Chemical Engineering (BS): Honors Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Honors Program allows students to gain a deeper understanding of chemical engineering principles than would be acquired by completing the standard CHE curriculum. Admission to the program requires students to have earned a minimum overall GPA of 3.5 and a minimum GPA of 3.5 in CHE 205 Chemical Process Principles and CHE 225 Introduction to Chemical Engineering Analysis. An honors thesis based on a supervised research experience and completion of at least one semester of faculty-supervised research are required for completion of the Honors Program.

Plan Requirements

First Year
Fall Semester
CH 101 or CH 103 Chemistry - A Molecular Science 1  or General Chemistry I for Students in Chemical Sciences 3
CH 102 or CH 104 General Chemistry Laboratory 1  or General Chemistry Laboratory I for Students in Chemical Sciences 1
E 101 Introduction to Engineering & Problem Solving 2 1
E 115 Introduction to Computing Environments 1
MA 141 Calculus I 1 4
ENG 101 Academic Writing and Research 2 4

Hours 14

Spring Semester
CH 201 or CH 203 Chemistry - A Quantitative Science 2  or General Chemistry II for Students in Chemical Sciences 3
CH 202 or CH 204 Quantitative Chemistry Laboratory 2  or General Chemistry Laboratory II for Students in Chemical Sciences 1
MA 241 Calculus II 1 4
PY 205 & PY 206 Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory 1 4

Select one of the following Economics Courses: 3
ARE 201 Introduction to Agricultural & Resource Economics
ARE 201A Introduction to Agricultural & Resource Economics
EC 201 Principles of Microeconomics
EC 205 Fundamentals of Economics
E 102 Engineering in the 21st Century 2

Hours 17

Second Year
Fall Semester
CH 221 or CH 225 Organic Chemistry I 2  or Organic Chemistry I for Students in Chemical Sciences 3
CH 222 or CH 226 Organic Chemistry I Lab 2  or Organic Chemistry Laboratory I for Students in Chemical Sciences 1
CHE 205 Chemical Process Principles 2 4
MA 242 Calculus III 2 4

Hours 12

Spring Semester
CH 223 or CH 227 Organic Chemistry II or Organic Chemistry II for Students in Chemical Sciences 3
CH 224 or CH 228 Organic Chemistry II Lab or Organic Chemistry Laboratory II for Students in Chemical Sciences 1
CHE 225 Introduction to Chemical Engineering Analysis 2 3
MA 341 Applied Differential Equations I 2 3
PY 208 & PY 209 Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory 4

Hours 14

Third Year
Fall Semester
CH 315 & CH 316 Quantitative Analysis and Quantitative Analysis Laboratory 4
CHE 311 Transport Processes I 2 3
CHE 315 Chemical Process Thermodynamics 2 3
Select one of the following Mathematics Electives: 3
MA 401 Applied Differential Equations II
MA 402 Mathematics of Scientific Computing
MA 405 Introduction to Linear Algebra
MA 427 Introduction to Numerical Analysis I
MA 501 Advanced Mathematics for Engineers and Scientists I
CHE 395 Professional Development Seminar 1

Hours 14

Spring Semester
Select one of the following Chemistry Electives: 4
PCC 464 Chemistry of Polymeric Materials Laboratory
BCH 351 General Biochemistry
BCH 451 Principles of Biochemistry
CH 437 Physical Chemistry for Engineers
CH 610 Special Topics in Chemistry
BIO 183 Introductory Biology: Cellular and Molecular Biology
FS 402 Chemistry of Food and Bioprocessed Materials
CHE 312 Transport Processes II 3
CHE 316 Thermodynamics of Chemical and Phase Equilibria 3

Hours 17
CHE 330 Chemical Engineering Lab I 4
ENG 333 Communication for Science and Research 3

Hours 17

Fourth Year
Fall Semester
CHE 446 Design and Analysis of Chemical Reactors 3
CHE 450 Chemical Engineering Design I 3
CHE 497 Chemical Engineering Projects I 3
Select one of the following: 3
CHE 711 Chemical Engineering Process Modeling
CHE 713 Thermodynamics I
CHE 715 Transport Phenomena
CHE 717 Chemical Reaction Engineering

Hours 12
Spring Semester
CHE 435 Process Systems Analysis and Control 3
CHE 451 Chemical Engineering Design II 3
Honors Elective (p. 2) 3
CHE 495 Honors Thesis Preparation 1

Hours 10
Total Hours 110

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

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Foreign Language Proficiency (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/) (verify requirement)

Total Hours 17

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<td>CHE 460/560</td>
<td>Chemical Processing of Electronic Materials</td>
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<td>CHE 461</td>
<td>Polymer Sciences and Technology</td>
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<td>CHE 462/562</td>
<td>Fundamentals of Bio-Nanotechnology</td>
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<td>CHE 463/563</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<td>CHE 465</td>
<td>Colloidal and Nanoscale Engineering</td>
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<td>CHE 467</td>
<td>Polymer Rheology</td>
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<td>Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems</td>
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<td>Advances in Pollution Prevention: Environmental Management for the Future</td>
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<td>CHE 525</td>
<td>Process System Analysis and Control</td>
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### Semester Sequence

