CHEMICAL FOCUS AREA:
Computation, Data Science, & Machine Learning

Department of Chemical and Biochemical Engineering

General Education (19 sh)

		sh
ALL	**RHET:1030 Rhetoric**	4
F/S	**Diversity & Inclusion**	3
ALL	**Be Creative**	3
ALL	**Approved Gen Ed Course**	3
ALL	**Approved Gen Ed Course**	3
ALL	**Approved Gen Ed Course**	3

Math & Basic Science Core (24 sh)

		sh	
F/S	**MATH:1550 Math I: Single Variable Calculus** *(P: ALEKS score ≥ 75 or MPT Level 3 score ≥ 9)*	4	
ALL	**MATH 1560 Math II: Multivariable Calculus** *(P: MATH:1550)*	4	
ALL	**MATH:2550 Math III: Matrix Algebra** *(P: MATH:1550)*	2	
ALL	**MATH:2560 Math IV: Differential Equations** *(P: MATH:1560 & MATH:2550)*	3	
ALL	**CBE:3020 Appl Stat Chem & Natural Resource Engr**	3	OR
ALL	**STAT:2020 Probability & Stats for Engr & Phys Sci** *(P: MATH:1560)*	3	OR
ALL	**STAT:3510 Biostatistics**	3	
ALL	**CHEM:1110 Principles of Chemistry I** *(P: ALEKS score ≥ 55 or MPT Level 3 score ≥ 9)*	4	
ALL	**PHYS:1611 Introductory Physics I / Lab** *(C: MATH:1550)*	4	

Engineering Core (7 sh)

		sh
F	**ENGR:1000 Engineering Success for First-Year Students** *(First semester standing)*	1
F	**ENGR:1100 Intro to Engineering Problem Solving**	3
F/S	**ENGR:1300 Intro to Engineering Computing** *(C: MATH:1550)*	3

ChemE Requirements (53 sh)

		sh	
ALL	**CHEM:1120 Principles of Chemistry II** *(P: CHEM:1110 with a minimum grade of C-)*	4	
ALL	**CHEM:2210 Organic Chemistry I** *(P: CHEM:1120 with a minimum grade of C-)*	3	OR
F	**CHEM:2230 Organic Chemistry I for Majors** *(P: CHEM:1120 with a minimum grade of C-)*	3	
ALL	**CHEM:2220 Organic Chemistry II** *(P: CHEM:2210 or CHEM:2230 with a minimum grade of C-)*	3	OR
S	**CHEM:2240 Organic Chemistry II for Majors** *(P: CHEM:2210 or CHEM:2230 with a minimum grade of C-)*	3	
ALL	**CHEM:2410 Organic Chemistry Laboratory** *(P: CHEM:1120 & (CHEM:2210 or CHEM:2230), both with a minimum grade of C-; C: CHEM:2220 or CHEM:2240)*	3	OR
S	**CHEM:2420 Organic Chemistry Lab for Majors** *(P: CHEM:1120 & (CHEM:2210 or CHEM:2230), both with a minimum grade of C-; C: CHEM:2220 or CHEM:2240)*	3	
ALL	**ENGR:2130 Thermodynamics** *(P: CHEM:1110 & PHYS:1611; C: MATH:1560)*	3	
ALL*	**ENGR:2720 Materials Science** *(P: CHEM:1110; C:MATH:1550)*	3	
F	**CBE:2110 Computational Tools for Chemical Engineers**	2	
F/S	**CBE:2105 Process Calculations** *(P: MATH:1550)*	3	
S	**CBE:3105 ChE Thermodynamics** *(P: ENGR:2130; C: CBE:2105)*	3	
S	**CBE:3109 Fluid Flow** *(C: CBE:2105)*	2	
F	**CBE:3113 Heat & Mass Transfer** *(P: MATH:2560 & CBE:2105; R: CBE:3109)*	3	
F	**CBE:3117 Separations** *(P: CBE:2105 & CBE:3105; C: CBE:3113)*	3	
F/S	**CBE:3120 Chemical Reaction Engineering**	3	
F	**CBE:3125 Chemical Process Safety** *(P: CBE:3105 & CBE:3109; C: CBE:3113)*	3	
S	**CBE:3150 Thermodynamics / Transport Laboratory** *(P: CBE:3105 & CBE:3113)*	3	
F	**CBE:3155 Chemical Reaction Engineering / Separation Lab**	3	
S	**CBE:3205 Introduction Biochemical Engineering** *(P: CBE:2105; C: CME:3109; R: CBE:3120)*	3	
F	**CBE:4105 Process Dynamics & Control** *(P: MATH:2560, CBE:2105, & CBE:3109; C: CBE:3120)*	3	

ChemE Capstone Design Courses (5 sh)

		sh
F	**CBE:4109 Chemical Engineering Process Design I** *(P: CBE:3109, CBE:3113, & CBE:3117; C: CBE:3120 & CBE:3125)*	2
S	**CBE:4110 Chemical Engineering Process Design II** *(P: CBE:4109; R: CBE:4105 & CBE:3205)*	3

ChemE Departmental Seminars (5 sh)

		sh
S	**CBE:1000 CBE Departmental Seminar**	1
F/S	**CBE:3000 CBE Professional Seminar** (1 sh x4); *(P: CBE:2105)*	4
S	**CBE:4195 Senior Enriching Activities Seminar** *(C: CBE:4110)*	0

