

# Chemical Engineering and Data Science, BSChE

## Overview

The Bachelor of Science in Chemical Engineering and Data Science provides students with the technical and analytical skills to work with large datasets. The curriculum focuses on the application of data science methods to solve problems in the chemical engineering field, including the development of predictive models, optimization of processes, and the design of experiments. Students also have an opportunity to learn data visualization, machine learning, and artificial intelligence techniques.

## 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/>).

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NUpath requirements: Interpreting Culture (IC), Understanding Societies and Institutions (SI), Engaging Differences and Diversity (DD), and Integrating Knowledge and Skills Through Experience (EX) are not explicitly satisfied by required engineering coursework. Successful completion of a cooperative education experience may fulfill the EX requirement. Students are responsible for satisfying unfulfilled NUpath requirements with general elective coursework.

## Engineering Requirements

Code	Title	Hours
<b>Required Engineering</b>		
CHME 2308	Conservation Principles in Chemical Engineering	4
CHME 2310	Transport Processes 1	4
CHME 2320	Chemical Engineering Thermodynamics	4
CHME 3305 and CHME 3306	Chemical Engineering Laboratory and Recitation for CHME 3305	4
CHME 3312	Transport Processes 2	4
CHME 3322	Chemical Thermodynamics	4
CHME 4510	Chemical Engineering Kinetics	4
CHME 4512	Chemical Engineering Process Control	4
CHME 4701	Separations and Process Analysis	4
<b>Chemical Engineering Capstone</b>		
CHME 4703 and CHME 4705	Chemical Process Design Capstone and Recitation for CHME 4703	4
<b>Supplemental Credit</b>		
2 semester hours from the following count toward the engineering requirement:		2
GE 1501	Cornerstone of Engineering 1 <sup>1</sup>	

3 semester hours from the following count toward the engineering requirement: 3

GE 1502 Cornerstone of Engineering 2 <sup>1</sup>

### Data Science Courses

Code	Title	Hours
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#### Programming Sequence Pathways

Complete one of the following two options: 12

#### Computer Science Option

CS 2500 and CS 2501	Fundamentals of Computer Science 1 and Lab for CS 2500	
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CS 2510 and CS 2511	Fundamentals of Computer Science 2 and Lab for CS 2510	
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CS 3500 and CS 3501	Object-Oriented Design and Lab for CS 3500	
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#### Data Science Option

DS 2000 and DS 2001	Programming with Data and Data Science Programming Practicum	
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DS 2500 and DS 2501	Intermediate Programming with Data and Lab for DS 2500	
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DS 3500	Advanced Programming with Data	
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#### Computer Science Required Courses

CS 1800 and CS 1802	Discrete Structures and Seminar for CS 1800	5
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CS 3200	Introduction to Databases	4
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#### Data Science Foundations

DS 3000	Foundations of Data Science	4
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DS 4200	Information Presentation and Visualization	4
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DS 4300	Large-Scale Information Storage and Retrieval	4
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DS 4400	Machine Learning and Data Mining 1	4
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### Supporting Courses: Mathematics/Science

Complete all mathematics/science courses with a minimum of 30 semester hours.

Code	Title	Hours
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#### Required Mathematics/Science

CHEM 1151 and CHEM 1153	General Chemistry for Engineers and Recitation for CHEM 1151	4
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MATH 1341	Calculus 1 for Science and Engineering	4
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MATH 1342	Calculus 2 for Science and Engineering	4
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MATH 2321	Calculus 3 for Science and Engineering	4
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MATH 2341	Differential Equations and Linear Algebra for Engineering	4
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MATH 3081 and MATH 3082	Probability and Statistics and Recitation for MATH 3081	4
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PHYS 1151 and PHYS 1152 and PHYS 1153	Physics for Engineering 1 and Lab for PHYS 1151 and Interactive Learning Seminar for PHYS 1151	5
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#### Supplemental Credit

1 semester hour from the following counts toward the mathematics/science requirement: 1

GE 1501	Cornerstone of Engineering 1 <sup>1</sup>	
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### Professional Development

Code	Title	Hours
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GE 1000	First-Year Seminar	1
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ENCP 2000	Introduction to Engineering Co-op Education	1
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ENCP 3000	Professional Issues in Engineering	1
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#### Additional Required Courses

