AICHE

[American Institute of Chemical Engineers]

Guide to Success

Chemical Engineering's Greatest Achievements

During the past Century, chemical engineers have made tremendous contributions to our standard of living. To celebrate these accomplishments, the American Institute of Chemical Engineers (AIChE) has compiled a list of the "10 Greatest Achievements of Chemical Engineering." These triumphs are summarized below:

Petrochemicals, "Black Gold, Texas Tea":

Chemical engineers have helped develop processes like catalytic cracking to break down the complex organic molecules found in crude oil into much simpler species. These building blocks are then separated and recombined to form many useful products including: gasoline, lubricating oils, plastics, synthetic rubber, and synthetic fibers. Petroleum processing is therefore recognized as an enabling technology, without which, much of modern life would cease to function.

Running on Synthetic Rubber:

Chemical engineers played a prominent role in developing today's synthetic rubber industry. During World War II, synthetic rubber capacity suddenly became of paramount importance. This was because modern society runs on rubber. Tires, gaskets, hoses, and conveyor belts (not to mention running shoes) are all made of rubber. Whether you drive, bike, roller-blade, or run; odds are you are running on rubber.

The Plastic Age:

The 19th Century saw enormous advances in polymer chemistry. However, it required the insights of chemical engineers during the 20th Century to make mass produced polymers a viable economic reality. When a plastic called Bakelite was introduced in 1908 it sparked the dawn of the "Plastic Age" and quickly found uses in electric insulation, plugs & sockets, clock bases, iron cooking handles, and fashionable jewelry. Today plastic has become so common that we hardly notice it exists. Yet nearly all aspects of modern life are positively impacted by plastic.

Synthetic Fibers, a Sheep's Best Friend:

From blankets and clothes to beds and pillows, synthetic fibers keep us warm, comfortable, and provide a good night's rest. Synthetic fibers also help reduce the strain on natural sources of cotton and wool, and can be tailored to specific applications. For example; nylon stockings make legs look young and attractive while bullet-proof vests keep people out of harm's way

The Environment, We All Have to Live Here:

Chemical engineers provide economical answers to clean up yesterday's waste and prevent tomorrow's pollution. Catalytic converters, reformulated gasoline, and smokestack scrubbers all help keep the world clean. Also, chemical engineers help reduce the strain on natural materials through synthetic replacements, more efficient processing, and new recycling technologies.

The Human Reactor:

Chemical engineers have long studied complex chemical processes by breaking them up into smaller "unit operations." Such operations might consist of heat exchangers, filters, chemical reactors and the like. This concept has also been applied to the human body. The results of such analysis have helped improve clinical care, suggested improvements in diagnostic and therapeutic devices, and led to mechanical wonders such as artificial organs. Medical doctors and chemical engineers continue to work hand in hand to help us live longer fuller lives.

Wonder Drugs for the Masses:

Chemical engineers have been able to take small amounts of antibiotics developed by people such as Sir Arthur Fleming (who discovered penicillin in 1929) and increase their yields several thousand times through mutation and special brewing techniques. Today's low price, high volume, drugs owe their existence to the work of chemical engineers. This ability to bring once scarce materials to all members of society through industrial creativity is a defining characteristic of chemical engineering.

Food, "It's What's For Dinner":

Plants need large amounts of nitrogen, potassium, and phosphorus to grow in abundance. Chemical fertilizers can help provide these nutrients to crops, which in turn provide us with a bountiful and balanced diet. Fertilizers are especially important in certain regions of Asia and Africa where food can sometimes be scarce. Advances in biotechnology also offer the potential to further increase worldwide food production. Finally, chemical engineers are at the forefront of food processing where they help create better tasting and most nutritious foods.

Liquefied Air, Yes it's Cool:

When air is cooled to very low temperatures (about 320°F below zero) it condenses into a liquid. Chemical engineers can then separate out the different components. The purified nitrogen can be used to recover petroleum, freeze food, produce semiconductors, or prevent unwanted reactions while oxygen is used to make steel, smelt copper, weld metals together, and support the lives of patients in hospitals.

