

COLLEGE OF ENGINEERING

DEPARTMENT OF CHEMICAL ENGINEERING

**DEGREE: BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING**

MAJOR: CHEMICAL ENGINEERING

FOR STUDENTS GRADUATING IN CALENDAR YEAR 2022 AND DATE OF ENTRY UNDER UG CATALOG 2020-2021

CREDITS REQUIRED FOR GRADUATION: 130

FALL 2018	Credits	SPRING 2019	Credits
CHEM 1035 General Chemistry	3	CHEM 1036 General Chemistry <i>Pre: CHEM 1035</i>	3
CHEM 1045 General Chemistry Laboratory <i>Co: CHEM 1035</i>	1	CHEM 1046 General Chemistry Laboratory <i>Pre: CHEM 1045 Co: CHEM 1036</i>	1
ENGL 1105 First-Year Writing	3	ENGL 1106 First-Year Writing <i>Pre: ENGL 1105</i>	3
MATH 1225 Calculus of a Single Variable (C-) <i>Pre: Math Ready</i>	4	P MATH 1226 Calculus of a Single Variable <i>Pre: MATH 1225</i>	4
ENGE 1215 Foundations of Engineering (C-)	2	P PHYS 2305 Foundations of Physics w/lab <i>Pre: (MATH 1205 or MATH 1205H or MATH 1225) or (MATH 1206 or MATH 1206H or MATH 1226)", Co: PHYS 2325 or (MATH 1206 or MATH 1206H or MATH 1226)</i>	4
Elective (Pathway 2, 3, or 7)	3	P ENGE 1216 Foundations of Engineering (C-) <i>Pre: ENGE 1215 (C-)</i>	2
<b>TOTAL</b>	<b>16</b>	<b>TOTAL</b>	<b>17</b>
FALL 2019	Credits	SPRING 2020	Credits
CHEM 2535 Organic Chemistry <i>Pre: CHEM 1036 or CHEM 1056 or CHEM 1056H or ISC 1106 or ISC 1106H</i> <b>OR</b> CHEM 2565 Principles of Organic Chem <i>Pre: CHEM 1036 or CHEM 1056 or CHEM 1036H or CHEM 1056H</i>	3 [F, S] <b>or</b> 3 [F]	CHEM 2536 Organic Chemistry <i>Pre: (CHEM 2535 or CHEM 2565 or CHEM 2565H)</i> <b>OR</b> CHEM 2566 Principles of Organic Chemistry <i>Pre: CHEM 2565</i>	3 [S, SII] <b>or</b> 3 [S]
		CHEM 2546 Organic Chemistry Laboratory <i>Pre: CHEM 2545, Co: CHEM 2536</i>	1 [S, SII]
CHEM 2545 Organic Chemistry Lab <i>Pre: CHEM 1046 or 1066 or ISC 1116; Co: CHEM 2535 or 2565</i>	1 [F, S]	CHEM 3615 Physical Chemistry <i>Pre: (CHEM 1035 or CHEM 1055 or CHEM 1055H), (CHEM 1036 or CHEM 1056 or CHEM 1056H), PHYS 2306, (MATH 2204 or MATH 2204H or MATH 2224)</i>	3 [F, S, S]
CHE 2114 Mass & Energy Balances (C-) <i>Pre: (MATH 1206, 1206H or 1226), (CHEM 1036 or 1056 or 1056H)</i>	3 [F, S]	CHE 2004 CHE Sophomore Seminar (P/F)	1 [S]
PHYS 2306 Foundations of Physics & Lab <i>Pre: PHYS 2305, (MATH 1206 or MATH 1206H or MATH 1226)</i>	4	CHE 2164 CHE Thermodynamics (C-) <i>Pre: CHE 2114 (C-), Co: CHEM 3615</i>	3 [F, S]
MATH 1114 Elementary Linear Algebra <b>OR</b> MATH 2114 Introduction to Linear Algebra <i>Pre: (MATH 1225 (B) or 1226)</i>	2 <b>or</b> 3	MATH 2214 Introduction to Differential Equations <i>Pre: (MATH 1114 or MATH 2114 or MATH 2114H or MATH 2405H), MATH 1226</i>	3
MATH 2204 Introduction to Multivariable Calculus <i>Pre: MATH 1226</i>	3	Elective (Pathway 2, 3, or 7)	3
<b>TOTAL</b>	<b>16</b>	<b>TOTAL</b>	<b>17</b>
FALL 2020	Credits	SPRING 2021	Credits
ENGL 3764 Technical Writing <i>Junior Standing, Pre: ENGL 1106 or ENGL 1204H or COMM 1016</i>	3	CHEM 3625 Physical Chemistry Laboratory <i>Pre: CHEM 3615 or CHEM 3615H or CHEM 4615</i>	1 [F, S, SII]
CHE 3114 Fluid Transport (C-) <i>Pre: 2114, PHYS 2305, (MATH 2204 or MATH 2224); Co: MATH 4564</i>	3 [F, S]	CHE 3015 Process Measurement & Control (C-) <i>Pre: MATH 4564; Co: (CHE 2124 or CHE 3124), CHE 3184, CHE 3044</i>	3 [S]
CHE 3134 Separation Processes (C-) <i>Pre: CHE 2114; (CHE 2164 or CHEM 3615)</i>	3 [F, S]	CHE 3044 Heat Transfer (C-) <i>Pre: CHE 2164, CHE 3114, MATH 4564</i>	2 [S]
		CHE 3144 Mass Transfer (C-) <i>Pre: CHE 2164, CHE 3114, MATH 4564</i>	3 [S]
CHE 3124 CHE Simulations and Modeling (C-) <i>Pre: CHE 2114 (C-), MATH 2214; Co: CHE 3114, MATH 4564</i>	3 [F, S]	CHE 3184 Chem Reactor Analysis & Design (C-) <i>Pre: CHE 2164, (MATH 2214 or 2214H); Co: CHE 3144, CHE 3044</i>	3 [S]
MATH 4564 Operational Methods for Engineers <i>Pre: MATH 2214 or MATH 2214H or MATH 2406H or CMDA 2006</i>	3	STAT 4604 Stats Methods for Engineers <i>Pre: MATH 1206 or 1226</i> <b>OR</b> STAT 4705 Probability & Statistics for Engineers <i>Pre: MATH 2224 or MATH 2204 or MATH 2204H or MATH 2406H</i> <b>OR</b> STAT 4714 Probability and Statistics for Electrical Engineers <i>Pre: MATH 2224 or MATH 2204 or MATH 2204H or MATH 2406H</i>	3
<b>TOTAL</b>	<b>15</b>	<b>TOTAL</b>	<b>15</b>

