Change Major

If Gen Ed requirements are changed a separate Gen Ed Checklist form must accompany this form.

Major Name: Chemical Engineering

Degree: Bachelor of Science

Effective Catalog Year: 2018-2019

- Change Major Name to: CHEN
- Change Degree to: Bachelor of Science
- ✔ Change Curriculum Requirements
- Change General Education Requirements
- Add, Change, or Delete Concentration(s)
- Add, Change, or Delete Emphasis Area(s)

Curriculum Map: 2017-18 catalog CH and BIOL changes-20170412130437.pdf

Description: Map with changes highlighted and underlined

Additional Information:

Description:

Summary/Explanation

We are making changes to both concentrations for CH 2290. We are adding a footnote to both concentrations such that two organic chemistry labs (CH 2270 and CH 2280) may be substituted for CH 2290. CH 2290 contains content for Organic Chem 1 and 2 in a single lab course. CH 2270 and 2280 are the full semester labs for Organic Chem 1 and 2. We are also adding a footnote to the Biomolecular Concentration such that BIOL 1100 and 1101 can be substituted with BIOL 1030, 1040, 1050, and 1060. This substitutes 8 credits of General Biology for 5 credits of Principles of Biology.

Rationale for Change Major

- ✔ Strengthen Program Requirement(s)
- Alignment of Student Learning Outcomes
- Alternative Delivery of Content
- Improve Time to Degree
- Evolution of the Discipline
- Changing Prerequisites
- Address DWF Rates
- General Education Modifications
- Other (Please specify.)

Form

User ID: ckitche **Name:** Christopher Kitchens

Date: 04/12/2017 **Number:** 31195

Christopher Kitchens — 4/12/2017
Chair, Department Curriculum Committee — Date

David A. Bruce — 4/13/17
Department Chair — Date

Christopher Kitchens — 2/19/2018
Chair, College Curriculum Committee — Date

Billy Hall — 2/19/18
College Dean — Date

Director, Calhoun Honors College — Date

John D. Griffin — 3/2/2018
Chair, Undergraduate Curriculum Committee — Date

Chair, Graduate Curriculum Committee — Date

Robert W Jones — 5/7/2018
Provost — Date

President — Date

CHEMICAL ENGINEERING

Bachelor of Science

The Department of Chemical and Biomolecular Engineering offers the Bachelor of Science degree in Chemical Engineering. Chemical Engineering students select one of several emphasis areas (such as energy studies or environmental engineering), a concentration in Biomolecular Engineering (to prepare them for medical school or a career in biotechnology), or any approved minor.

Chemical engineering is based on chemistry, biology, physics, and mathematics. The curriculum at Clemson includes classroom and laboratory instruction and emphasizes broadly applicable fundamental principles and current technology to prepare graduates for professional practice and professional growth. The Educational Objective of the BS degree program is for graduates to have careers characterized by:

- success in chemical engineering practice, post-graduate education, or other areas making use of engineering skills, as defined by accomplishments and/or job satisfaction;
- demonstrated success in the design of chemical processes and/or identification, formulation, and solution of chemical engineering problems;
- ethical behavior in all endeavors;
- demonstrated effectiveness in teamwork, communication, and service to society through professional contributions;
- demonstrated technical and/or managerial leadership; and
- demonstrated commitment to lifelong learning.

Chemical engineers are involved in the research, manufacture, sales, and use of commodity and specialty chemicals, fuels, pharmaceuticals, electronic components, synthetic fibers and textiles, food and consumer goods, and many other products. They work on environmental pollution prevention and remediation and apply engineering science to solve medical and health-related problems.

Combined Bachelor of Science/ Master of Science

Qualified students can reduce the time to earn a Master's Degree by applying graduate credits to both the Bachelor's and Master's program requirements. Undergraduate Chemical and Biomolecular Engineering students who have earned a grade-point average of 3.4 or above and completed 90 credit hours can begin work toward a Master of Science in Chemical Engineering or a Master of Science in Environmental Engineering and Science by selecting approved graduate courses for their emphasis area. Details are available in the ChBE Undergraduate Handbook, which can be found at *www.clemson.edu/ces/chbe.*

Freshman Year

First Semester

4 - CH 1010 General Chemistry
3 - ENGL 1030 Composition and Rhetoric
2 - ENGR 1020 Engineering Disciplines and Skills
4 - MATH 1060 Calculus of One Variable I
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
16

Second Semester

4 - CH 1020 General Chemistry
3 - CHE 1300 Intro to Chemical Engineering
4 - MATH 1080 Calculus of One Variable II
3 - PHYS 1220 Physics with Calculus I
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
17