Electives: Advanced Chemistry / Science (6 sh)

sh
Advanced Chemistry or Biochemistry Course 3
Advanced Science Course 3

Engineering Electives:

		sh
F/S	**ECE:2400 Linear Systems I** *(P: ENGR:2120 & MATH:2560)*	3
F/S	**ENGR:2730 Computers in Engineering** *(P: ENGR:1300)*	3
F/S	**ENGR:2995 Intro to AI and Machine Learning in Engr** *(P: ENGR:1300; C: MATH:2550)*	3
ALL	**CBE:3998 Individual Investigations (usually research)**	1-3
F/S	**ECE:3330 Introduction to Software Design** *(P: ENGR:2730)*	3
	CBE:3020 Applied Statistics for Chemical and Natural Resources Engineering (see MyUI	3
F	**ISE:3600 Quality Control** *(P: STAT:2020 or MSCI:9100 or (STAT:3100 & STAT:3101 & STAT:3200))*	3
F/S	**ME:4111 Scientific Computing and Machine Learning** *(P: MATH:2560)*	3
F	**ME:4150 Artificial Intelligence in Engineering** *(P: ME:4111)*	3
F	**BME:4310 Computational Biochemistry** (fall semester, even years) *(P: (MATH:1560 or MATH:1860) & CHEM:1120; Recommended: BIOC:3110 or BIOC:3120)*	3
F/S	**CEE:4511 Numerical Calculations** *(P: MATH:2560)*	3
S	**CEE:4512 Engr Design Opt** *(P: ENGR:2100 & MATH:2550; Requirement: junior standing)*	3
S	**ISE:4900 Introduction to Six Sigma** *(P: ISE:3600)*	3
S	**ME:5114 Nonlinear Control in Robotic Systems** *(P: ME:3600 or ME:4120 or CBE:4105 or ECE:36000)*	3
F	**ME:5115 Cooperative Autonomous Systems** *(P: ME:3600 or ME:4120 or ME:4113 or CBE:4105 or ECE:3600)*	3
F	**ME:5143 Computational Fluid and Thermal Engineering** *(P: ME:3045)*	3
F	**BME:5320 Bioinformatics Techniques** *(P: BIOL:1411 & (ENGR:2730 or CS:2110 or CS:5110)*)	
S	**ECE:5330 Graph Algorithms & Combinatorial Optimization** *(P: ECE:3330)*	3
	CBE:5417 Physical Meteorology & Atmospheric Radiative Transfer	3
F	**ECE:5420 Power Electronics** (fall semester, odd years) *(P: PHYS:1611 & ENGR:2120; Requirements: junior standing)*	3
S	**CBE:5425 Atmospheric Chemistry and Physics** (spring semester, even years) *(C: CBE:3120)*	3

Science Electives:

F/S	**CS:2110 Programming for Informatics** *(P: CS:110 w/min C-)*	4
ALL	**CS:2210 Discrete Structures**	3
ALL	**CS:2230 Computer Science II: Data Structures** *(P: CS:120 w/min C- or ENGR:2730 w/min C-)*	4
F/S	**CS:5110 Introduction to Informatics**	3
ALL	**CS:3330 Algorithms** *(P: CS:2210 w/min C- & CS:2230 w/min C- & (MATH:1850 or MATH:1550 or*	3
	MSCI:3500 Data Mining	3
F/S	**MATH:3770 Fundamental Properties Spaces/Funct** *(P: MATH:1560 or MATH:1860; C: MATH:2700)*	4
F/S	**MSCI:3800 Optimization and Simulation Modeling** *(P: MSCI:2800 or STAT:4101 or ECON:4800*	3
F/S	**MATH:3800 Elementary Numerical Analysis** *(P: (MATH:2550 or MATH:2700) & (MATH:1560 or*	3
F	**ACCT:4200 Acctg for Management Analysis & Control** *(P: (STAT:2020 w/min B or ECON:4800 or STAT:4101 or BAIS:2800) & (CS:2110 or BAIS:3005) & ((ACCT:2100 w/min B- & ACCT:2200 w/min B-) or ACCT:3200)); Requirements: restricted to majors)*	3
F	**BIOL:4213 Bioinformatics** *(P: BIOC:3120 or MICR:3170 or BIOL:2512 or BIOC:3110; Recommended:*	4
	CS:4740 Large Data Analysis (check MyUI for offerings) *(P: (CS:1210 w/min C- or ENGR:2730 w/min C-) & (MATH:3800 or CS:3700) & (STAT:3200 or IE:3760 or IGPI:3200)*	3
	CHEM:4480 Introduction to Molecular Modeling (check MyUI for offerings) *(C: CHEM:4432)*	3
S	**BIOL:5320 Computational Genomics** (check MyUI for offerings) *(P: (BIOS:4120 or STAT:3510) &*	3
F	**CHEM:5431 Statistical Thermodynamics I** (spring semester, even years) *(Recommended:*	3
S	**MATH:5600 Nonlinear Dynamics with Numerical Methods** *(P: MATH:3600 & (MATH:3770 or MATH:4210))*	4
S	**MATH:5700 Partial Differential Equations with Numerical Methods** *(P: MATH:2850 & MATH:3600 & (MATH:3770 or MATH:4210))*	4

Total Semester Hours Requirements: 134

Note: students who take ENGR:2730, ECE:3330, CS:2210, CS:2230, and CS:3330 earn a computer science minor.