SUMMER 2021 (TERM I OR II)		Credits		
CHE 4014 CHE LABORATORY (C-) PRE: CHE 3015, CHE 3044, CHE 3134, CHE 3144, CHE 3184, (CHE 2124 OR CHE 3124), ENGL 3764		5 <sup>[SI, SII]</sup>		
<b>TOTAL</b>		<b>5</b>		
FALL 2021		Credits	SPRING 2022	
CHE 4104 Process Materials (C-) Pre: 2164, (CHEM 2535 or CHEM 2565)		3 <sup>[F]</sup>	CHE 4186 Process & Plant Design (C-) Pre: 4185	
CHE 4185 Process & Plant Design (C-) Pre: Pre: CHE 3144, CHE 3134, CHE 3184, CHE 3044, CHE 4014		4 <sup>[F]</sup>	Elective (Pathway 2, 3, or 7)	
Elective (Pathway 2, 3, or 7)		6	Elective (Pathway 6a)	
Technical Elective		3	Free Elective	
<b>TOTAL</b>		<b>16</b>	<b>TOTAL</b>	
			<b>13</b>	

**General Information about Checksheet:** Superscripted annotation (F, S, SI, SII) in credits column indicates terms when a course is expected to be offered. The (C-) indicates a graduation requirement of a C- or better. Colors denote **CHE Common Degree Core Courses** and **Pathways Courses**.

### Pathways to General Education (Pathways)

Consult the pathways courses table: <https://www.pathways.prov.vt.edu/about/table.html>. Pathways courses need to be completed prior to graduation

<b>Pathway 1:</b> Discourse (6 hrs foundational, 3 hrs advanced)	<i>Foundational:</i> ENGL 1105 (3) ENGL 1106 (3)
	<i>Advanced:</i> ENGL 3764 (3)
<b>Pathway 2:</b> Critical Thinking in the Humanities (6 hrs)	(3) (3)
<b>Pathway 3:</b> Reasoning in the Social Sciences (6 hrs)	(3) (3)
<b>Pathway 4:</b> Reasoning in the Natural Sciences (8 hrs)	PHYS 2305 (4) PHYS 2306 (4)
<b>Pathway 5:</b> Quantitative and Computational Thinking (11 hrs) (8 hrs foundational, 3 hrs advanced)	<i>Foundational:</i> MATH 1225 (4) MATH 1226 (4)
	<i>Advanced:</i> MATH 2214 (3)
<b>Pathway 6:</b> Critique and Practice in Design and the Arts (7 hrs)	<i>Arts:</i> (3)
	<i>Design:</i> ENGE 1215 + ENGE 1216 (4)
<b>Pathway 7:</b> Critical Analysis of Identity & Equity in the US (3 hrs)	(3)

**Electives:** CHE majors must take 3 hrs of Technical elective the approved list. If more than 3 hrs are taken, the excess hours count toward Free Electives. Technical Electives must be taken A-F, not P/F.