Sophomore Year

First Semester

3 - CH 2230 Organic Chemistry
4 - CHE 2110 Mass and Energy Balances
4 - MATH 2060 Calculus of Several Variables
3 - PHYS 2210 Physics with Calculus II
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
17

Second Semester

3 - CH 2240 Organic Chemistry
1 - CH 2290 Organic Chemistry Lab.
3 - CHE 2200 Chemical Engr. Thermodynamics I
4 - CHE 2300 Fluids/Heat Transfer
4 - MATH 2080 Intro. to Ordinary Diff. Equations
15

Junior Year

First Semester

1 - CH 3390 Physical Chemistry Lab.
3 - CHE 3210 Chemical Engr. Thermodynamics II
4 - CHE 3300 Mass Transfer and Separation Proc.
2 - ECE 2070 Basic Electrical Engineering
1 - ECE 2080 Basic Electrical Engineering Lab.
3 - STAT 4110 Statistical Methods for Process Development and Control
3 - Emphasis Area Requirement[2]
17

Second Semester

3 - BMOL 4250 Biomolecular Engineering
3 - CH 3320 Physical Chemistry
1 - CH 3400 Physical Chemistry Lab.
3 - CHE 3070 Unit Operations Lab. I
3 - CHE 3190 Engineering Materials
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
16

Senior Year

First Semester

3 - CHE 4070 Unit Operations Lab. II
3 - CHE 4310 Chemical Process Design I
2 - CHE 4430 Safety, Environ & Prof Practice I
3 - CHE 4500 Chemical Reaction Engineering
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
3 - Emphasis Area Requirement[2]
17

Second Semester
3 - BMOL 4290 Bioprocess Engineering
3 - CHE 3530 Process Dynamics and Control
3 - CHE 4330 Process Design II
1 - CHE 4440 Safety, Environ. and Prof. Practice II
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
3 - Emphasis Area Requirement[2]
16

131 Total Semester Hours

[1]See Policy on Humanities and Social Sciences for Engineering Curricula. Six of these credit hours must also satisfy the Cross-Cultural Awareness and Science and Technology in Society Requirements.

[2]See advisor for details. Nine credit hours devoted to completion of an emphasis area or approved minor are required. Emphasis Area courses may not be used to satisfy other degree requirements Emphasis areas are:

Applied Engineering, Mathematics and Science Emphasis Area—Select from the following lists. At least one course must be selected from the Engineering courses list.

Engineering Courses—CHE 4010, 4140, CE 2010, IE 3600, 3610, 4620, ME 2040

Mathematics Courses—MATH 4340 or 4500

Science Courses—CH 3130, 4020, 4110, 4130, 4210, 4270, 4350, PHYS 2220, 4200, 4320, 4410, 4450

Biomolecular Science and Engineering Emphasis Area—Select from the following lists. At least one course must be selected from the Engineering courses list and the Science courses list.

Engineering Courses—BE 4280, BIOE 3020, 4010, 4020, 4400, 4480, 4490, BMOL 4260, 4270

Science Courses—BCHM 3050, 4310, 4330, 4060, 4360, BIOL 4340, CH 3600, 4040, 4140, 4250, GEN 3120,4400, MICR 3050, 4070, 4130, PHYS 4170

Business Management Emphasis Area—MGT 2010 is required. Select two additional courses from ACCT 2010, ECON 3060, 3100, 3210, ELE 3010, 4000, 4010, MGT 3150, 3900, 4110, 4230, MKT 3140

Energy Studies Emphasis Area—Select from AGRB 4570, BE 4400, CE 4370, 4400, 4430, 4910, CHE 4140, 4150, ECE 4200, 4570, 4610, 4710, ECON 4570, EES 4090, 4100, 4120, GEOL 4090, ME 4200, 4220, 4260

Environmental Engineering and Science Emphasis Area—Select two engineering courses and one science or policy course from the following lists:

Engineering Courses—BE 4240, 4400, BMOL 4030, CHE 4010, 4140, 4150, EES 4010, 4020, 4100, 4110, 4300, 4800, 4850, 4860, ETOX 4210, 4460

Science/Policy Courses—CH 4110, 4130, ENR 3120, ENSP 4000, PHYS 2450, 4200

Polymeric Materials Emphasis Area—Select from BIOE 3020, CH 4510, CHE 4120, 4130, 4450, MSE 4150, 4610, PKSC 4160. Students may not use both CHE 4120 and MSE 4150 to satisfy this requirement.

[3] CH 2270 and CH2280 may be substituted for CH 2290. Note: No student may exceed a maximum of two attempts, including a W, to complete successfully any CHE course.