**First Year**

**Fall Semester**

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<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
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**Spring Semester**

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<td>MA 241</td>
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<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
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<td>&amp; PY 206</td>
<td>and Physics for Engineers and Scientists I Laboratory</td>
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Select one of the following:

- EC 205 Fundamentals of Economics
- EC 201 Principles of Microeconomics
- ARE 201 Introduction to Agricultural & Resource Economics

**GEP Requirement**

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**Second Year**

**Fall Semester**

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<td>CHE 205</td>
<td>Chemical Process Principles</td>
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<td>MA 242</td>
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**Spring Semester**

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<td>and Physics for Engineers and Scientists II Laboratory</td>
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<td>CHE 225</td>
<td>Introduction to Chemical Engineering Analysis</td>
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<td>MA 341</td>
<td>Applied Differential Equations I</td>
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**GEP Requirement**

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**Third Year**

**Fall Semester**

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<td>Quantitative Analysis and Thermodynamics of Chemical and Phase Equilibria</td>
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<td>and Chemodynamics of Chemical and Phase Equilibria</td>
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<td>CHE 311</td>
<td>Transport Processes I</td>
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<td>CHE 315</td>
<td>Chemical Process Thermodynamics</td>
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Select one of the following Mathematics Electives:

- MA 401 Applied Differential Equations II
- MA 402 Mathematics of Scientific Computing
Chemical Engineering (BS): Honors Concentration

MA 405 Introduction to Linear Algebra
MA 427 Introduction to Numerical Analysis I
MA 501 Advanced Mathematics for Engineers and Scientists I
GEP Requirement [link]
CHE 395 Professional Development Seminar

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Spring Semester
Select one of the following Chemistry Electives:

- PCC 464 Chemistry of Polymeric Materials Laboratory
- BCH 351 General Biochemistry
- BCH 451 Principles of Biochemistry
- CH 437 Physical Chemistry for Engineers
- CH 610 Special Topics In Chemistry
- BIO 183 Introductory Biology: Cellular and Molecular Biology
- FS 402 Chemistry of Food and Bioprocessed Materials
- CHE 312 Transport Processes II
- CHE 316 Thermodynamics of Chemical and Phase Equilibria
- CHE 330 Chemical Engineering Lab I
- ENG 333 Communication for Science and Research

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Fourth Year

Fall Semester
CHE 497 Chemical Engineering Projects I
CHE 446 Design and Analysis of Chemical Reactors
CHE 450 Chemical Engineering Design I
Select one of the following CHE Electives:

- CHE 711 Chemical Engineering Process Modeling
- CHE 713 Thermodynamics I
- CHE 715 Transport Phenomena
- CHE 717 Chemical Reaction Engineering
GEP Requirement [link]

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Spring Semester
CHE 435 Process Systems Analysis and Control
CHE 451 Chemical Engineering Design II
Honors Elective (p. 2)
GEP Requirement [link]
CHE 495 Honors Thesis Preparation

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Total Hours 127

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1. Grade of C (2.0) or higher is required.
2. CH 103 General Chemistry I for Students in Chemical Sciences/CH 104 General Chemistry Laboratory I for Students in Chemical Sciences may substitute for CH 201 Chemistry - A Molecular Science/CH 202 Quantitative Chemistry Laboratory
3. Minimum grade of C- required.
4. CH 225 Organic Chemistry I for Students in Chemical Sciences/CH 226 Organic Chemistry Laboratory I for Students in Chemical Sciences may substitute for CH 221 Organic Chemistry I/CH 222 Organic Chemistry I Lab and CH 227 Organic Chemistry II for Students in Chemical Sciences/CH 228 Organic Chemistry Laboratory II for Students in Chemical Sciences may substitute for CH 223 Organic Chemistry II/CH 224 Organic Chemistry II Lab.
5. Honors electives include CHE 460 Chemical Processing of Electronic Materials and above, CHE 5xx, CHE 7xx.
6. An honors thesis is required for completion of the Honors Program.

Career Opportunities

Careers in chemical engineering are sometimes exciting, always demanding, and ultimately provide a sense of accomplishment and achievement. Graduates find employment in sub-disciplines such as production, technical service, sales, management and administration; research and development; and consulting and teaching. Students desiring careers in teaching, research, or consulting are encouraged to continue their education and pursue a graduate degree (consult the Graduate Catalog). The undergraduate curriculum also provides strong preparation for graduate study in a wide range of professional specialties, and chemical engineering graduates often pursue careers in the medical sciences, business management, and law.