

COMPUTER INFORMATION SYSTEMS (CS)

CS 100 Solving Business Problems with Information Technology (3 credits)

Pre-req: Student has not earned credit for IT 101

4th Credit Service Learning

This course introduces information technology skills necessary for operating a small business and understanding how information technology benefits all organizations. Through hands-on exercises, readings, class discussions, homework assignments, and group projects, students will learn to identify and use IT resources for problem solving, with a focus on how IT enables modern businesses to operate. Students will gain a fundamental understanding of digital technology and the implications of hardware, software, cloud and networking decisions on related business operations. They will use productivity software to create, modify, and present business documents, and develop an intermediate level of proficiency using Excel. Students will explore emerging technology trends such as artificial intelligence, machine learning, virtual/augmented reality and the Internet of Things and their impact on conducting business.

Typically Offered: Fall and Spring

CS 150 Introduction to Data and Information Management (3 credits)

Pre-Req: IT 101 or CS 100

Programming Intensive

The course introduces information management and relational databases; data collection, storage and retrieval; query/report design and generation; logical database structures; basic transaction architecture; and systems analysis for database design.

Typically Offered: Fall and Spring

CS 160 Data-Driven Decision Making (3 credits)

Pre-Req: IT 101 or CS 100

Programming Intensive

The primary objective of this course is to expose the student to the breadth, depth, versatility and usefulness of data and databases in problem solving. This course will develop the students' foundational competencies related to data management that allow them to critically analyze complex problems using a variety of data sources and tools and to effectively present their ideas to others.

The key learning objectives of this course are: 1. Understanding how data can support effective problem solving and decision making in specific problem contexts, 2. Understanding how data are stored, organized, managed, and how data can support effective problem solving and decision making in specific problem contexts, 3. Acquiring, cleaning, and structuring data for analysis and decision support, 4. Analyzing the data with relevant tools, and 5. Presenting the results of the analysis effectively to various stakeholder groups

Typically Offered: Fall and Spring

CS 180 Programming Fundamentals (3 credits)

Pre-Req: IT 101 or CS 100

Programming Intensive

Students will develop basic programming and problem-solving skills through a variety of assignments that explore the use of fundamental control and data structures using the Java programming language. Students learn about the concepts of classes and objects without being exposed to the advanced principles of object orientation. Testing and debugging techniques, the development of sound programming logic, and the writing of well-structured code are also emphasized.

Typically Offered: Fall and Spring

CS 213 Web Development and Programming (3 credits)

Pre-Req: IT 101 or CS 100

Programming Intensive

This comprehensive course is designed to provide students with a solid foundation in web programming using HTML, CSS, and JavaScript and covers the basic principles of designing and implementing websites, focusing on the client-side technologies of web page creation. Course topics include creating web pages, using graphics, internal and external linkages, styling web pages, layout of web pages, basic programming concepts using JavaScript, development of interactive web pages, and event handling. Students will use a professional integrated development environment to develop web pages using technologies such as HTML, Cascading Style Sheets, and JavaScript. Students will be introduced to cloud computing for the presentation of web pages.

Typically Offered: Fall and Spring

CS 230 Introduction to Programming with Python (3 credits)

Pre-Req: IT 101 or CS 100

Programming Intensive

This course introduces students to the fundamentals of programming and algorithmic thinking using the Python programming language. Students learn the fundamental constructs and key concepts that are common to all modern programming language using this relatively straightforward, popular, and versatile language. Their understanding is reinforced throughout the course by the development of several standalone applications, in which the importance of writing efficient, clear, and well-structured code is also emphasized. This course is intended for any motivated student interested in learning how to program. No prior knowledge of Python or other programming languages is required.

Typically Offered: Fall and Spring

CS 240 Business Processing and Communications Infrastructure (3 credits)*Pre-Req: IT 101 or CS 100*

A detailed overview of information technology infrastructure components used by modern organizations: underlying principles, concepts, and terminology of computer architecture and digital communication networks; organization of computer hardware, data representation, input/output, instruction sets, file and memory organization, and operating - enabling evaluation of the hardware capabilities and performance of a computer system; assembly, compilation and execution of computer programs will be addressed as the basic operations of a computer system at the machine level. Foundational technologies and fundamental principles of digital communication: ISO, IETF and IEEE standards, concepts relevant to physical, data link, and network layers of communication including analog and digital signaling, communications media, data representation, communications protocols and addressing.

*Typically Offered: Fall and Spring***CS 250 AI Foundations and Applications in Business (3 credits)**

This course focuses on how organizations integrate artificial intelligence (AI) technologies into their business operations and functions to increase productivity and support strategic decision making. It introduces the fundamental concepts and mechanisms behind AI technologies and explores key techniques used in AI applications. This course also offers plenty of demonstrations of state-of-the-art AI technologies, allowing students to explore and gain experience with AI software and tools. Case studies and hands-on exercises are used to illustrate the use of AI in various business domains and motivate in-depth discussions about the limitations and ethical implications of AI and automation.