The Atom, as Large as Life:

Biology, medicine, metallurgy, and power generation have all been revolutionized by our ability to split the atom and isolate isotopes. Chemical engineers played a prominent role in achieving both of these results. Early on facilities such as DuPont's Hanford Chemical Plant used these techniques to bring an abrupt conclusion to World War II with the production of the atomic bomb. Today these technologies have found uses in more peaceful applications. Medical doctors use isotopes to monitor bodily functions; quickly identifying clogged arteries and veins.

Adapted from: www.cems.umn.edu/~aiche_ug

Cal Poly Pomona
Advising Sheet

Date: ______________________
Name: ______________________
Bronco ID: ______________________
Major: ______________________

Quarter/Year: ______________________
Class Standing: ______________________

CPP GPA ________
Tsfr GPA ________
Cum GPA ________

Quarter/ Year:

Course	Unit	Grade

Total Units: ________
Qtr GPA ________
CPP GPA ________
Cum GPA ________

Quarter/ Year:

Course	Unit	Grade

Total Units: ________
Qtr GPA ________
CPP GPA ________
Cum GPA ________

Quarter/ Year:

Course	Unit	Grade

Total Units: ________
Qtr GPA ________
CPP GPA ________
Cum GPA ________

Replacement Courses:

Quarter/ Year	Course	Unit	Grade

Notes:
____
____
____

Quarter/ Year:

Course	Unit	Grade

Total Units: ________
Qtr GPA ________
CPP GPA ________
Cum GPA ________

Quarter/ Year:

Course	Unit	Grade

Total Units: ________
Qtr GPA ________
CPP GPA ________
Cum GPA ________

Quarter/ Year:

Course	Unit	Grade

Total Units: ________
Qtr GPA ________
CPP GPA ________
Cum GPA ________

Student Signature ______________________

Advisor Signature: ______________________

Sophomore year

Stoichiometry (CHE 201-Fall, CHE 202-Winter)
*includes lab classes – Dr. Yam Lee

- Learn to conduct basic mass, energy and molar balances
- Learn the basics of process control and calculating unknowns
- Learn about mixing rules
- Analysis of single and multiple phase systems for chemical

Transport Lab 1 (CHE 322L) –Dr. Yam Lee

- Applying experimental design and the basic concepts in fluid mechanics and thermodynamics in experimental study of systems that may involve viscosity measurement, heat of combustion measurement, energy and entropy balance, pump operating characteristics

Senior Year

Unit Operations (CHE 425-Fall) *including lab – Dr. TK

- Combining all the skills learned in the transport series to solve real world problems using heat transfer, mass transfer and fluid mechanics
- Learn about proper distillation, heat exchanger and absorption column design

Process Control (CHE 426-Winter) – Dr. TK

- Introduction to theory, design, and application of automatic control systems to chemical and physical processes

Chemical Process Synthesis and Design (CHE 441-Fall, CHE 442-Winter and CHE 443-Spring)
*including labs for each quarter – Dr. Mingheng Li

- Design of major equipment and control systems common to most chemical industries
- Emphasis on how equipment fits together and interacts in an integrated process.
- Optimization strategies in process design
- Topics in air pollution, water pollution, and solid waste.
- Learn to use process simulators such as HYSYS and PRO/2
- Treatment of process design methodology
- On-site study of selected process industries
- Basic engineering economics including cost estimating
- Team project to perform process design and cost estimating of a complete plant with attention to environmental constraints including state and Federal laws

Junior Year

Thermodynamics Series

Chemical Engineering Thermodynamics (CHE 302-Fall, CHE 303 - Winter) – Dr. Lloyd Lee

- Learn about energy and its transformations
- The effects of heat and work
- Learn about the first and second laws of thermodynamics
- Basics of using equations of states to calculate pressure, volume and temperature of gases in various environments
- Learn the basics of heat pumps, refrigeration cycles, steam power plant cycles and engine cycles

Kinetics and Reactor Design (CHE 304-Spring) – Dr. Lloyd Lee

- Understand how quickly reactions occur for homogeneous and heterogeneous mixtures
- Learn about different types of reactors and when they should be used
- Learn how to calculate the size of a reactor needed for a given reaction
- Transport Series

