

## Chemical Engineering Pre-Approved Technical Elective List

The courses listed below are preapproved for use as technical electives. If the course counts as a Track Elective, that is indicated (**M** = Materials track, **B** = Biological Track, **E** = Energy and the Environment Track).

If a course is pre-approved as a meeting the laboratory course requirement it is indicated with an **L**.

Courses not on the list may be taken with the **prior, written approval** of the Department of Chemical and Biomolecular Engineering. It is the responsibility of the student to ask, and provide the syllabus of the course.

If three hours of CHE 4931, 4932, 4933, or 4934 (Independent Study) are completed, it will count toward the Technical Elective hours. No more than three hours of these courses may be used. Three hours of the course Special investigation courses taken in other departments will be considered upon request, but must be approved, in writing, by your advisor or the department chair **prior** to undertaking the special investigation.

Some of the courses listed below have prerequisites listed within the parentheses which differ from those listed in the catalog. These alternate prerequisites have typically been accepted by the department teaching the course in place of those prerequisites listed in the catalog. The acceptance of alternate prerequisites is at the discretion of the individual course instructor. In general, other RCENT departments have accepted ChE courses in thermodynamics, heat transfer, and fluid flow in place of their courses. It is the responsibility of the student to check with individual instructors about course prerequisites.

### Chemical Engineering (ChE)

**(note that any of these courses can count toward the six hours of "Chemical Engineering" technical elective requirement)**

CHE 4400 (3) Advanced Topics in Materials Science & Engineering (ET 2300) **M**

ChE 4410L (3) Material Characterization Laboratory (ET 2300) **M L**

CHE 4420 (3) Metallic Corrosion (C or better in ET 2300) **M**

CHE 4430 (3) Polymer Synthesis and Properties (CHE 3210 or CHEM 4530) **M**

CHE 4500 (3) Coal Conversion Technologies (CHE 3210, 3700) **E**

CHE 4520 (3) Analysis of Electrochemical Systems (CHE 3210, 3500, CHEM 1520) **E**

CHE 4530 (3) Alternative Fuels and Renewable Energy (ET 3200) **E**

CHE 4610 (3) Atmospheric Chemistry (CHEM 1520, MATH 2302, PHYS 2051) **E**

CHE 4800 (3) Biochemical Engineering (CHE 3700, BIOS 1700 or PBIO 1140) (Either 4800 or 4830 are required of all CHE majors. The second counts as a Technical Elective. Both are required of students on the Biological Track)

CHE 4820 (3) Bio- and Nano-Interfaces. (ChE 2010, ET 3200) **B**

CHE 4830 (3) Applied Cellular and Molecular Biology (CHE 2000, BIOS 1700 or PBIO 1140) (Either 4800 or 4830 are required of all CHE majors. The second counts as a Technical Elective. Both are required of students on the Biological Track)

CHE 4840 (3) Applied Immunology (BIOS 1700 or PBIO 1140) **B**

CHE 4931 (1-3) Independent Study - Chemical Engineering (PERM) (3 hrs max. of 4931, 4932, 4933, or 4934 may be counted toward graduation requirements.)

CHE 4932 (1-3) Independent Study - Chemical Engineering: Materials Track (PERM) (3 hrs max. of

4931, 4932, 4933, or 4934 may be counted toward graduation requirements.) **M**  
 CHE 4933 (1-3) Independent Study - Chemical Engineering: Biological Track (PERM) (3 hrs max. of 4931, 4932, 4933, or 4934 may be counted toward graduation requirements.) **B**  
 CHE 4934 (1-3) Independent Study - Chemical Engineering: Energy and the Environment Track (PERM) (3 hrs max. of 4931, 4932, 4933, or 4934 may be counted toward graduation requirements.) **E**  
 CHE 4941 (1-2) Intercollegiate Engineering Design Competition (PERM) (Hours may be spread over two semesters. Credit as a Track Elective is project specific. 3 hrs max toward TE requirement)

