

COLLEGE OF ENGINEERING
DEPARTMENT OF CHEMICAL ENGINEERING
BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING (BSCHE)
FOR STUDENTS GRADUATING IN CALENDAR YEAR 2020 (CO-OP STUDENTS GRADUATING IN CALENDAR YEAR 2021)
131 CREDITS REQUIRED FOR GRADUATION

| FALL SEMESTER FRESHMAN 2016 | | Credits | SPRING SEMESTER FRESHMAN 2017 | | Credits |
|--|--|------------|--|--|--------------|
| CHEM 1035 General Chemistry | Pre: None | 3 | CHEM 1036 General Chemistry | Pre: CHEM 1035 | 3 |
| CHEM 1045 General Chemistry Lab | Co: CHEM 1035 | 1 | CHEM 1046 General Chemistry Lab | Pre: CHEM 1045 Co: CHEM 1036 | 1 |
| ENGL 1105 First-Year Writing | Pre: None | 3 | ENGL 1106 First-Year Writing | Pre: ENGL 1105 | 3 |
| MATH 1225 Calculus of Single Variable (C-) | Pre: Math Ready | 4 | MATH 1226 Calculus of Single Variable (C-) | Pre: MATH 1225 | 4 |
| ENGE 1215 Foundations of Eng (C-) | | 2 | PHYS 2305 Found of Physics I w/lab | Pre: MATH 1225; Co: MATH 1226 | 4 |
| CLE (Area 2, 3, or 7) | | 3 | ENGE 1216 Foundations of Eng (C-) | Pre: ENGE 1215 (C-) | 2 |
| TOTAL | | 16 | TOTAL | | 17 |
| FALL SEMESTER SOPHOMORE 2017 | | Credits | SPRING SEMESTER SOPHOMORE 2018 | | Credits |
| CHEM 2535 Organic Chemistry | Pre: CHEM 1036 or 1056 or 1056H or 1036H OR | 3 [F, SI] | CHEM 2536 Organic Chem | Pre: CHEM 2535 or 2565 OR | 3 [S, SI] |
| CHEM 2565 Principles of Organic Chem | Pre: CHEM 1036 or 1056 or 1056H or 1036H | or 3 [F] | CHEM 2566 Principles of Organic Chem | Pre: CHEM 2565 | or 3 [S] |
| CHEM 2545 Organic Chemistry Lab | Pre: CHEM 1046 or 1066; Co: CHEM 2535 | 1 [F, SI] | CHEM 2546 Organic Chemistry Lab | Pre: CHEM 2545, Co: CHEM 2536 | 1 [S, SI] |
| MATH 2204 Intro to Multivariable Calculus | Pre: MATH 1226 | 3 | CHEM 3615 Physical Chemistry | Pre: CHEM 1036, MATH 2204, PHYS 2306 | 3 [F, S, SI] |
| CHE 2114 Mass & Energy Balances (C-) | Pre: MATH 1206 or 1206H or 1226, CHEM 1036 or 1036H or 1056 or 1056H | 3 [F, S] | MATH 2214 Intro to Differential Eqns | Pre: MATH 1226, (MATH 1114 or 2114) | 3 |
| PHYS 2306 Foundations of Physics I & Lab | Pre: PHYS 2305, MATH 1226 | 4 | CHE 2004 CHE Sophomore Seminar (P/F) | | 1 [S] |
| MATH 1114 Elem Linear Algebra OR | | 2 | CHE 2164 CHE Thermodynamics (C-) | Pre: 2114 (C-), Co: CHEM 3615 | 3 [F, S] |
| MATH 2114 Intro to Lin Algebra | Pre: (MATH 1225 (B) or 1226) | or 3 | CLE (Area 2, 3, or 7) | | 3 |
| TOTAL | | 16 | TOTAL | | 17 |
| FALL SEMESTER JUNIOR 2018 | | Credits | SPRING SEMESTER JUNIOR 2019 | | Credits |
| ENGL 3764 Technical Writing | | 3 | CHE 3015 Process Measure & Control (C-) | Pre: MATH 4564 or 4544; Co: 3184, 3044, 3124 | 3 [S] |
| MATH 4564 Operational Methods | Pre: MATH 2214 | 3 | CHE 3044 Heat Transfer (C-) | Pre: 2164, 3114, MATH 4564 or 4544 | 2 [S] |
| CHE 3114 Fluid Transport (C-) | Pre: 2114, PHYS 2305, MATH 2204 or 2224; Co: MATH 4564 | 3 [F, S] | CHE 3144 Mass Transfer (C-) | Pre: 2164, 3114, MATH 4564 or 4544 | 3 [S] |
| CHE 3134 Separation Processes (C-) | Pre: 2114; (2164 or CHEM 3615) | 3 [F, S] | CHE 3184 Chem Reactor Analysis & Des (C-) | Pre: 2164, MATH 2214 or 4544; Co: 3144, 3044 | 3 [S] |
| CHE 3124 CHE Modeling (C-) | Pre: 2114 (C-), MATH 2214; Co: 3114, MATH 4564 | 3 [F, S] | STAT 4604 Stats Methods for Engrs | Pre: MATH 1226 OR | 3 |
| | | | STAT 4705 Prob & Stat for Engrs | Pre: MATH 2204 OR | |
| | | | STAT 4714 Prob & Stat for EE | Pre: MATH 2204 | |
| | | | CHEM 3625 Physical Chemistry Lab | Pre: CHEM 3615 | 1 [F, S, SI] |
| TOTAL | | 15 | TOTAL | | 15 |
| SUMMER TERM I OR II 2019 | | Credits | | | |
| CHE 4014 CHE LABORATORY (C-) | Pre: 3015, 3044, 3124, 3134, 3144, 3184, ENGL 3764 | 5 [SI, SI] | | | |
| TOTAL | | 5 | | | |