1 semester hour from the following counts toward the professional development requirement: 1

GE 1501	Cornerstone of Engineering 1 <sup>1</sup>
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1 semester hour from the following counts toward the professional development requirement: 1

GE 1502	Cornerstone of Engineering 2 <sup>1</sup>
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## Writing Requirements

Code	Title	Hours
A grade of C or higher is required in each course:		
ENGW 1111	First-Year Writing	4
ENGW 3302	Advanced Writing in the Technical Professions	4
or ENGW 3307	Advanced Writing in the Sciences	
or ENGW 3315	Interdisciplinary Advanced Writing in the Disciplines	

## Integrative Courses

Code	Title	Hours
This course is already required above and also fulfills the integrative requirement.		
CHME 4512	Chemical Engineering Process Control	

## Required General Electives

Code	Title	Hours
Complete 8 semester hours of academic, nonremedial courses not used toward other requirements.		8

## Major GPA Requirement

Minimum 2.000 GPA required in CHME courses

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

## Program Requirement

133 total semester hours required

<sup>1</sup> Students can substitute Engineering Design (GE 1110) and Engineering Problem Solving and Computation (GE 1111) for Cornerstone of Engineering 1 (GE 1501) and Cornerstone of Engineering 2 (GE 1502).

## Plan of Study

### Four Years, One Co-op in Summer 2/Fall

Year 1							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)		4 GE 1502 (ER)		4 CHME 2308		4 Vacation	
CHEM 1153	0	MATH 1342 (FQ)	4	MATH 2321 (FQ)	4		
ENGW 1111 (WF)	4	PHYS 1151 (ND)	3				
GE 1000	1	PHYS 1152 (AD)	1				
GE 1501	4	PHYS 1153	1				
MATH 1341 (FQ)	4	General elective	4				
	<b>17</b>		<b>17</b>		<b>8</b>		<b>0</b>
Year 2							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHME 2320		4 CHME 2310		4 CS 3200 (FQ, AD)		4 Vacation	
CS 1800 (FQ)	4	ENCP 2000	1	ENGW 3302, 3307, or 3315 (WD)	4		
CS 1802	1	DS 2500	4				
DS 2000	2	DS 2501	1				
DS 2001	2	General elective	4				
MATH 2341	4	MATH 3081	4				
	<b>17</b>		<b>18</b>		<b>8</b>		<b>0</b>

Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHME 3312		4 CHME 3305		4 Vacation		Co-op	0
CHME 3322		4 CHME 3306		0			
DS 3000		4 CHME 4510		4			
DS 3500		4 CHME 4701		4			
		DS 4200		4			
		<b>16</b>	<b>16</b>		<b>0</b>		<b>0</b>
Year 4							
Fall	Hours	Spring	Hours				
Co-op		0 CHME 4512		4			
		CHME 4703 (EI, WI, CE)		4			
		CHME 4705		0			
		ENCP 3000		1			
		DS 4300		4			
		DS 4400		4			
		<b>0</b>	<b>17</b>				

Total Hours: 134

**Four Years, One Co-op in Spring/ Summer 1**

Year 1							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 and CHEM 1153		4 GE 1502		4 CHME 2308		4 Vacation	
ENGW 1111		4 MATH 1342		4 MATH 2321		4	
GE 1000		1 PHYS 1151 and PHYS 1152 and PHYS 1153		5			
GE 1501		4 General Elective		4			
MATH 1341		4					
		<b>17</b>	<b>17</b>		<b>8</b>		<b>0</b>
Year 2							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHME 2320		4 CHME 2310		4 CS 3200		4 Vacation	
CS 1800 and CS 1802		5 DS 2500 and DS 2501		5 ENGW 3302, 3307, or 3315 (WD)		4	
DS 2000 and DS 2001		4 ENCP 2000		1			
MATH 2341		4 MATH 3081		4			
		General Elective		4			
		<b>17</b>	<b>18</b>		<b>8</b>		<b>0</b>
Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHME 3312		4 Co-op		0 Co-op		0 Vacation	
CHME 3322		4					
DS 3000		4					
DS 3500		4					
		<b>16</b>	<b>0</b>		<b>0</b>		<b>0</b>
Year 4							
Fall	Hours	Spring	Hours				
CHME 3305 and CHME 3306		4 CHME 4512		4			
CHME 4510		4 CHME 4703		4			