BIOMOLECULAR ENGINEERING CONCENTRATION

Freshman Year

First Semester
4 - CH 1010 General Chemistry
3 - ENGL 1030 Composition and Rhetoric
2 - ENGR 1020 Engineering Disciplines and Skills
4 - MATH 1060 Calculus of One Variable I
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
16

Second Semester
4 - CH 1020 General Chemistry
3 - CHE 1300 Intro to Chemical Engineering
4 - MATH 1080 Calculus of One Variable II
3 - PHYS 1220 Physics with Calculus I
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
17

Sophomore Year

First Semester
5 - BIOL 1100 Principles of Biology I[4]
3 - CH 2230 Organic Chemistry
4 - CHE 2110 Mass and Energy Balances
4 - MATH 2060 Calculus of Several Variables
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
19

Second Semester
3 - CH 2240 Organic Chemistry
1 - CH 2290 Organic Chemistry Lab.[5]
3 - CHE 2200 Chemical Engr. Thermodynamics I
4 - CHE 2300 Fluids/Heat Transfer
4 - MATH 2080 Intro. to Ordinary Diff Equations
15

Junior Year

First Semester
3 - CHE 3210 Chemical Engr. Thermodynamics II
4 - CHE 3300 Mass Transfer and Separation Proc.
3 - PHYS 2210 Physics with Calculus II
3 - STAT 4110 Stat Methods for Process Dev & Con
3 - Biochemistry Requirement[2]
16

Second Semester
3 - BIOE 3020 Biomaterials
2 - BIOL 4340 Biological Chem Lab Techniques
3 - BMOL 4250 Biomolecular Engineering
3 - CHE 3070 Unit Operations Lab. I
3 - CHE 3190 Engineering Materials
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
17

Senior Year

First Semester
3 - BCHM 4310 Physical Approach to Biochem
3 - CHE 4070 Unit Operations Lab. II
3 - CHE 4310 Chemical Process Design I
2 - CHE 4430 Safety, Environ & Prof Prac I
3 - CHE 4500 Chemical Reaction Engineering
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
17

Second Semester
3 - BMOL 4290 Bioprocess Engineering
3 - CHE 3530 Process Dynamics and Control
3 - CHE 4330 Process Design II
1 - CHE 4440 Safety, Environ & Prof Prac II
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
3 - Engineering Requirement[3]
16

133 Total Semester Hours

[1]See Policy on Humanities and Social Sciences for Engineering Curricula. Six of these credit hours must also satisfy the Cross-Cultural Awareness and Science and Technology in Society Requirements.

[2]Select from BCHM 3010, 3050, 4230, or CH 3600.
[3]Select from BE 4280, 4350, BIOE 4400, 4490, 4760, BMOL 4030, 4270, CHE 4010, or MICR 4130.

[4]BIOL 1030, BIOL 1040, BIOL 1050 and BIOL 1060 may be substituted for BIOL 1100

[5]CH 2270 and CH2280 may be substituted for CH 2290.

Note: No student may exceed two attempts, including a W, to complete successfully any CHE course.

Change Undergraduate Course

Change a Course

Subject: BE-Biosystems Engineering

Number: 4400

Effective Term: Summer 2017

Title: Sustainable Energy Engineering

Honors Course:

☐ Add Honors Course:

Last Term Course was taught: 201505

Brief Statement of Change Based on Assessment Results:
Change of prerequisite

Rationale for Changing a Course

- ☐ **Strengthen Program Requirement(s)**
- ☐ **Alignment of Student Learning Outcomes**
- ☐ **Alternative Delivery of Content**
- ☐ **Improve Time to Degree**
- ☐ **Evolution of the Discipline**
- ☑ **Changing Prerequisites**
- ☐ **Address DWF Rates**
- ☐ **General Education Modifications**
- ☐ **Other (Please specify.)**

☑ Change Prerequisite(s) / Corequisite(s)

From	Junior standing in an engineering major.
To	ENGR 1020 with C or better

Form

User ID: cdrapch **Name:** Caye Drapcho

Date: 03/16/2017 **Number:** 26383

140

Kevin Thomas Finneran Digitally signed by Kevin Thomas Finneran
Date: 2017.04.12 16:23:51 -04'00'

Chair, Department Curriculum Committee — Date

David Freedman — 4/11/17

Department Chair — Date

Christopher Kitchens — 2/19/2018

Chair, College Curriculum Committee — Date

2/19/18

College Dean — Date

Director, Calhoun Honors College — Date

3/2/2018

Chair, Undergraduate Curriculum Committee — Date

Chair, Graduate Curriculum Committee — Date

Robert H Jones — 5/7/2018

Provost — Date

President — Date