Fluid Mechanics (CHE 311-Fall) – Dr. TK, Dr. Perry

- Understand how fluids (including air) flow
- Use Bernoulli's equation to find pressure and velocity of a fluid flowing in a pipe
- Understand the basics of how friction affects fluid flow and required pump power

Heat Transfer (CHE 312-Winter) *including lab – Dr. TK

- Learn about the types of heat transfer mechanism
- Calculate amount of heat transfer across a distance
- Understanding thermal resistance and the driving force behind heat transfer
- Applying these concepts to basic design problems for heat exchangers

Mass Transfer (CHE 313-Spring) – Dr. TK

- Learn about mass diffusing into or out of materia
- Calculate the time it takes for a gas to diffuse through a medium
- Understand the driving force behind diffusion
- Apply these concepts to real world process units such as distillation columns

California State Polytechnic University, Pomona
Degree Curriculum Sheet

Plan (Major) **CHEMICAL ENGINEERING** Catalog Year **2014 - 2015** Name _____

Subplan/Option _____ Minimum Units Required **194** Student ID _____

Required Core Courses

Course		Units
Required of all students. A 2.0 cumulative GPA is required in core courses in order to receive a degree in the major.		
Intro to Chemical Engineering & Lab	CHE 131/141L	2/1
Chemical Engineering Analysis & Lab	CHE 132/142L	2/1
Chemical Engineering Data Analysis and Design of Experiments Lab	CHE 143L	1
Stoichiometry I & Lab	CHE 201/211L	3/1
Stoichiometry II & Lab	CHE 202/212L	3/1
Chemical Engineering Thermodynamics I	CHE 302	4
Chemical Engineering Thermodyamics II	CHE 303	4
Kinetics and Reactor Design	CHE 304	4
Momentum Transport	CHE 311	4
Energy Transport	CHE 312	3
Mass Transport	CHE 313	3
Transport Laboratory I	CHE 322L	1
Transport Laboratory II	CHE 333L	1
Unit Operations I & Lab	CHE 425/435L	3/1
Process Controls	CHE 426	3
Process Controls Lab	CHE 436L	1
Chemical Processes Synthesis & Design I & Lab	CHE 441/451L	4/1
Chemical Processes Synthesis & Design II & Lab	CHE 442/452L	3/1
Chemical Processes Synthesis & Design III & Lab	CHE 443/453L	3/1
Undergraduate Project	CHE 463	2
	Total Units	**62**

Required Support Courses

Course		Units
The following required support courses should be taken to satisfy the indicated GE requirement to achieve the maximum units to degree listed at the top of this sheet.		
General Chemistry & Lab (B3)	CHM 121/121L	3/1
General Chemistry & Lab	CHM 122/122L	3/1
General Chemistry	CHM 123	3
Organic Chemistry & Lab	CHM 314/317L	3/1
Organic Chemistry	CHM 315	3
Organic Chemistry	CHM 316	3
Elements of Electrical Engineering & Lab	ECE 231/231L	3/1
Ethical Considerations in Tech and Applied Sci (C4)	IME 402	4
Project Design Principles and Applications (B5)	EGR 481	2
and Project Design Principles and Applications (B5)	EGR 482	2
Analytic Geometry and Calculus I (B4)	MAT 114	4
Analytic Geometry and Calculus II	MAT 115	4
Analytic Geometry and Calculus III	MAT 116	4
Calculus of Several Variables I	MAT 214	3
Calculus of Several Variables II	MAT 215	3
Differential Equations	MAT 216	4
or Elem Linear Algebra and Diff Equations	MAT 224	(4)
Vector Statics	ME 214	3
Materials Science and Engineering	MTE 207	3
Materials Science and Engineering Lab	MTE 317L	1
Corrosion and Materials Degradation & Lab	MTE 401/401L	3/1
General Physics & Lab (B1, B3)	PHY 131/131L	3/1
General Physics & Lab	PHY 132/132L	3/1
General Physics & Lab	PHY 133/133L	3/1
	Total Units	**78**

