

# Requirements for the Chemistry Major

The Chemical Sciences major consists of 25-27 courses (12 lower division and 13-15 upper division, depending on emphasis track) designed to give all students a common foundation of core knowledge specific to the discipline.

## Lower Division Major Requirements [46 Units]

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- [BIO 001: Contemporary Biology](#) [4 units] \*
  - [CHEM 002: General Chemistry I](#) [4 units] or
  - [CHEM 002H: Honors General Chemistry I](#) [4 units]
  - [CHEM 010: General Chemistry II](#) [4 units] or
  - [CHEM 010H: Honors General Chemistry II](#) [4 units]
  - [CHEM 008: Principles of Organic Chemistry](#) [3 units] and
  - [CHEM 008L: Principles of Organic Chemistry Lab](#) [1 unit] or
  - [CHEM 008H: Honors Principles of Organic Chemistry](#) [4 units]
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- [CSE 020: Introduction to Computing I](#) [2 units] \*\*
  - [MATH 021: Calculus I for Physical Sciences and Engineering](#) [4 units]
  - [MATH 022: Calculus II for Physical Sciences and Engineering](#) [4 units]
  - [MATH 023: Vector Calculus](#) [4 units]
  - [MATH 024: Linear Algebra and Differential Equations](#) [4 units]
  - [MATH 032: Probability and Statistics](#) [4 units]
  - [PHYS 008: Introductory Physics I for Physical Sciences](#) [4 units] or
  - [PHYS 008H: Honors Introductory Physics I for Physical Sciences](#) [4 units]
  - [PHYS 009: Introductory Physics II for Physical Sciences](#) [4 units] or
  - [PHYS 009H: Honors Introductory Physics II for Physical Sciences](#) [4 units]
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\*[BIO 001L](#) is recommended but not required.

\*\*[MATH 015](#) or [CSE 005](#) may be taken in place of [CSE 020](#).

## Upper Division Major Requirements [28 Units]

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- [CHEM 100: Organic Synthesis and Mechanism](#) [3 units]
- [CHEM 101L: Advanced Synthetic Laboratory](#) [2 units]
- [CHEM 111: Biochemistry I](#) [4 units] or
- [BIO 101: Biochemistry I](#) [4 units]
- [CHEM 112: Quantum Chemistry and Spectroscopy](#) [3 units]
- [CHEM 113: Chemical Thermodynamics and Kinetics](#) [3 units]
- [CHEM 115: Instrumental Analysis and Bioanalytical Chemistry](#) [3 units]
- [CHEM 120: Inorganic Chemistry](#) [3 units]
- [CHEM 150: Inorganic and Materials Chemistry Laboratory](#) [2 units]
- [CHEM 153: Physical Chemistry Laboratory](#) [2 units]
- [CHEM 155: Instrumental Analysis Laboratory](#) [2 units]
- [CHEM 194: Ethics and Communication in Chemistry](#) [1 unit]

## Chemistry Emphasis Track Requirements

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Any two of the following in-depth course electives:

- Any other 3- or 4-unit CHEM course numbered 100-189 [3 or 4 units]
- Any 200-level CHEM course (instructor approval required) [3 units]
- [ESS 100: Environmental Chemistry](#) [4 units]
- [MSE 110: Solid State Materials Properties](#) [4 units]
- [MSE 118: Introduction to Nanotechnology and Nanoscience](#) [3 units]

## Biological Chemistry Emphasis Requirements

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- [BIO 102: Advanced Biochemistry and Molecular Biology](#) [4 units] or
- [CHEM 122: Advanced Biochemistry and Molecular Biology](#) [4 units]
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- Two other upper division biology courses [7-8 units]

AND

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One of the following in-depth course electives:

- Any other 3- or 4-unit CHEM course numbered 100-189 [3 or 4 units]
- Any 200-level CHEM course (instructor approval required) [3 units]
- [ESS 100: Environmental Chemistry](#) [4 units]
- [MSE 118: Introduction to Nanotechnology and Nanoscience](#) [3 units]

## Materials Chemistry Emphasis Requirements

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- [ENGR 045: Introduction to Materials](#) [4 units]

AND

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One of the following materials electives:

- [CHEM 140: Nanoscale Materials Chemistry](#) [3 units]
- [ENGR 170: Introduction to Electron Microscopy](#) [3 units]
- [MSE 110: Solid State Materials Properties](#) [4 units]
- [MSE 113: Materials Characterization](#) [4 units]
- [MSE 114: Polymeric Materials](#) [4 units]
- [MSE 115: Ceramic Materials](#) [3 units]
- [MSE 116: Composites](#) [3 units]
- [MSE 118: Introduction to Nanotechnology and Nanoscience](#) [3 units]
- [MSE 119: Materials Simulations](#) [3 units]