### **Biological Science (BIOS)**

BIOS 3100 (3) General Genetics (C- or better BIOS 1715, and 1710 or PBIO 1150) (Chemical Eng Students have typically been let into this course with just BIOS 1700) **B**  
 BIOS 3105 (2) Laboratory Genetics (BIOS 3100) **L**  
 BIOS 3200 (3) Fundamentals of Animal Cell Biology C- or better BIOS 3100) **B**  
 BIOS 3205 (2) Animal Cell Biology Lab (BIOS 3200 or concurrent) **L**  
 BIOS 3220 (3) General Microbiology (BIOS 3100) **B**  
 BIOS 3225 (1) General Microbiology Laboratory (BIOS 3100 and concurrent with 3220) **B L**  
 BIOS 3420 (5) Principles of Physiology (PHYS 2052, CHEM 1520, C- or better BIOS 1710) **B**  
 BIOS 3435 (2) Principles of Physiology Lab (BIOS 3430 or concurrent) **B, L**  
 BIOS 4630 (3) Biological Chemistry (CHEM 3050) **B**  
 BIOS 4860 (2) Immunology (C- or better in BIOS 3210) **B**

### **Chemistry (CHEM)**

**(note that any of these courses can count toward the six-hours of "advanced chemistry" technical elective requirement)**

CHEM 2410 (3) Quantitative Analysis ( $\geq$ C- CHEM 1520, concurrent with 2410L) **M E**  
 CHEM 2410L (1) Quantitative Analysis Laboratory ( $\geq$ C- CHEM 1520, concurrent with 2410) **M, E, L**  
 CHEM 3080 (1) Organic Chemistry Laboratory (CHEM 3050 or concurrent) **L**  
 CHEM 3085 (1) Organic Chemistry Laboratory (CHEM 3080, 3060 or concurrent, not 3090)  
 CHEM 3760 (3) Fundamentals of Inorganic Chemistry (CHEM 1520) **M**  
 CHEM 4310 (3) Analytical Chemistry II (C- or better in CHEM 2410, 3510 or 4530) **M**  
 CHEM 4310L (1) Analytical Chemistry II Lab (CHEM 4310 or concurrent)  
 CHEM 4501 (3) Principles of Brewing Science (CHEM 3060) **B**  
 CHEM 4530 (3) Physical Chemistry I (C- or better CHEM 1520, PHYS 2052, MATH 2302)  
 CHEM 4530L (1) Physical Chemistry Lab I (CHEM 4530 or concurrent) **L**  
 CHEM 4540 (3) Physical Chemistry II (CHEM 4530)  
 CHEM 4540L (1) Physical Chemistry Lab II (CHEM 4540 or concurrent)  
 CHEM 4600 (3) Spectroscopic Methods in Organic Chemistry (C- or better CHEM 3060)  
 CHEM 4760 (3) Modern Inorganic Chemistry (CHEM 3760, 3510 or 4530) **M**  
 CHEM 4800 (3) Advanced Organic Chemistry (CHEM 3060) **B**  
 CHEM 4805 (3) Advanced Organic Synthesis (CHEM 3060)  
 CHEM 4850 (3) Introduction to Toxicology (C- or better CHEM 4890 or 4090) **B**  
 CHEM 4890 (3) Basic Biochemistry (CHEM 3060, not 4901) **B**  
 CHEM 4901 (3) Biochemistry I (CHEM 3060, not 4890 or 4902) **B**  
 CHEM 4902 (3) Biochemistry II (CHEM 4901) **B**  
 CHEM 4903 (2) Biochemical Techniques Lab (CHEM 4901) **B, L**

**Civil Engineering (CE)**

CE 3420 (3) Applied Hydraulics & Hydrology (ChE 3400, CE 4000) **E**  
CE 3530 (3) Basics of Environmental Engineering (CE 3420) **E**  
CE 3700 (4) Geotechnical Engineering (ET 2220, ChE 3400, GEOL 2830) **E**  
CE 3710 (1) Soil Engineering Laboratory (CE 3700 or concurrent)  
CE 3800 (3) Civil Engineering Materials (ET 2220) **M**  
CE 4240 (3) Strength of Materials II (C or better in ET 2220) **M**  
CE 4500 (3) Water & Wastewater Engineering (CE 3420) **E**  
CE 4530 (3) Solid/Hazardous Waste Management (CE 3530) **E**  
CE 4570 (3) Water Resources Engineering (CE 3420) **E**  
CE 4580 (3) Water Quality Engineering (Chem 1510) **E**  
CE 4740 (1) Soil Mechanics Laboratory (CE 3700, CE 3710)

**Electrical and Computer Engineering (ECE)**

EE 3143 (3) Basic Electrical Engineering II (ET 3132)  
EE 4053 (3) Physical & Power Electronics (EE 3343)

**Engineering and Technology (ET)**

ET 2200 (3) Statics (MATH 2302, PHYS 2051) **M**  
ET 2220 (3) Strengths of Materials (C or better in ET 2200) **M**  
ET 2240 (4) Dynamics (PHYS 2051, C or better in ET 2200)