Elective Support Courses

Course	Units
Upper Division MTE/CHE Elective	*3*
Total Units	**3**

General Education Requirements

Area	Units
Area A Communication & Critical Thinking	12
1. Oral Communication	
2. Written Communication	
3. Critical Thinking	
Area B Mathematics & Natural Sciences	16
Select at least one lab course from subarea 1 or 2.	
1. Physical Science	
2. Biological Science	
3. Laboratory Activity	
4. Math/Quantitative Reasoning	
5. Science & Technology Synthesis	
Area C Humanities	16
1. Visual and Performing Arts	
2. Philosophy and Civilization	
3. Literature and Foreign Language	
4. Humanities Synthesis	
Area D Social Sciences	20
1. U.S. History, Constitution, American Ideals	
a. United States History	
b. Introduction to American Government	
2. History, Economics and Political Science	
3. Sociology, Anthropology, Ethnic & Gender Studies	
4. Social Science Synthesis	
Area E Lifelong Understanding & Self Development	4
Total Units	**68**

American Institutions Courses that satisfy this requirement may also satisfy GE Area D1	8

American Cultural Perspectives Requirement Refer to catalog for list of courses that satisfy this requirement. Course may also satisfy major, minor, GE, or unrestricted elective requirements.	4

All persons who receive undergraduate degrees from Cal Poly Pomona must pass the Graduation Writing Test (GWT). The test must be taken by the quarter following completion of 120 units for undergraduates.

CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA
CHEMICAL ENGINEERING

CURRICULUM FLOWSHEET, 2013-2014 — 2014 - 2015 — 2014 — 2015

NAME: _____
CPID: _____

FRESHMAN			SOPHOMORE			JUNIOR			SENIOR		
FALL	WINTER	SPRING	FALL	WINTER	SPRING	FALL	WINTER	SPRING	FALL	WINTER	SPRING
units	units	units	units	units	units	units	units	units	units	units	units
[1] CHE131/ 141L 3 [Preq: MAT105,ENG96]	[6] CHE132/ 142L 3 [Preq: MAT105,ENG96]	[10] CHE 143L 1 [Preq: 5,6]	[15] CHE201/ 211L 4 [Preq: 3,9]	[20] CHE202/ 212L 4 [Preq: 15,19]	[25] CHE 322L 1 [Preq: 20]	[31] CHE 302 4 [Preq:17,21,24]	[35] CHE 303 4 [Preq: 31]	[39] CHE 304 4 [Preq: 35, 36]	[49] CHE 425/435L 4 [Preq: 36,39]	[53] CHE 426 3 [Preq: 36,39]	
[43] AREA E 4		[11] PHY131/ 131L 4 [Preq: 4] (B1,B3)	[16] ME 214 3 [Preq: 11]	[21] MTE 207 3 [Preq:3,11,13]	[26] MTE 317L 1 [Preq:21]	[32] CHE 311 4 [Preq: 16,20,24]	[36] CHE 312 3 [Preq:31,32]	[38] CHE313 3 [Preq: 35,36]	[45] CHE441/ 451L 5 [Preq: 39,38]	[50] CHE442/ 452L 4 [Preq: 45]	[55] CHE443/ 453L 4 [Preq:50]
[3] CHM121/ 121L 4 (Area B1,B3)	[7] CHM122/ 122L 4 [Preq: 3]	[12] CHM 123 3 [Preq: 7]	[17] PHY132/ 132L 4 [Preq: 8,11]	[22] PHY133/ 133L 4 [Preq:8, 11]	[27] ECE231/ 231L 4 [Preq: 13,11]		[40] CHE 333L 1 [Preq: 25,31,32]		[46] EGR 481 (Area B5) 2 [Preq:GWT & senior]	[51] EGR 482 (Area B5) 2 [Preq:46]	[56] CHE 463 2 [Preq:51]
[4] MAT 114 4 (Area B4)	[8] MAT 115 4 [Preq: 4]	[13] MAT 116 4 [Preq: 8]	[18] CHM314/ 317L 4 [Preq: 12]	[23] CHM 315 3 [Preq: 18]	[28] CHM 316 3 [Preq: 23]	[33] CHM 327/L or a list* 4 [Preq: 18,26]	[37] MTE/ChE Elective 3 [Prer:21,26]		[47] MTE 401/ 401L 4 [Preq: 21,27,35]		[42] Area C3 4
			[19] MAT 216 or 224 4 [Preq: 13]	[24] MAT 214 3 [Preq: 13]	[29] MAT 215 3 [Preq: 24]					[54] CHE436L 1 [Coreq: 53]	
					[30] AREA A1 4			[41] AREA A3 4		[52] AREA D4 4	[57] EGR402 4 (Area C4)
IGE 120 4	IGE 121 4	IGE 122 4				IGE 220 4	IGE 221 4	IGE 222 4	IGE 223 4	IGE 224 4	
GE [5] ENG 104 4 (Area A2)	[9] AREA C1 4	[14] AREA C2 4				[34] Area D2 4	[42] Area D3 4	[2] AREA B2 3		[48] PLS 201 4 (Area D1a)	[53] HST 202 4 (Area D1b)
UNITS 19	15	16	19	17	15	16	15	14	15	18	16

