

# Computer Science and Design, BS

The combined major in Computer Science and Design integrates a strong programming foundation with the practice of understanding humans, their surrounding contexts and systems, and designing alternative futures. Students focus on the fundamentals of program design, software development, computer organization, systems and networks, theories of computation, principles of languages, and advanced algorithms and data for developing digital interfaces and applications that allow audiences to take an active role to achieve meaningful goals.

The program also offers students a choice of a design option: Experience Design, a holistic and integrative approach that focuses on the quality of the human experience in concrete situations; Graphic Design, the integration of text and image to communicate critical concepts; Information Design, the visualization and physicalization of data to enhance human understanding of complex knowledge, or Interaction Design: the creation navigable interfaces and systems that allow audiences to take an active role to achieve meaningful goals.

## Program Requirements

- Concentrations and course offerings may vary by campus and/or by program modality. Please consult with your advisor or admissions coach for the course availability each term at your campus or within your program modality.
- Certain options within the program may be *required* at certain campuses or for certain program modalities. Please consult with your advisor or admissions coach for requirements at your campus or for your program modality.

Complete all courses listed below unless otherwise indicated. Also complete any corequisite labs, recitations, clinicals, or tools courses where specified and complete any additional courses needed beyond specific college and major requirements to satisfy graduation credit requirements.

## Universitywide Requirements

All undergraduate students are required to complete the Universitywide Requirements (<https://catalog.northeastern.edu/undergraduate/university-academics/university-wide-requirements/>).

## NUpath Requirements

All undergraduate students are required to complete the NUpath Requirements (<https://catalog.northeastern.edu/undergraduate/university-academics/nupath/>).

## Computer Science Courses

Code	Title	Hours
<b>Computer Science Overview</b>		
Must be taken in alignment with your home college:		
CS 1200 or ARTF 1000	First Year Seminar Art and Design at Northeastern	1
CS 1210 or EEAM 2000	Professional Development for Khoury Co-op Professional Development for Co-op	1
<b>Computer Science Fundamental Courses</b>		
CS 1800 and CS 1802	Discrete Structures and Seminar for CS 1800	5
CS 2500 and CS 2501	Fundamentals of Computer Science 1 and Lab for CS 2500	5
CS 2510 and CS 2511	Fundamentals of Computer Science 2 and Lab for CS 2510	5
<b>Computer Science Required Courses</b>		
CS 3000	Algorithms and Data	4
CS 3500 and CS 3501	Object-Oriented Design and Lab for CS 3500	5
CS 4500 or CS 4530	Software Development Fundamentals of Software Engineering	4
IS 4300	Human Computer Interaction	4

## Computer Science Elective Courses

With advisor approval, directed study, research, project study, and appropriate graduate-level courses may also be taken as upper-division electives.

Complete 8 semester hours of CS, CY, DS, or IS classes that are not already required. Choose courses within the following ranges:	8
CS 2500 or higher, except CS 5010	
CY 2000 or higher, except CY 4930	
DS 2500 or higher, except DS 4900	
IS 2000 or higher, except IS 4900	

## Design Requirements

Code	Title	Hours
<b>Art + Design Fundamentals Required</b>		
ARTF 1220	Elements of Visual Composition (with optional ARTF 1221)	2
<b>Art + Design Fundamentals Electives</b>		
Complete three of the following:		6
ARTF 1200	Representational Drawing	
ARTF 1210	Abstract Drawing	
ARTF 1230 and ARTF 1231	Making with Form and Materials and Making with Form and Materials Tools	
ARTF 1240 and ARTF 1241	Making with Video, Sound, and Animation and Making with Video, Sound, and Animation Tools	
ARTF 1250 and ARTF 1251	Designing Interactive Experiences and Designing Interactive Experiences Tools	
<b>Design Required</b>		
ARTG 1001 and ARTG 1002	Design Perspectives: An Introduction to Design in the World and Seminar for Design Perspectives	4
ARTG 1270 and ARTG 1271	Design: Process + Practices and Studio for Design: Process + Practices	4
ARTG 1290 and ARTG 1291	Typographic Systems and Studio for Typographic Systems	4
<b>Design Elective</b>		
Complete any one ARTG course, as long as prerequisites have been met and that is not used to fulfill other requirements of the program. ARTG 2262 and ARTG 2263 are recommended. <sup>1</sup>		4
<b>Art + Design History Elective</b>		
Complete any one ARTH course. ARTH 1001 Visual Intelligence and ARTH 1002 Seminar in Visual Intelligence is recommended to fulfill this requirement		4
<b>Art + Design Elective</b>		
Complete any one ARTD, ARTE, ARTF(4SH), ARTG, ARTH, ARTS, or GAME course as long as prerequisites have been met.		4
<b>Degree Capstone Project</b>		
ARTG 4550	Design Degree Project	4