AND

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One of the following in-depth course electives:

- Any other 3- or 4-unit CHEM course numbered 100-189 [3 or 4 units]
- Any 200-level CHEM course (instructor approval required) [3 units]
- [ESS 100: Environmental Chemistry](#) [4 units]

# Transfer Students

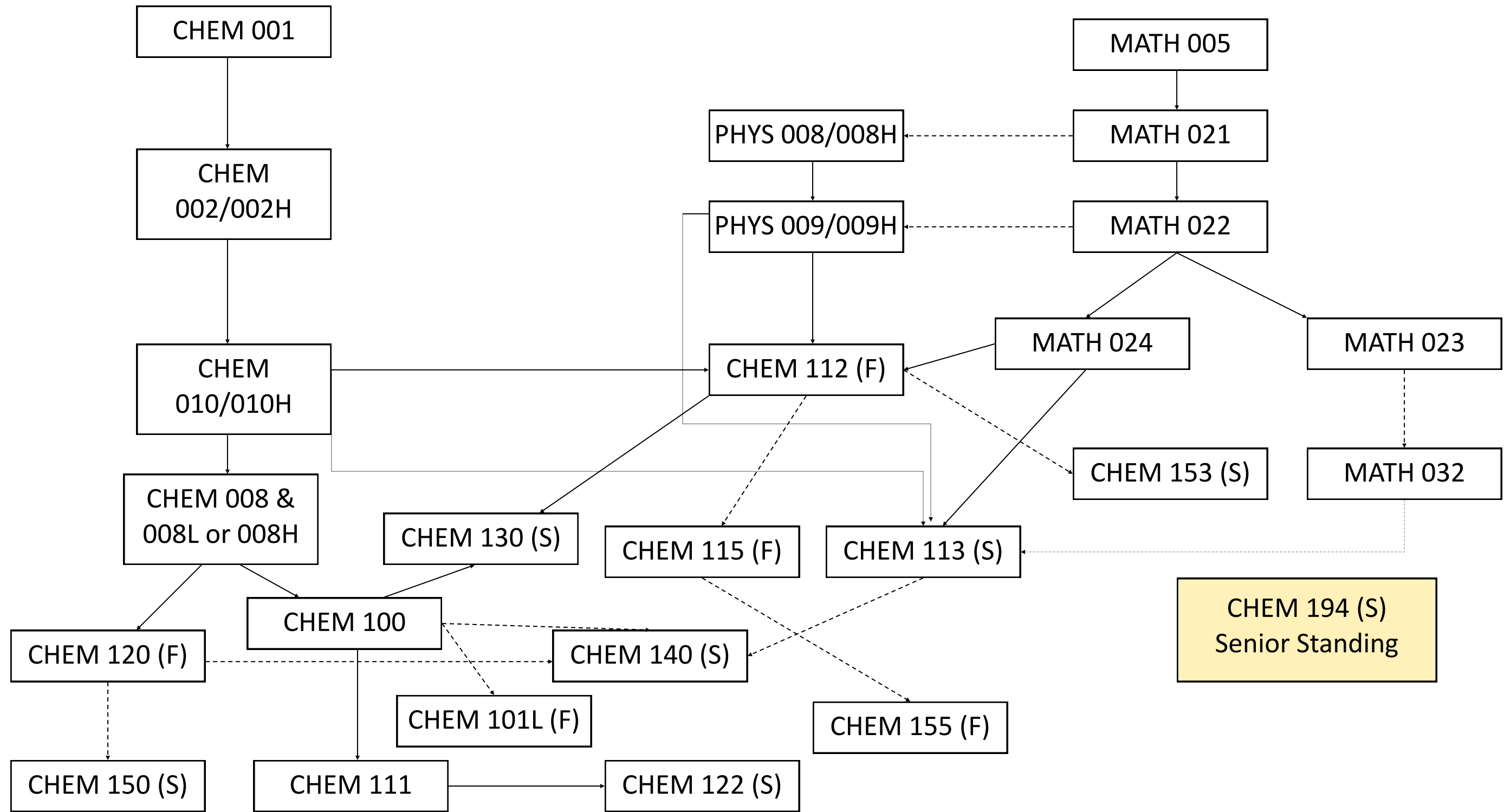
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To be admitted to the Chemical Sciences major transfer students must meet the following requirements:

Applicants will, at the time of admission have completed at minimum each of the following courses (or their equivalent) with a “C-” or better:

