Information Systems, B.S.

B.S. in Information Systems

Curriculum

The Information Systems major is offered only as a Bachelor of Science (B.S.) degree. In addition to major requirements outlined below, all Information Systems students must fulfill the General Education requirements (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/general-education/) for the Dietrich College of Humanities and Social Sciences. A total of 360 units is required for the degree.

Requirements are subject to revision. Advisor approval is required for each student's major curriculum plan. Any proposed course substitutions to courses required for the IS major must be approved in advance by the IS Academic Advisor.

Technical Core (Prerequisites)

Information Systems requires completion of prerequisite courses in Mathematics and Computer Science. All prerequisites must be successfully completed prior to the start of Fall semester, third-year year.

Mathematics

Complete one (1) of the following math courses:

		Units
21-112	Integral Calculus Pre-requisite of 21-111	10
21-120	Differential and Integral Calculus Pre-requisite of 21-090	10
21-127	Concepts of Mathematics	12
21-240	Matrix Algebra with Applications	10
80-210	Logic and Proofs	9

Computer Science

Three Computer Science courses are required. To maintain normal progress toward the Information Systems degree, students must complete 15-121 Introduction to Data Structures prior to the start of Spring Semester, second-year.

Students entering the program as freshmen will have the option to complete a Computer Science Placement Test. Depending on appropriate Advanced Placement credit and/or results of the Computer Science Placement Test, entering students may place directly into 15-112 (http://coursecatalog.web.cmu.edu/search/?P=15-112) or 15-121 (http://coursecatalog.web.cmu.edu/search/?P=15-121). 15-110 (http://coursecatalog.web.cmu.edu/search/?P=15-110) is taken as the first Computer Science prerequisite unless a student places directly into 15-112 (http://coursecatalog.web.cmu.edu/search/?P=15-112) or 15-121 (http://coursecatalog.web.cmu.edu/search/?P=15-121). Students that do not gain a placement into 15-112 (http://coursecatalog.web.cmu.edu/search/?P=15-112) or 15-121 (http://coursecatalog.web.cmu.edu/search/?P=15-121) must begin the sequence with 15-110 (http://coursecatalog.web.cmu.edu/search/?P=15-110) and must complete it with a grade of D or above prior to entering 15-112 (http://coursecatalog.web.cmu.edu/search/?P=15-112).

15-110	Principles of Computing	10
15-112	Fundamentals of Programming and Computer Science	12
or 02-120	Programming for Scientists	
15-121	Introduction to Data Structures	10

Note: Students cannot receive credit for both 15-104 Introduction to Computing for Creative Practice and 15-110 Principles of Computing. Students may also take 15-122 (http://coursecatalog.web.cmu.edu/search/?P=15-122) Principles of Imperative Computation in place of 15-121 (http://coursecatalog.web.cmu.edu/search/?P=15-121) Introduction to Data Structures but should first consult with their academic advisor prior to doing so.

Information Systems Core

In the Information Systems Core, students will learn the basic skills necessary to analyze, design, implement, and test high-quality, cost effective information systems. The Information Systems Core consists of seven courses (not including 67-100 and 67-200).

Complete **all** of the following courses:

67-100	Information Systems First Year Colloquium	1
67-200	Information Systems Research Colloquium	1
67-250	The Information Systems Milieux (Spring Semester Only)	9
67-262	Database Design and Development (Fall Semester Only)	9
67-272	Application Design and Development (Spring Semester Only)	12
67-373	Information Systems Consulting Project (Spring Semester Only)	12
17-313	Foundations of Software Engineering	12
95-422	Managing Digital Transformation	9

Complete one (1) of the following three courses:

05-391	Designing Human Centered Software	12
05-410	User-Centered Research and Evaluation Not open to first-year students.	12
05-452	Service Design	12

Information Systems Breadth

In the Information Systems Breadth, students will study key areas fundamental to understanding and solving problems in information systems. At least one course is required from each of the following categories:

Professional Communications

Information systems professionals communicate with a wide range of people in most organizations and often facilitate communications between diverse groups of stakeholders. Consequently, the most successful professionals typically are those with strong communication skills. These courses help students see that the structure and presentation of information affects how well (and how easily) it can be understood and used.