*Typically Offered: Fall and Spring***CS 280 Object-Oriented Application Development (3 credits)***Pre-Req: CS 180**Programming Intensive*

This course teaches object-oriented programming and development using the Java programming language. Students will complete several programming assignments designed to reinforce their comprehension of object-oriented concepts, including encapsulation, class hierarchies and polymorphism. Developing both Java applications and applets will strengthen their understanding of abstract classes and interfaces, event-driven programming and exception handling. This course will include required lab sessions and regularly scheduled lab hours.

*Typically Offered: Fall and Spring***CS 297 Experimental Course (3 credits)**

Experimental courses explore curriculum development, with specific content intended for evolution into a permanent course. A topic may be offered twice before it becomes a permanent course. Students may repeat experimental courses with a different topic for credit.

*Typically Offered: As needed***CS 298 Experimental Course in CS (3 credits)**

Experimental courses explore curriculum development with specific content intended for evolution into a permanent course. A topic may be offered twice before it becomes a permanent course. Students may repeat experimental courses with a different topic for credit.

*Typically Offered: As needed***CS 299 Experimental Course in CS (3 credits)**

Experimental courses explore curriculum development with specific content intended for evolution into a permanent course. A topic may be offered twice before it becomes a permanent course. Students may repeat experimental courses with a different topic for credit.

*Typically Offered: As needed***CS 305 Business Processes and Systems (3 credits)***Pre-Req: ST 113 and at least 51 completed or in progress credits**Students who have completed GB 310 or IPM 300 are not eligible to take this course*

Businesses rely on the efficient and effective execution of business processes to ensure value creation and sustained profitability. Efficiency and effectiveness are often maximized through the digital transformation of business processes using business information systems, often resulting in a dynamic environment of changing roles, relationships, and metrics. Bentley graduates will encounter complex businesses processes entering the workforce and be required to utilize the rapidly changing digital toolsets on which businesses now rely to carry out these processes. This course will provide students with the technological literacy and a future-focused skillset to (1) recognize and participate in organizations' digitally-driven processes, (2) formulate and solve quantitative problems to improve these processes, and (3) be nimble, self-directed learners who can use the technologies of today, and innovations of tomorrow, to ensure long-term success in a rapidly-changing digital landscape.

*Typically Offered: Fall and Spring***CS 321 Decision Support and Business Intelligence (3 credits)***Pre-Req: GB 310 or IPM 300 or CS 305**Students who have completed IPM 320 not eligible for this course*

Business intelligence provides applications and technologies used to gather, provide access to, and analyze information about company operations. Today's managers rely on decision support tools, which utilize the web and graphical user interfaces, for analysis. New tools support collaborative work, have embedded artificial intelligence and assign intelligent agents for routine work. This course will cover all facets of management support systems (MSS): business intelligence for enterprise decision support, decision support systems, expert systems, and knowledge-based systems. Cases are used throughout the course to exemplify concepts and provide students with analysis problems. Hands-on experimentation and testing will be done in Excel.

Typically Offered: Fall

CS 330 Enterprise Systems Configuration for Business (3 credits)

Pre-Req: (GB 310 or IPM 300/CS 305 or AC 340) and at least 81 completed or in progress credits

Students who have completed IPM 450 not eligible for this course

Most companies rely on enterprise systems to support their business processes. Companies purchase enterprise system software and then configure it to match the way they currently do business, which may require package modification or system integration. Alternatively, systems are configured to match the practices designed into the software, which may involve business process re-engineering and organizational change. In this course, students will gain hands-on experience configuring the world's leading enterprise software product, SAP R/3. Students will gain a deep understanding of how business processes work in a company setting, and how carefully configured software can lead to efficiency and effectiveness gains and support competitive strategy. The course will prepare students to participate in the enterprise system implementation process as a consultant, a business systems analyst, an auditor, or an expert user.

Typically Offered: Once a year

CS 341 Information Security and Computer Forensics (3 credits)

Pre-Req: IT 101 or CS 100

Students who completed IPM 210 are not eligible to take this course

The security of electronically shared information is critical to organizational success. Increased connectivity is enabling to business, but is also enabling to unintentional entry of errors as well as intentional theft, modification and destruction of organizational data. This course will present an overview of information security management issues that must be addressed by organizations in today's ubiquitously networked environments. Specifically, the course will delve into information security risks and related protection of data, networks and application software. In addition, The course will cover computer forensics issues, including discussion on what organizations can do to collect evidence from various types of computer systems that might be employed to commit a crime, how to manage computer crime investigations, and how to preserve evidence from various platforms including mobile devices.

Typically Offered: Fall and Spring

CS 342 Cybersecurity (3 credits)

Pre-Req: CS 240

This course provides a technical focus on critical aspects of cybersecurity, namely information, computer, and network security. It introduces what cybersecurity means, both in the abstract and in the context of business information systems. Students learn relevant cybersecurity issues, technologies, and approaches found in the contemporary enterprise. Students recognize and understand threats to privacy, confidentiality, integrity, and service availability as well as best practices to defend both digital and physical assets against such threats.