<sup>1</sup> In place of Prototyping with Code (ARTG 2262) and Lab for ARTG 2262 (ARTG 2263), Visualization Technologies 1: Fundamentals (ARTG 5330) is recommended for students considering the Plus One pathway to a graduate program in Information Design and Data Visualization.

## Design Option

Code	Title	Hours
Complete one of the following options:		8
<b>Experience Design Option</b>		
ARTG 3462	Experience Design Principles	
ARTG 3464	Topics In Experience Design Inquiry	
<b>Graphic Design Option</b>		
ARTG 2252	Graphic Design Principles	
ARTG 3452	Topics In Graphic Design Inquiry	
<b>Information Design Option</b>		
ARTG 2242	Information Design Principles	
ARTG 3444	Topics in Information Design Inquiry <sup>2</sup>	
<b>Interaction Design Option</b>		

ARTG 2400	Interaction Design Principles (with optional ARTG 2401)
ARTG 3400	Topics In Interaction Design Inquiry

<sup>2</sup> Instead of ARTG 3444, ARTG 5100 is recommended for students considering the Plus One in Information Design and Data Visualization.

## Degree-Focused Electives

Code	Title	Hours
Complete two courses from the following lists:		8

### *Art + Design*

Complete any ARTG course as long as prerequisites have been met. If ARTG 5000 (or any other topics course in the subject listed) is completed more than once, the additional completions may be allowed toward the electives.

### *Psychology*

PSYC 1101	Foundations of Psychology
PSYC 3452	Sensation and Perception
PSYC 3464	Psychology of Language
PSYC 3466	Cognition

### *Computer Science*

CS 3200	Introduction to Databases
CS 3520	Programming in C++
CS 3540	Game Programming
CS 3650	Computer Systems
CS 3800	Theory of Computation
CS 4100	Artificial Intelligence
CS 4150	Game Artificial Intelligence
CS 4300	Computer Graphics
CS 4400	Programming Languages
CS 4520	Mobile Application Development
CS 4550	Web Development
CS 4700	Network Fundamentals
CS 4730	Distributed Systems
CS 4850	Building Game Engines
CS 4991	Research
CS 4992	Directed Study
DS 3000	Foundations of Data Science
DS 4200	Information Presentation and Visualization
DS 4300	Large-Scale Information Storage and Retrieval
DS 4400	Machine Learning and Data Mining 1
DS 4420	Machine Learning and Data Mining 2
IS 2000	Principles of Information Science

## Integrative Requirement

Code	Title	Hours
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The following courses are used in the major but also count as the integrative requirement:

ARTG 4550	Design Degree Project
IS 4300	Human Computer Interaction

## Supporting Course

Code	Title	Hours
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### **Computing and Social Issues**

Complete one of the following: 4

AFCS 2600	Issues in Race, Science, and Technology
CY 4170	The Law, Ethics, and Policy of Data and Digital Technologies
CY 5240	Cyberlaw: Privacy, Ethics, and Digital Rights
HIST 2220	History of Technology

INSH 2102	Bostonography: The City through Data, Texts, Maps, and Networks
IS 1300 or PHIL 1300	Knowledge in a Digital World
PHIL 1145	Technology and Human Values
SOCL 1280	The Twenty-First-Century Workplace
SOCL 2485	Environment, Technology, and Society
SOCL 4528	Technology and Society

### Computer Science Writing Requirement

Code	Title	Hours
<b>College Writing</b>		
ENGW 1111	First-Year Writing	4
<b>Advanced Writing in the Disciplines</b>		
ENGW 3302 or ENGW 3314 or ENGW 3315	Advanced Writing in the Technical Professions Advanced Writing in the Arts, Media, and Design Interdisciplinary Advanced Writing in the Disciplines	4

### Required General Electives

Code	Title	Hours
	Complete 24 semester hours of general electives.	24

### NUpath Requirements Satisfied

- Engaging with the Natural and Designed World
- Exploring Creative Expression and Innovation
- Conducting Formal and Quantitative Reasoning
- Analyzing and Using Data
- Writing in the First Year
- Advanced Writing in the Disciplines
- Writing-Intensive in the Major
- Demonstrating Thought and Action in a Capstone

Integrating Knowledge and Skills Through Experience is satisfied through co-op.