**Change of Major Requirements:** Please see: <http://www.enge.vt.edu/undergraduate-changing-majors.html>

**Foreign Language Requirements:** Students must have had 2 years of a foreign language in high school or one year at the college level (6 credit hours) of the same language. College-level credits used to meet this requirement do not count towards the degree.

**In-Major GPA:** All CHE-prefix courses except CHE 4144: Bus & Mktg for Proc Industries are used to calculate in-major GPA.

**Satisfactory Progress Towards Degree:** University Policy 91 outlines university-wide minimum criteria to determine if students are making satisfactory progress towards the completion of their degrees. The CHE Department fully supports this policy. Specific expectations for satisfactory progress for Chemical Engineering majors are as follows:

- Each student must meet the minimum University-wide criteria as described in Policy 91 and summarized in the Undergraduate Catalog (under Academic Policies)
- Students must make C- or better in all ChE-prefix courses and maintain a minimum in-major GPA of 2.0.
- If in-major GPA drops below 2.0, students will be placed on departmental probation.
- If an in-major GPA of 2.0 or better is not achieved after two semesters of departmental probation, the student is suspended from the department and prohibited from registering for ChE courses for at least one semester.
- Following suspension, permission of the department head is required for registration in CHE-prefix courses.

### Prerequisites:

- Prerequisites for each course are listed after the course title. The (letter grade) notation, such as (C-), indicates the minimum grade students must earn in the prerequisite course.
- There are no hidden prerequisites in this program of study.
- Prerequisites may change from what is indicated. Be sure to consult the University Catalog or check with your advisor for the most current requirements.
- Entry into CHE 4014 and 4185 is restricted to students who have a C- or better in all CHE-prefix courses and an in-major GPA of 2.0 or better.

### Graduation Requirements:

- Have a minimum in-major GPA of 2.0.
- Complete at least 130 semester credit hours with a minimum overall GPA of 2.0.

**CHEMICAL ENGINEERING DEPARTMENT**

**TECHNICAL Electives – Approved Courses**  
**(For students graduating in calendar year 2022  
and date of entry under UG Catalog 2020-2021)**

The following courses are approved Technical Electives **FOR STUDENTS GRADUATING in 2022 and date of entry under UG Catalog 2020-2021**. Be sure to check the pre-requisites, co-requisites, and credit hours as listed in the University Catalog. If you do not have the pre-requisites and co-requisites, talk with the instructor for permission to take the class. The list may be updated during the year; be sure to get an up-to-date copy from the Chemical Engineering office at the time you choose the technical electives. The course(s) you choose must be on the approved list in effect at the time you take the course(s).

**Three hours of technical elective are required.** If you take more than three hours, the excess hours will count toward Free Electives. **All Technical Electives must be taken A-F.**

<b>Biochemistry</b>		<b>Credits</b>
BCHM 2024	Concepts of Biochemistry <i>Pre: CHEM 2514 or CHEM 2535</i>	3
BCHM 3114	Biochemistry for Biotechnology & the Life Sciences <i>Pre: CHEM 2536 or CHEM 2566</i>	3
BCHM 4115	General Biochemistry <i>Pre: (CHEM 2536 or CHEM 2566), (BCHM 2114 or CHEM 2154)</i>	4
BCHM 4116	General Biochemistry <i>Pre: BCHM 4115</i>	3
 <b>Biomedical Engineering</b>		
BME 2104	Introduction to Biomedical Engineering <i>Pre: ENGE 1216 or ENGE 1414; Co: MATH 2214</i>	3
 <b>Chemical Engineering</b>		
CHE 4214	Introduction to Polymer Materials <i>Pre: CHEM 2536, CHE 2164</i>	3
CHE 4224	Introduction to Polymer Processing <i>Pre: 3144, 3044</i>	3
CHE 4304/ ME 4344	Biological Transport Phenomena <i>Pre: (CHE 3114, CHE 3044, CHE 3144) or (ME 3304, ME 3404) or (CHE 3114, CHE 3044, CHE 3144) or (ME 3304, ME 3404)</i>	3
CHE 4344	Introduction to Colloidal Interface Science <i>Pre: CHE 2164, CHE 3144</i>	3
CHE 4544/ BSE 4544	Protein Separation Engineering <i>Pre: BSE 3504 or CHE 3144</i>	3
CHE 4994/ 4974*	Independent Study/Undergraduate Research	1-3
 <b>Chemistry</b>		
CHEM 2114	Analytical Chemistry <i>Pre: 1036 or 1056 or 1056H; Co: CHEM 2124</i>	3