Complete one (1) of the following courses:

05-317	Design of Artificial Intelligence Products	12
05-360	Interaction Design Fundamentals	12
36-315	Statistical Graphics and Visualization	9
51-261	Communication & Digital Design Fundamentals	9
or 51-262	Communication and Digital Design Fundamentals	
67-265	Design Fundamentals: Shaping Interactions and Experiences	9
67-336	Building Data Visualizations in to Information Systems	9
67-338	Information & Grid Design	9
70-301	Transformational Leadership	9
70-321	Negotiation and Conflict Resolution	9
70-340	Business Communications	9
70-342	Managing Across Cultures	9
70-350	Acting for Business	9
76-270	Writing for the Professions	9
84-250	Writing for Political Science and Policy	9
88-230	Human Intelligence and Human Stupidity	9
88-231	Thinking in Person vs. Thinking Online	9
88-341	Team Dynamics and Leadership	9
or 70-341	Team Dynamics and Leadership	

Quantitative Analysis and Research Methods

This area focuses on decision making and data analysis — essential to development of useful information systems. This area exposes students to analytic methods in the social sciences and quantitative methods for approaching complex methods.

Complete one (1) of the following courses:

21-325	Probability	9
36-202	Methods for Statistics & Data Science	9
36-219	Probability Theory and Random Processes	9

36-225	Introduction to Probability Theory	9
36-235	Probability and Statistical Inference I	9
36-303	Sampling, Survey and Society	9
36-309	Experimental Design for Behavioral & Social Sciences	9
36-315	Statistical Graphics and Visualization	9
36-350	Statistical Computing	9
36-401	Modern Regression	9
36-402	Advanced Methods for Data Analysis	9
67-285	Across the Universe from Intelligent Agents to Users	9
67-364	Practical Data Science	9
73-265	Economics and Data Science	9
80-305	Game Theory	9
80-306	Decision Theory	9
88-223	Decision Analysis	12
88-251	Empirical Research Methods	9
88-252	Causal Inference: from Data to Decisions	9
88-275	Bubbles: Data Science for Human Minds	9
88-300	Programming and Data Analysis for Social Scientists	9
94-216	Introduction to Decision Analytics and Systems	6

Innovation and Entrepreneurship

The focus of this area is to apply disciplined techniques to generate ideas that have value in a market, and bring them through design, feasibility testing, and frequent revision, towards a potential launch. Students must have completed 67-272 Application Design & Development in order to fulfill one of the courses below towards their Innovation and Entrepreneurship requirement.

Complete one (1) of the following courses:

05-470	Digital Service Innovation	12
17-356	Software Engineering for Startups	12
67-428	Innovation and Entrepreneurship: A Focus on Startups and Emerging Technologies	9
67-443	Mobile Application Design and Development	12
94-491	Lean Innovation Lab	12

Information systems concentration

The study of Information Systems can take many paths; **Concentrations** allow students to find the path that best suits their plans and aspirations. They also allow students to establish relationships with leading researchers in their area of interest. It is strongly recommended to determine your concentration requirement by the end of the sophomore year to ensure timely completion by the conclusion of the fourth year.

IS Concentrations:

- AI Management
- Data Analytics
- Health Information Systems
- Information Security
- Product Management
- Technology & Arts Enterprises
- Technology & International Development
- User Experience (UX) Design

Alternatively, students may choose from an approved list of minors or additional majors, including those offered through the Integrative Design, Arts, and Technology (IDeATe) (https://ideate.cmu.edu/undergraduate-programs/) initiative that blend information systems and the arts as only Carnegie Mellon University can.

Additional Majors:

- Artificial Intelligence (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/artificialintelligence/artificial-intelligence-additional-major/)
- Behavioral Economics (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofsocialanddecisionsciences/behavioral-economics-bs/)
- Business Administration (http://coursecatalog.web.cmu.edu/schools-colleges/tepper/undergraduatebusinessadministrationprogram/business-administration-additional-major/)
- Cognitive Science (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofpsychology/cognitive-science-bs/)
- Computational Biology (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/undergraduatecomputatonalbiology/computational-biology-additional-major/)
- Computational Finance (http://coursecatalog.web.cmu.edu/intercollegeprograms/computational-finance/computational-finance-bs/)
- Computer Science (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/undergraduatecomputerscience/computer-science-additional-major/)
- Decision Science (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofsocialanddecisionsciences/decision-science-bs/)
- Economics (http://coursecatalog.web.cmu.edu/schools-colleges/tepper/undergraduateeconomicsprogram/economics-additional-major/)
- Economics & Statistics (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofstatistics/economics-statistics-bs/)
- Engineering & Public Policy (http://coursecatalog.web.cmu.edu/schools-colleges/collegeofengineering/departmentofengineeringandpublicpolicy/engineering-public-policy-additional-major/)
- Human-Computer Interaction (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/humancomputerinteractionprogram/human-computer-interaction-additional-major/)
- Linguistics (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofphilosophy/linguistics-ba/)
- Policy & Management (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofsocialanddecisionsciences/policy-management-bs/)
- Political Science, Security, and Technology (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/carnegiemelloninstituteforstrategyandtechnology/political-science-security-technology-bs/)
- Robotics (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/robotics/robotics-additional-major/)
- Science, Technology, and Public Policy (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofhistory/science-technology-society-bs/)
- Statistics & Data Science (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofstatistics/statistics-data-science-bs/)
- Statistics and Machine Learning (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofstatistics/statistics-machine-learning-bs/)