Typically Offered: Fall and Spring

CS 350 Database Management Systems (3 credits)

Pre-Req: CS 150 or CS 160 or (AC 340 for ISAC major) or (MA 346 for DA/DT students)

Programming Intensive

This course is a comprehensive introduction to data management in organizations. It establishes the data management foundation in the computing and AIS majors. Topics include conceptual and logical data modeling, entity relationship and relational data modeling, and database design and implementation using the SQL programming language. Students will complete exercises in database modeling, design and programming.

Typically Offered: Fall and Spring

CS 360 Business Systems Analysis and Modeling (3 credits)

Pre-Req: CS 150 or CS 160 or (AC 340 and ISAC major)

This course begins with business functional analysis and ends with object-oriented information systems design. Students are introduced to tools and techniques enabling effective analysis, design and documentation of an information system. Students learn formal methodologies that form the basis of object-oriented systems engineering practices. Models that focus on the articulation of business functions, integrating process, data and behavioral abstractions form the core of formal methods in systems development using the Unified Modeling Language (UML).

Typically Offered: Fall and Spring

CS 370 Introduction to Machine Learning (3 credits)

Pre-req: CS 230 or CS 180. CS 230 is recommended, CS 180 is sufficient.

Programming Intensive

This course provides a hands-on introduction to the subject of Machine Learning (ML). Lectures on the fundamental concepts, algorithms, application, and ethical use of Machine Learning and data exploration techniques, are supplemented with practical content introducing relevant Python libraries, data repositories and ML platforms. Examples, labs, and homework assignments provide hands-on experience with data exploration and visualization, natural language processing, computer vision, and other tasks.

Typically Offered: Fall

CS 380 Multi-Tiered Application Development (3 credits)

Pre-Req: (CS 150 or CS 160) and (CS 180 or CS 213)

This class provides a hands-on introduction to a number of tools and technologies that are utilized to develop e-business applications and considers the impact of these technologies on e-business solutions. It assumes the student has basic proficiency in programming (e.g., JavaScript or Java) and basic Web-site use and introduces tools to develop dynamic, data-driven Web applications. The primary objective of the course is to learn how to develop database driven web applications that enable businesses to interact with their customers, employees and suppliers. This will be a hands-on course and numerous programming assignments and related project work will be expected.

Typically Offered: Fall

CS 399 Experimental Course (3 credits)

Experimental courses explore curriculum development, with specific content intended for evolution into a permanent course. A topic may be offered twice before it becomes a permanent course. Students may repeat experimental courses with a different topic for credit.

Typically Offered: As needed

CS 401 Directed Study in Computer Systems (3 credits)

Permits superior students to study special topics. Allows repetition for credit.

Typically Offered: Fall and Spring

CS 402 Advanced Computing Topics Seminar (3 credits)

Pre-Req: CS 213 or CS 180

Discusses current topics in computing based on readings in the professional literature, guest speakers, and field and individual research projects.

Typically Offered: As needed

CS 421 Internship in Computer Systems (3 credits)

Pre-Req: Computer science major, any 300 or 400 level CS course, at least 66 completed and in progress credits, and internship coordinator permission

Provides an opportunity to develop an extensive project relating computer systems concepts to a specific organization in combination with a work assignment. Involves both full-time employment with an organization and close work with a faculty member.

Typically Offered: Fall and Spring

CS 444 Faculty-led Study Abroad Course (3 credits)

Pass/Fail option not available for this course.

Faculty-led international courses are 3-credit intensive study abroad experiences offered during semester breaks, usually 10 to 15 days in length during January break, Spring break (as part of a Spring semester course), or in May after exams. The professor leads his/her students on an immersive learning experience in a region of the world where the professor has expertise, offering students the opportunity to combine cultural activities with business, NGO, or other relevant site visits. Students benefit from personal interactions with companies and organizations they would not encounter as a tourist.

The intensive format allows students to study abroad without missing a semester at Bentley.

Please visit <https://www.bentley.edu/offices/international-education> to learn more.

Typically Offered: As needed

CS 460 Applied Software Project Management (3 credits)

Pre-Req: CS 360

Students learn and experience the process of information systems development through managing team dynamics and performing software engineering project management. Specific topics discussed include the value of different software development life cycles, project management tools and techniques, software process management practices and software quality management practices. This course fuses students' prior IT and business education, preparing them to launch their professional IT careers.

Typically Offered: Spring

CS 480 Advanced Application Development Technology (3 credits)

Pre-Req: CS 280

Programming Intensive

This course gives CIS majors the opportunity to explore emerging application development technologies. The instructor will choose a particular development technology to present or students will be assigned emerging technologies in the commercial arena to investigate.

Typically Offered: Spring