CHEM 2124	Analytical Chemistry Laboratory Techniques and Practices Pre: CHEM 1046 or CHEM 1066; "Co: CHEM 2114	1
CHEM 2555-2556	Organic Synthesis & Techniques Lab: Pre: CHEM 2565 for CHEM 2555; Pre: CHEM 2555 for CHEM 2556	2,2
CHEM 3616	Physical Chemistry Pre: MATH 2214, (CHEM 3615 or CHEM 3615H), (CHEM 3615, MATH 2214 or CHEM 3615H)	3
CHEM 3626	Physical Chemistry Laboratory Pre: (CHEM 3616 or CHEM 3616H or CHEM 4616), CHEM 3625, CHEM 4014	1
CHEM 4074/ MSE 4544	Laboratory in Polymer Science Pre: CHEM 3616, CHEM 4534	2
CHEM 4114	Instrumental Analysis Pre: (CHEM 3615 or CHEM 3615H), CHEM 2154; "Co: CHEM 4124	3
CHEM 4124	Instrumental Analysis Laboratory Co: CHEM 4114	1
CHEM 4404	Physical Inorganic Chemistry Pre: (CHEM 3616 or CHEM 3616H), CHEM 2424	3
CHEM 4414	Inorganic Chemistry Laboratory Pre: CHEM 2424, (CHEM 3616 or CHEM 3616H), CHEM 4404; Co: CHEM 4424, CHEM 3616	3
CHEM 4514	Green Chemistry Pre: CHEM 2536 or CHEM 2566	3
CHEM 4524	Identification of Organic Compounds Pre: (CHEM 2536 or CHEM 2566), (CHEM 3616 or CHEM 3616H or CHEM 4616)	3
CHEM 4534	Organic Chemistry of Polymers Pre: CHEM 2536 or CHEM 2566	3
CHEM 4554	Drug Chemistry Pre: CHEM 2536 or CHEM 2566	3
CHEM 4616	Physical Chemistry for the Life Sciences Pre: CHEM 4615	3
CHEM 4634	Polymer and Surface Chemistry Pre: CHEM 3615 or CHEM 4615	3
CHEM 4994	Undergraduate Research	1-3

### **Civil and Environmental Engineering**

CEE 5104	Environmental Chemistry	3
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### **Engineering**

ENGR 3124	Introduction to Green Engineering Pre: (CHEM 1035 or CHEM 1074), (ENGE 1216 or ENGE 1104 or ENGE 1114), PHYS 2306	3
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### **Environmental Science**

CSES 4734/ CHEM 4734	Environmental Soil Chemistry Pre: CSES 3114, CSES 3124, CHEM 2514 or CHEM 2535, CHEM 3114, (MATH 2015 or MATH 1026)	3
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### **Food Science and Technology**

FST 4504	Food Chemistry Pre: FST 3604, FST 4304	3
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### **Materials Science and Engineering**

MSE 3204	Fundamentals of Electronic Materials Pre: MSE 2054, PHYS 2306	3
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### **Nuclear Science and Engineering**

NSEG 3145	Fundamentals of Nuclear Engineering Pre: MATH 2214 or MATH 2214H	3
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**Physics**

PHYS 3324	Modern Physics <i>Pre: PHYS 2306 Co: MATH 2214, MATH 2504</i>	4
PHYS 4564	Polymer Physics <i>Pre: Phys 2306</i>	3

**Sustainable Biomaterials**

SBIO 3434	Chemical & Conversion of Sustainable Biomaterials <i>Pre: CHEM 1036</i>	3
SBIO 3444	Sustainable Biomaterials & Bioenergy <i>Pre: (CHEM 2514 or CHEM 2535), (CHEM 3615 or CHEM 4615)</i>	3

\*CHE 4994/Undergraduate Research (UR) and CHE 4974/ Independent Study (IS) cannot be added through online request. Instead, the student should talk with a faculty member about a research project, complete the request for approval to take CHE 4994 or 4974 (the form is available online), and **return it to Jane Price (CHE main office) by the first day of classes**. To be eligible to take 4974 or 4994, your overall and in-major GPA must be at least 2.0.

If there is a course you are interested in taking and it is not on the approved list, talk to Dr. Goldstein for approval to substitute a course.