- [CHEM 002:&nbsp;&nbsp;&nbsp;General Chemistry I](#) [4 units]
- [CHEM 010:&nbsp;&nbsp;&nbsp;General Chemistry II](#) [4 units]
- [MATH 021:&nbsp;&nbsp;&nbsp;Calculus I for Physical Sciences and Engineering](#) [4 units]
- [MATH 022:&nbsp;&nbsp;&nbsp;Calculus II for Physical Sciences and Engineering](#) [4 units]
- [PHYS 008:&nbsp;&nbsp;&nbsp;Introductory Physics I for Physical Sciences](#) [4 units]
- [PHYS 009:&nbsp;&nbsp;&nbsp;Introductory Physics II for Physical Sciences](#) [4 units]

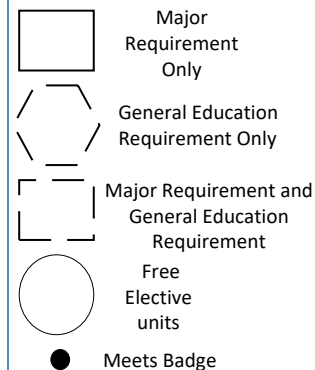
# Chemical Sciences Course Flow Chart



- > Prerequisite
- .-> Can be taken concurrently
- (F) Offered Fall only
- (S) Offered Spring only

## Sample Plan and Course Flow Chart Template – Chem-Chem

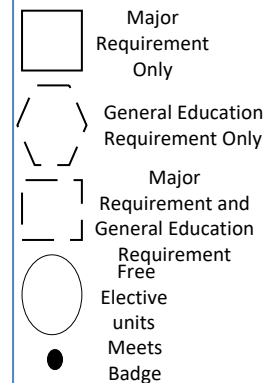
		Sample Plan and Course Flow Chart Template – Chem-Chem				
Year 1	Semester 1 (14 Units)	CHEM 02/02H General Chemistry I (4 units)	SPARK Seminar (4 units)	MATH 21 Calculus I for Physical Sciences & Engineering (4 units)	CSE 005/020 Computer Science Requirement (2 units)	
	Semester 2 (16 Units)	CHEM 10 General Chemistry II (4 units)	WRI 10 College Reading & Composition (4 units)	MATH 22 Calculus II for Physical Sciences & Engineering (4 units)	PHYS 08/08H Introductory Physics I (4 units)	
Year 2	Semester 3 (16 Units)	CHEM 08/08H & 08L Organic Chemistry I (4 units)	Approaches to Knowledge Area B (4 units)	MATH 023 Vector Calculus (4 units)	PHYS 09/09H Introductory Physics II (4 units)	
	Semester 4 (15 Units)	CHEM 100 Organic Synthesis and Mechanism (3 units)	Approaches to Knowledge Area B (4 units)	MATH 024 Linear Algebra & Differential Equations (4 units)	MATH 032 Probability and Statistics (4 units)	
Year 3	Semester 5 (14 Units)	CHEM 101L Advanced Synthetic Lab (2 units)	CHEM 112 Quantum Chemistry and Spectroscopy (4 units)	BIO 01 Contemporary Biology (4 units) <b>*Lab recommended, not required</b>	Approaches to Knowledge Area B (4 units)	
	Semester 6 (14 Units)	CHEM 113 Chemical Thermodynamics and Kinetics (4 units)	UD CHEM Emphasis Elective (4 units)	CHEM 153 Physical Chemistry Lab (2 units) <b>*Writing in Discipline</b>	Free Elective (4 units)	
Year 4	Semester 7 (16 Units)	CHEM 111/BIO 101 Biochemistry I <b>*Crossroads Course</b> (4 units)	CHEM 115 Instrumental Analysis (3 units)	CHEM 120 Inorganic Chemistry (3 units)	CHEM 155 Instrumental Lab (2 units)	Free Elective (4 units)
	Semester 8 (15 Units)	CHEM 150 Inorganic Lab (2 units)	CHEM 194 Ethics and Communications <b>*Integrative Culminating Experience</b> (1 unit)	UD CHEM Emphasis Elective (4 units)	Free Elective (4 units)	Free Elective (4 units)



- This sample plan demonstrates the recommended sequencing and timing of the required and elective components within the major.
- In many cases, a student's academic background will require variations in the timing of the coursework listed in the plan.
- All students are expected to work with their academic advisor to find their best pathway through the degree requirements of their chosen program.