| FALL SEMESTER SENIOR 2019 | Credits | SPRING SEMESTER SENIOR 2020 | Credits |
|---|------------------|--|------------------|
| CHE 4104 Process Materials (C-) Pre: 2164, (CHEM 2535 or CHEM 2565) | 3 ^[F] | CHE 4186 Process & Plant Design (C-) Pre: 4185 | 4 ^[S] |
| CHE 4185 Process & Plant Design (C-) Pre: 4014 | 4 ^[F] | CLE (Area 2,3,7) | 3 |
| CLE (Area 2, 3, or 7) | 6 | CLE (Area 6) | 1 |
| Technical Elective | 3 | Free Electives | 6 |
| TOTAL | 16 | TOTAL | 14 |

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.

Curriculum for Liberal Education (CLE)

Consult the CLE Alphabetical Listing at: <http://www.cle.prov.vt.edu/guides/alpha.html>, CLE courses need to be completed prior to graduation

| | | | | |
|--|----------------|-----|----------------|-----|
| CLE Area 1: Writing and Discourse (6 hrs) | ENGL 1105 | (3) | ENGL 1106 | (3) |
| CLE Area 2: Ideas, Cultural Traditions, Values Electives (6 hrs) | | (3) | | (3) |
| CLE Area 3: Society & Human Behavior electives (6 hrs) | | (3) | | (3) |
| CLE Area 4: Scientific Reasoning and Discovery (8 hrs) | CHEM 1035/1045 | (4) | CHEM 1036/1046 | (4) |
| CLE Area 5: Quantitative and Symbolic Reasoning (8 hrs) | MATH 1225 | (4) | MATH 1226 | (4) |
| CLE Area 6: Creativity & Aesthetic Experience elective (1 hr) | | | | (1) |
| CLE Area 7: Global Issues Elective (3 hrs) | | | | (3) |

If a CLE course is double-counted to satisfy two different CLE areas, a free elective(s) must be taken to maintain a minimum of 131 credits.

Electives: CHE majors must take 3 hrs of Technical elective from approved lists. At least 2 hrs must be taken from the engineering 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.

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. (All ChE credits except CHE 4144: Bus & Mktg for Proc Industries are used to calculate in-major GPA.)
- 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 ChE department head is required for registration in ChE 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.

Graduation Requirements:

- Have a minimum in-major GPA of 2.0. (All ChE credits except CHE 4144: Bus & Mktg for Proc Industries are used to calculate in-major GPA.)
- Complete at least 131 semester credit hours with a minimum overall GPA of 2.0.