CHME 4701	4	CHME 4705	0
DS 4200	4	DS 4300	4
		DS 4400	4
		ENCP 3000	1
	<b>16</b>		<b>17</b>

Total Hours: 134

### Five Years, Three Co-ops in Spring/ Summer 1

Year 1								
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours	Hours
CHEM 1151 and CHEM 1153	4	GE 1502	4	CHME 2308	4	Vacation	4	
ENGW 1111	4	MATH 1342	4	MATH 2321	4			
GE 1000	1	PHYS 1151 and PHYS 1152 and PHYS 1153	5					
GE 1501	4	General Elective	4					
MATH 1341	4							
	<b>17</b>		<b>17</b>			<b>8</b>		<b>0</b>

Year 2								
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours	Hours
CHME 2310	4	Co-op	0	Co-op	0	CHME 2320	4	4
CS 1800 and CS 1802	5					ENGW 3302, 3307, or 3315 (WD)	4	4
DS 2000 and DS 2001	4							
ENCP 2000	1							
MATH 2341	4							
	<b>18</b>		<b>0</b>		<b>0</b>			<b>8</b>

Year 3								
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours	Hours
CHME 3312	4	Co-op	0	Co-op	0	Vacation	0	
CHME 3322	4							
DS 3000	4							
DS 2500 and DS 2501	5							
	<b>17</b>		<b>0</b>		<b>0</b>			<b>0</b>

Year 4								
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours	Hours
CHME 3305 and CHME 3306	4	Co-op	0	Co-op	0	Vacation	0	
DS 4200	4							
ENCP 3000	1							
MATH 3081	4							
CS 3200	4							
	<b>17</b>		<b>0</b>		<b>0</b>			<b>0</b>

### Year 3 (4-Year Option) or Years 3 and 4 (5-Year Co-op Option)

Fall	Hours	Spring	Hours
CHME 4510	4	CHME 4512	4
CHME 4701	4	CHME 4703	4
DS 3500	4	CHME 4705	0
General Elective	4	DS 4300	4

DS 4400	4
<b>16</b>	<b>16</b>

Total Hours: 134

**Five Years, Three Co-ops in Summer 2/Fall**

Year 1							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)		4 GE 1502 (ER)		4 CHME 2308		4 Vacation	
CHEM 1153	0	MATH 1342 (FQ)		4 MATH 2321 (FQ)		4	
ENGW 1111 (WF)	4	PHYS 1151 (ND)		3			
GE 1000	1	PHYS 1152 (AD)		1			
GE 1501	4	PHYS 1153		1			
MATH 1341 (FQ)	4	General elective		4			
	<b>17</b>		<b>17</b>		<b>8</b>		<b>0</b>
Year 2							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHME 2320		4 CHME 2310		4 Vacation		Co-op	0
CS 1800 (FQ)	4	ENCP 2000		1			
CS 1802	1	DS 2500		4			
DS 2000	2	DS 2501		1			
DS 2001	2	MATH 3081		4			
MATH 2341	4	General elective		4			
	<b>17</b>		<b>18</b>		<b>0</b>		<b>0</b>
Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	CHME 3312		4 CS 3200 (FQ, AD)		4 Co-op	0
		CHME 3322		4 ENGW 3302, 3307, or 3315 (WD)		4	
		DS 3000		4			
		DS 3500		4			
	<b>0</b>		<b>16</b>		<b>8</b>		<b>0</b>
Year 4							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	CHME 3305		4 Vacation		Co-op	0
		CHME 3306		0			
		CHME 4510		4			
		CHME 4701		4			
		ENCP 3000		1			
		DS 4200		4			
	<b>0</b>		<b>17</b>		<b>0</b>		<b>0</b>
Year 5							
Fall	Hours	Spring	Hours				
Co-op	0	CHME 4512 (EI, CE, WI)		4			
		CHME 4703		4			
		CHME 4705		0			
		DS 4300		4			
		DS 4400		4			
	<b>0</b>		<b>16</b>				

Total Hours: 134