**Environmental and Plant Biology (PBIO)**

PBIO 4310 (3) Cell Biology (BIOS 1700 or PBIO 1140) **B**  
PBIO 4500 (3) Biotechnology and Genetic Engineering (BIOS 1700 or PBIO 1140) **B**

**Geological Sciences (GEOL)**

GEOL 4270 (3) Water Geochemistry (GEOL 1010, CHEM 1520) **E**  
GEOL 4280 (3) Physical Geochemistry (GEOL 4270) **E**  
GEOL 4800 (3) Prin. of Hydrogeology (GEOL 1010 or 2020 or 2830, MATH 2302, PHYS 2052) **E**  
GEOL 4811 (3) Advanced Hydrogeology (GEOL 4800) **E**  
GEOL 4890 (1-3) Advanced Topics in Hydrogeology (GEOL 4800)

**Mathematics (MATH)**

MATH 3050 (3) Discrete Mathematics (MATH 2301)  
MATH 3300 (4) Calculus III (C or better MATH 2302)  
MATH 3320 (3) Vector Analysis (MATH 3300)  
MATH 4301 (3) Advanced Calculus I (MATH 3200, 3300)  
MATH 4302 (3) Advanced Calculus II (MATH 4301)  
MATH 4310 (3) Complex Variables (MATH 3300)  
MATH 4400 (3) Advanced Differential Equations (MATH 3200, 3400)  
MATH 4410 (3) Fourier Analysis and Partial Differential Equations (MATH 3300, 3400)  
MATH 4500 (3) Theory of Statistics (MATH 3200, 3300, 3500)  
MATH 4510 (3) Applied Statistics (MATH 4500)  
MATH 4520 (3) Stochastic Processes (MATH 4500)  
MATH 4600 (3) Introduction to Numerical Analysis (MATH 3200, 3400, ChE 3800)  
MATH 4620 (3) Linear and Nonlinear Optimization (MATH 3200, 3300, ChE 3800)  
MATH 4630 (3) Discrete Modeling and Optimization (MATH 3300)

**Mechanical Engineering (ME)**

ME 3140 (3) Introduction to Manufacturing Processes (ET 2220, 2300) **M**  
ME 4070 (3) Fundamentals of Nuclear Engineering (ChE 3400, 3500, ET 3200) **E**  
ME 4130 (3) Conduction and Radiation Heat Transfer (ChE 3400, 3500, 3800)  
ME 4160 (3) Combustion (ChE 3400, 3500 and ME 4210) **E**  
ME 4170 (3) Design of Thermal Systems (ME 4210)  
ME 4230 (3) Fuel Cell Design (Chem 1510, ET 3200) **E**  
ME 4270 (3) Power Station Engineering (ME 4210) **E**  
ME 4310 (3) Atmospheric Pollution Control (ChE 3400, 3500, ET 3200) **E**  
ME 4340 (3) Fundamentals of Aerosol Behavior (ChE 3400, 3500, ET 3200) **E**  
ME 4350 (3) Energy Engineering and Management (Chem 1510, ET 3200) **E**  
ME 4400 (3) Direct Energy Conversion (ET 3200) **E**  
ME 4460 (3) Potential Flow Theory (ChE 3400, 3500)  
ME 4470 (3) Viscous Flow Theory (ChE 3400, 3500)  
ME 4630 (3) Mechanics of Materials (ET 2220, 2300)  
ME 4660 (3) Mechanics of Biological Solids (ET 2220) **M B**  
ME 4670 (3) Engineering Biomechanics (PHYS 2051) **B**  
ME 4750 (3) Solar Design (ET 3200) **E**  
ME 4950 (3) Kinetic Theory and Statistical Thermodynamics (ME 4210)

**Physics (PHYS)**

PHYS 2701 (2) Electronics Lab I (PHYS 2052 and PHYS major)  
PHYS 3011 (3) Thermal Physics (PHYS 2052 and Math 2302)  
PHYS 3701 (2) Intermediate Lab - Electrons & Photons (PHYS 2053)  
PHYS 3702 (2) Intermediate Lab - Photons & Nucleons (PHYS 2053)  
PHYS 4301 (3) Cell and Molecular Biophysics (PHYS 2052, CHEM 1510, BIOS 1700) **B**  
PHYS 4701 (2) Electronics Laboratory (PHYS 3702)

(last updated 17 April 2017 by DR)