CHEMICAL ENGINEERING DEPARTMENT

TECHNICAL Electives – Approved Courses
(For students graduating 2020)

The following courses are approved Technical Electives **FOR STUDENTS GRADUATING in 2020**. 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. You must take at least two hours from the List of Approved Engineering Technical Electives; the remainder can be taken from either the List of Approved Engineering Technical Electives (below) or the List of Other Approved Technical Electives (next page). If you take more than three hours, the excess hours will count toward Free Electives. **All Technical Electives must be taken A-F.**

LIST OF APPROVED ENGINEERING TECHNICAL ELECTIVES[§]

(take at least two credit hours from the following)

(credits)

| | | |
|-----------|--------------------------------------|-----|
| BSE 4544 | Protein Separation Engineering | 3 |
| BMES 2104 | Intro to Biomedical Engineering | 3 |
| CHE 4214 | Intro to Polymer Materials | 3 |
| CHE 4224 | Intro to Polymer Processing | 3 |
| CHE 4304 | Biological Transport Phenomena | 3 |
| CHE 4334 | Intro to Colloid Interface Sci | 3 |
| CHE 4544 | Protein Separation Engineering | 3 |
| CHE 4974* | Independent Study | 1-3 |
| CHE 4994* | Undergraduate Research | 1-3 |
| CEE 5104 | Environmental Chemistry | 3 |
| ENGR 3124 | Introduction to Green Engineering | 3 |
| ESM 2214 | Statics and Mechanics of Materials | 3 |
| MSE 3204 | Introduction to Electronic Materials | 3 |
| NSEG 3145 | Fundamentals of Nuclear Engr | 3 |

[§]The following courses cannot be counted toward Engineering Technical Electives: CHE 4144 Bus. & Mktg. for Proc. Indus., MSE 4544 Laboratory in Polymer Science

* CHE 4974 Independent Study and CHE 4994 Undergraduate Research 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 4974 or 4994 (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.

LIST OF OTHER APPROVED TECHNICAL ELECTIVES

| <u>Discipline</u> | <u>Course No.</u> | <u>Course Title</u> | <u># Credits</u> |
|---------------------------------------|-------------------|--|------------------|
| Biochemistry | BCHM 2024 | Concepts of Biochemistry | 3 |
| | BCHM 3114 | Biochem. for Biotechnology & Life Sci. | 3 |
| | BCHM 4115,4116 | General Biochemistry | 4,3 |
| Chemistry | CHEM 2114, 2124 | Analytical Chem & Lab | 3, 1 |
| | CHEM 2424 | Descriptive Inorganic Chemistry | 3 |
| | CHEM 2555, 2556 | Organic Synthesis & Techniques Lab | 2, 2 |
| | CHEM 3616, 3626 | Physical Chemistry & Lab | 3, 1 |
| | CHEM 4616 | Physical Chemistry for the Life Sciences | 3 |
| | CHEM 4074 | Laboratory in Polymer Science | 2 |
| | CHEM 4114 | Instrumental Analysis | 4 |
| | CHEM 4124 | Advanced Instrumental Techniques | 2 |
| | CHEM 4404 | Physical Inorganic Chemistry | 3 |
| | CHEM 4414 | Inorganic Chemistry Lab | 2 |
| | CHEM 4514 | Green Chemistry | 3 |
| | CHEM 4524 | Identification of Organic Compounds | 3 |
| | CHEM 4534 | Organic Chemistry of Polymers | 3 |
| | CHEM 4554 | Drug Chemistry | 3 |
| | CHEM 4634 | Polymer and Surface Chemistry | 3 |
| Crop&Soil Envir. Sci. | CSES 4734 | Environmental Soil Chemistry | 3 |
| Envir. Sci. | ENSC 4734 | Environmental Soil Chemistry | 3 |
| Food Sci. & Technology | FST 4504 | Food Chemistry | 3 |
| | FST 3514 | Food Analysis | 3 |
| Materials Sci & Engr | MSE 4544 | Laboratory in Polymer Science | 2 |
| Physics | PHYS 3324 | Modern Physics | 4 |
| | PHYS 4564 | Polymer Physics | 3 |
| Sustainable Biomaterials | SBIO 3434 | Chem & Conv of Sust Biomats | 3 |
| | SBIO 3444 | Sustainable Biomaterials & Bioenergy | 3 |

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.