Approved minors:

- Artificial Intelligence (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/minors/artificial-intelligence-minor/)
- Behavioral Economics
- Business Administration*
- Business Analytics & Optimization

- Computational Biology
- Computational Finance
- Computer Science
- Cybersecurity & International Conflict
- Decision Making and Intelligent Systems (http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofsocialanddecisionsciences/decision-making-intelligent-systems-minor/)
- Decision Science
- Economics
- Engineering Studies
- Financial Management
- Human-Computer Interaction
- Humanities Analytics
- IDeATe: Animation & Special Effects
- IDeATe: Design for Learning
- IDeATe: Game Design
- IDeATe: Immersive Technologies in Arts & Culture
- IDeATe: Innovation & Entrepreneurship
- IDeATe: Intelligent Environments
- IDeATe: Physical Computing
- IDeATe: Media Design
- IDeATe: Sonic Arts
- IDeATe: Soft Technologies
- Information Security, Privacy, and Policy
- Language Technologies
- Linguistics
- Machine Learning
- Neural Computation
- Operations & Supply Chain Management
- Political Science, Security, and Technology
- Product Management
- Robotics
- Science, Technology & Society
- Software Engineering
- Statistics & Data Science
- Tech Entrepreneurship (http://coursecatalog.web.cmu.edu/schools-colleges/qatar/tech-entrepreneurship-minor/) (requires semester abroad at CMU Qatar, minor only)
- Technology & Policy

* **Business Administration minors**
Only if the following conditions are met can the Business Administration minor also be used to meet the IS Concentration requirement.
Required Courses:
- 70-100 Global Business
- 70-122 Introduction to Accounting
- 73-102 Principles of Microeconomics

Constrained Electives (take one of the following courses)**:**
(***Note:*** The BA minor also accepts 70-311 Organizational Behavior, but that will not count toward the Concentration.)
- 70-381 Marketing I
- 70-391 Finance
- 70-371 Operations Management

Electives (Take 2 courses from this subset of courses allowed for the BA minor):
- 70-374 Data Mining & Business Analytics
- 70-387 Strategy for High-Tech Products and Services
- 70-469 End to End Business Analytics
- 70-443 Digital Marketing and Social Media Strategy
- 70-371 Operations Management
- 70-471 Supply Chain Management
- 70-460 Mathematical Models for Consulting
- 70-462 Uncertainty and Risk Modeling
- 70-464 AI & Emerging Economies
- 70-467 Machine Learning for Business Analytics
- 70-374 Data Mining & Business Analytics
- 70-387 Strategy for High-Tech Products and Services
- 70-469 End to End Business Analytics
- 70-443 Digital Marketing and Social Media Strategy
- 70-371 Operations Management
- 70-471 Supply Chain Management
- 70-460 Mathematical Models for Consulting
- 70-462 Uncertainty and Risk Modeling
- 70-464 AI & Emerging Economies
- 70-467 Machine Learning for Business Analytics

Sample Schedule

First-Year		Second-Year	
Fall	**Spring**	**Fall**	**Spring**
67-100 Information Systems First Year Colloquium	67-250 The Information Systems Milieux	67-200 Information Systems Research Colloquium	67-272 Application Design and Development
15-110 Principles of Computing	15-112 Fundamentals of Programming and Computer Science	67-262 Database Design and Development	Quantitative Analysis Requirement
36-200 Reasoning with Data	Grand Challenge Seminar	15-121 Introduction to Data Structures	General Education Course
76-101 Interpretation and Argument or other approved first-year writing options	General Education Course	Professional Communications Requirement	Elective Course
Math Requirement	General Education Course	General Education Course	Elective Course
Elective Course		Elective Course	
99-101 Core@CMU			

Third-Year		Fourth-Year	
Fall	**Spring**	**Fall**	**Spring**
17-313 Foundations of Software Engineering	67-373 Information Systems Consulting Project	95-422 Managing Digital Transformation	Concentration Course
Concentration Course	Concentration Course	Concentration Course	General Education Course
HCI Requirement	General Education Course	Innovation & Entrepreneurship Requirement	Elective Course
General Education Course	Elective Course	General Education Course	Elective Course
Elective Course	Elective Course	Elective Course	Elective Course