### Khoury College GPA Requirement

Minimum cumulative 2.000 GPA required in all CS, CY, DS and IS courses

### Computer Science and Design Major Credit Requirement

96 SH are required in the major.

### Program Requirement

129 total semester hours required

### Plan of Study

#### Sample Plan of Study:

#### FOUR YEARS, TWO CO-OPS IN SPRING/SUMMER 1

Year 1							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
ARTG 1001 and ARTG 1002		4 ARTG 1270 and ARTG 1271		4 CS 3500 and CS 3501		5 Vacation	
ARTF 1220 (with optional ARTF 1121)	2	ARTG 1290 and ARTG 1291	2	4 A+D Fundamentals Elective 2		2	
A+D Fundamentals Elective 1	2	CS 2510 and CS 2511	3	5 A+D Fundamentals Elective 3		2	
CS 1200 or ARTF 1000	1	ENGW 1111		4			
CS 1800 and CS 1802	5						

CS 2500 and CS 2501	5							
	<b>19</b>			<b>17</b>		<b>9</b>		<b>0</b>
<b>Year 2</b>								
<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>	<b>Hours</b>
ARTG 2262 and ARTG 2263	4	Co-op		0	Co-op	0	Elective	4
CS 1210 or EEAM 2000	1					Elective		4
CS 3000	4							
Design Option level 1	4							
Degree-focused elective 1	4							
	<b>17</b>			<b>0</b>		<b>0</b>		<b>8</b>
<b>Year 3</b>								
<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>	<b>Hours</b>
IS 4300	4	Co-op		0	Co-op	0	Elective	4
Art+Design History elective	4			ENGW 3302		4	Elective	4
Computing and social issues	4							
Design Option level 2	4							
	<b>16</b>			<b>0</b>		<b>4</b>		<b>8</b>
<b>Year 4</b>								
<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>					
CS 4500 or 4530	4	ARTG 4550	4					
Art+Design elective	4	CS elective	4					
Elective	4	CS elective	4					
Elective	4	Degree-focused elective 2	4					
	<b>16</b>		<b>16</b>					

Total Hours: 130

**FOUR YEARS, TWO CO-OPS IN SUMMER 2/FALL**

<b>Year 1</b>								
<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>	<b>Hours</b>
ARTG 1001 and ARTG 1002	4	ARTG 1270 and ARTG 1271	4	CS 3500 and CS 3501	5	Vacation		
ARTF 1220 (with optional ARTF 1221)	2	ARTG 1290 and ARTG 1291	4	A+D Fundamentals Elective 2	2			
A+D Fundamentals Elective 1	2	CS 2510 and CS 2511	5	A+D Fundamentals Elective 3	2			
CS 1200 or ARTF 1000	1	ENGW 1111	4					
CS 1800 and CS 1802	5							
CS 2500 and CS 2501	5							
	<b>19</b>		<b>17</b>		<b>9</b>			<b>0</b>
<b>Year 2</b>								
<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>	<b>Hours</b>
ARTG 2262 and ARTG 2263	4	CS 1210	1	Elective	4	Co-op		0
CS 3000	4	IS 4300	4	Elective	4			
Design Option level 1	4	A+D History Elective	4					
Degree-focused elective 1	4	Computing and Social Issues	4					
		Design Option level 2	4					
	<b>16</b>		<b>17</b>		<b>8</b>			<b>0</b>

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Year 3								
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours	
Co-op	0	CS 4530		4	Elective	4	Co-op	0
		Art + Design Elective		4	Elective	4	ENGW 3302	4
		Elective		4				
		Elective		4				
	<b>0</b>			<b>16</b>		<b>8</b>		<b>4</b>
Year 4								
Fall	Hours	Spring	Hours					
Co-op	0	ARTG 4550	4					
		CS elective	4					
		CS elective	4					
		Degree-focused elective 2	4					
	<b>0</b>		<b>16</b>					

Total Hours: 130