## Sample Plan and Course Flow Chart Template – Chem-BioChem

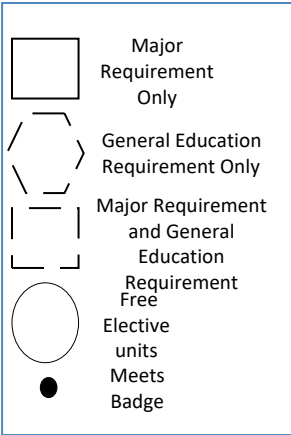
		Sample Plan and Course Flow Chart Template – Chem-BioChem				
Year 1	Semester 1 (14 Units)	CHEM 02/02H General Chemistry I (4 units)	SPARK Seminar (4 units)	MATH 21 Calculus I for Physical Sciences & Engineering (4 units)	CSE 005/020 Computer Science Requirement (2 units)	
	Semester 2 (16 Units)	CHEM 10 General Chemistry II (4 units)	WRI 10 College Reading & Composition (4 units)	MATH 22 Calculus II for Physical Sciences & Engineering (4 units)	PHYS 08/08H Introductory Physics I (4 units)	
Year 2	Semester 3 (16 Units)	CHEM 08/08H & 08L Organic Chemistry I (4 units)	Approaches to Knowledge Area B (4 units)	MATH 023 Vector Calculus (4 units)	PHYS 09/09H Introductory Physics II (4 units)	
	Semester 4 (15 Units)	CHEM 100 Organic Synthesis and Mechanism (3 units)	Approaches to Knowledge Area B (4 units)	MATH 024 Linear Algebra & Differential Equations (4 units)	MATH 032 Probability and Statistics (4 units)	
Year 3	Semester 5 (14 Units)	CHEM 101L Advanced Synthetic Lab (2 units)	CHEM 112 Quantum Chemistry and Spectroscopy (4 units)	BIO 01 Contemporary Biology (4 units) <b>*Lab recommended, not required</b>	Approaches to Knowledge Area B (4 units)	
	Semester 6 (14 Units)	CHEM 113 Chemical Thermodynamics and Kinetics (4 units)	UD In-Depth Emphasis Elective (4 units)	CHEM 153 Physical Chemistry Lab (2 units) <b>*Writing in Discipline</b>	BIO 02 Introduction Molecular Biology (4 units)	
Year 4	Semester 7 (16 Units)	CHEM 111/BIO 101 Biochemistry I (4 units) <b>*Crossroads Course</b>	CHEM 115 Instrumental Analysis (3 units)	CHEM 120 Inorganic Chemistry (2 units)	CHEM 155 Instrumental Lab (2 units)	UD BIO Emphasis Elective (4 units)
	Semester 8 (15 Units)	CHEM 150 Inorganic Lab (2 units)	CHEM 194 Ethics and Communications (1 unit) <b>*Integrative Culminating Experience</b>	UD BIO Emphasis Elective (4 units)	CHEM 122/BIO 101 Biochemistry II (4 units)	Free Elective (4 units)



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## Sample Plan and Course Flow Chart Template – Chem-Materials

Year 1	Semester 1 (14 Units)	CHEM 02/02H General Chemistry I (4 units)	SPARK Seminar (4 units)	MATH 21 Calculus I for Physical Sciences & Engineering (4 units)	CSE 005/020 Computer Science Requirement (2 units)	
	Semester 2 (16 Units)	CHEM 10 General Chemistry II (4 units)	WRI 10 College Reading & Composition (4 units)	MATH 22 Calculus II for Physical Sciences & Engineering (4 units)	PHYS 08/08H Introductory Physics I (4 units)	
Year 2	Semester 3 (16 Units)	CHEM 08/08H & 08L Organic Chemistry I (4 units)	Approaches to Knowledge Area B (4 units)	MATH 023 Vector Calculus (4 units)	PHYS 09/09H Introductory Physics II (4 units)	
	Semester 4 (15 Units)	CHEM 100 Organic Synthesis and Mechanism (3 units)	Approaches to Knowledge Area B (4 units)	MATH 024 Linear Algebra & Differential Equations (4 units)	MATH 032 Probability and Statistics (4 units)	
Year 3	Semester 5 (18 Units)	CHEM 101L Advanced Synthetic Lab (2 units)	CHEM 112 Quantum Chemistry and Spectroscopy (4 units)	ENGR 45 Introduction to Materials (4 units)	BIO 01 Contemporary Biology (4 units) <b>*Lab recommended, not required</b>	Free Elective (4 units)
	Semester 6 (14 Units)	CHEM 113 Chemical Thermodynamics and Kinetics (4 units)	CHEM 153 Physical Chemistry Lab (2 units) <b>*Writing in Discipline</b>	Free Elective (4 units)	Approaches to Knowledge Area B (4 units)	
Year 4	Semester 7 (16 Units)	CHEM 115 Instrumental Analysis (3 units)	CHEM 111/BIO 101 Biochemistry I (4 units) <b>*Crossroads Course</b>	CHEM 120 Inorganic Chemistry (3 units)	CHEM 155 Instrumental Lab (2 units)	UD Materials Science Emphasis Elective (4 units)
	Semester 8 (15 Units)	CHEM 150 Inorganic Lab (2 units)	CHEM 194 Ethics and Communications (1 unit) <b>*Integrative Culminating Experience</b>	UD In-Depth Emphasis Elective (4 units)	Free Elective (4 units)	Free Elective (4 units)



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