission of Instructor

**67-338 Information & Grid Design**

Fall: 9 units

Whether you create, oversee, or want practice solving problems through grid systems for websites, responsive applications, slide presentations, or data visualizations, this course provides the skills and perspective needed to communicate in grid environments: a synthesis of content, structure, and interaction. Grids emerged to address content/structure needs linked to print production, leaving opportunities to fully explore how they can better help stakeholders in interactive environments. As we explore this space, specific skillsets will include: developing a better understanding of visual composition through the grid, using the vocabulary of communication and information design in critique, manipulating typographic variables to create readable documents, learning approaches to invention using image, text, and amp; typography, creating simple to complex grid structures, developing skills in Illustrator, Photoshop, and Adobe XD, adapting simple prototypes to HTML/CSS through basic Bootstrap.

**67-345 Power, Leadership, and Networks in Organizations**

Spring: 6 units

This course is designed to improve your effectiveness as a manager by introducing you to frameworks for understanding power and leadership through the lens of networks. Organizations are political institutions, and effectively mobilizing resources to get things done is essential if a manager is to be effective in their job. Specifically, we focus on what power is, how it is acquired and how to use it to accomplish personal and organizational goals. Managers and members of organizations have different interests and resources. They are interdependent. When interdependent organizational actors with different interests need to attain certain goals, this can not be done without working with and through others. Consequently, leaders need to find ways to influence others to act in ways which they might not choose to do otherwise. We discuss how these political actions are associated with networking behaviors and how social relationships co-evolve power dynamics in organizations. This course will introduce you to t and ways to apply the knowledge to particular situations through class discussion, case analysis, and in-class activities.

**67-346 Blockchain Fundamentals**

Intermittent: 6 units

In this course, we will dig into the blockchain technology. We will learn from the basic, single-purpose blockchain (such as for Bitcoin) to general purpose blockchain (which includes a range of use-cases). The course will cover a broad spectrum of blockchain technology, different consensus algorithms, its various real-world use-cases with an eye on developing our own blockchain. We will also understand various challenges with this technology, and a case-study that covers implementation in Python. This would be an interactive course and the students are expected to share ideas and their thoughts.

**67-348 Black Mirror - Cultural Representations of Technology**

Fall: 9 units

Advances in technology raise a variety of fascinating ethical, cultural, and societal questions often resulting in uncertainties and unanticipated dilemmas. This course provides students opportunities to explore how cultural representations of technology are reflected in society and inform continued technical advancements. Using episodes from Black Mirror - a British anthology television series created by Charlie Brooker - we will explore the depictions of technology and society. Discussions of episodes will be supplemented by popular, critical texts and academic articles. This course will challenge students to think critically about technological change and acquire a more sophisticated understanding of the political, economic, and cultural considerations that underlie technological development. Students will engage critically and constructively in key debates that shape the future of the technology, through in-class discussions, presentations, and colloquia.

**67-364 Practical Data Science**

Spring: 9 units

From empirical, to theoretical, to computational science, we are at the dawn of a new revolution and #8212;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

**67-367 Information Warfare**

Intermittent: 9 units

In this course, we will examine information warfare through technical as well as strategic, operational, and tactical employment perspectives. This course will address historical aspects of military deception, electronic warfare, computer network operations, operational security, and psychological operations

**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

**67-380 Information Systems Security**

Intermittent: 9 units

This course is an introduction to information systems security for the IS student. The course will introduce the student to fundamental concepts in information system security, including operational issues, planning, and design. Topics will include confidentiality, integrity, and availability; risk; access controls and access control frameworks; security policies; authentication strategies and issues; auditing; using cryptography; security design issues; controlling information flows; malicious logic; and applying security principles

**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.

**67-393 Guided Research in Information Systems**

All Semesters

This course is for team-based research with an IS faculty member. Upon prior approval by the faculty member, students may enroll for 3, 6, 9, or 12 units.

**67-404 Blockchain Applications**

Intermittent: 9 units

In this course, we will dig into the blockchain technology. We will learn from the basic, single-purpose blockchain (such as for Bitcoin) to general purpose blockchain (which includes a range of use-cases). The course will cover a broad spectrum of blockchain technology, different consensus algorithms, its various real-world use-cases - with an eye on developing our own blockchain. We will also understand various challenges with this technology, and a case-study that covers implementation in Python. This would be an interactive course and the students are expected to share ideas and their thoughts.

**67-410 Clinical Data Science**

Intermittent: 9 units

This course is designed as an introductory course in Critical Care Data Science, providing an introduction to the tools and techniques of data science, specifically focused on clinically relevant critical care. Electronic Medical Records; Common Data Models for Clinical Data; SQL Querying; Computational Phenotyping; Common Machine Learning Techniques (Supervised; Unsupervised; Reinforcement Learning); and Reporting Clinical Data Science Research.

**67-415 Cyber Ethics and Regulation**

Intermittent: 9 units

This course investigates the ethical and regulatory implications of technology by adopting a four-dimensional framework focused on Privacy, Accuracy, Property, and Accessibility (PAPA Framework). It examines legal rights and corresponding duties and responsibilities of stakeholders. The course delves into established and emergent themes including cyber law, surveillance, dis/misinformation, artificial intelligence, intellectual property, cybersecurity, and organizational policy. Its primary focus is on social, behavioral, and legal implications of technology, assessed from multiple perspectives pertaining to individuals, organisations and societies.

**67-425 Special Topics - Capstone course in Digitalization**

Intermittent: 9 units

Most organizations including your future employers use enterprise systems to run their business processes such as sales, procurement, and production. This course discusses key business processes in organizations and the role, functions and technical foundations of enterprise systems such as Enterprise Resource Planning (ERP) systems and Customer Relationship Management (CRM) systems. Through hands-on use of enterprise systems in multiple case studies, the students will become familiar with the key concepts in such systems and demonstrate practical knowledge on how such systems allow organizations to run end-to-end business processes such as order-to-cash or make-to-order. The course also addresses the lifecycle of enterprise systems' projects and their various phases such as selection, implementation, operation and maintenance.

**67-426 Special Topics - Capstone course in Data Science**

Intermittent: 9 units

TBA

**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 seniors in the IS major.

Prerequisite: 67-272 Min. grade C

**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.

**67-728 Full-Stack Application Development**

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.

**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, 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: 95-712