Refer to the University Catalog for complete prerequisite and corequisite requirements.

* 4 units from any of the following list: CHM 327/L, CHM 321/L, CHM 311, CHM 312, CHM 313, CHM 352L, CHM 353L

☐ GWT Test available at the completion of 90 units, mandatory at 120 units

Revised:11/03/2011

TOTAL 198

CALIFORNIA STATE POLYTECHNIC UNIVERSITY POMONA

Materials Engineering Minor For Chemical Engineering Majors

Materials Science and Engineering relates the properties of materials to their structure. All engineers are called upon to work on new ideas and with novel materials. Almost every field of engineering is limited by the properties of available materials. The graduate with an understanding of the principles of materials behavior possesses a decided career advantage.

The College of Engineering provides a minor in Materials Science and Engineering to the student who satisfactorily completes 24-units requirement within her/his major curriculum. It is frequently possible for students to complete the minor within the normal requirements for an engineering degree through careful advisement including authorized substitutions.

Requirements for the MTE Minor

Core Courses (Total Required = 12)

Materials Science and Engineering	**MTE 207**	**(3)**
Materials Science and Engineering Lab	**MTE 317L**	**(1)**
Mass Transport	**CHE 313**	**(3)**
Transport Laboratory II	**CHE 333L**	**(1)**
Chemical & Materials Engineering Thermo 1	**CHE 302**	**(4)**

MTE Elective Courses (Total Required = 11 or 12)

Take any three of the following courses (from any stream) for a total of 12 units.

Corrosion and Degradation of Materials	**MTE 401**	**(3/1)**
Mechanical Metallurgy and Lab	**MTE 320/L**	**(3/1)**
Fracture and Failure Analysis	**MTE 422**	**(4)**
Physical Metallurgy	**MTE 406/416L**	**(3/1)**
Ceramic Materials/Laboratory	**MTE 407/L**	**(3/1)**
Composite Materials/Laboratory	**MTE 408/418L**	**(3/1)**
Polymer Engineering/Laboratory	**MTE 303/L**	**(3/1)**

LEARNING RESOURCE CENTER

Library, 2nd Floor Rooms 2921 & 2919 (Free Tutoring)

Hours: M-Th (9am-5pm); F (9am-4pm)

COLLEGE READING SKILLS PROGRAM (CRSP)

- Reading tutorials, supplemental academic advising, mentoring, and other services
- CRSP is a TRIO Student Support Services Program; participants must meet eligibility requirements.

GENERAL TUTORING (Formerly ASI)

- One-to-one and group tutoring in Business, Humanities and Social Science courses
- Tutoring by appointment and some walk-in

MATH and SCIENCE HELP (MaSH)

- Tutoring and workshops in math, science, and engineering courses
- Walk-in Center and appointments

UNIVERSITY WRITING CENTER (UWC)

- Tutoring and workshops in English, writing & GWT
- CPU 401 assistance

909-869-3502, lrc@csupomona.edu
Accudemia (scheduling): http//calpoly.accudemia.net

Other Available Minors for Chemical Engineering Majors

Besides the Materials minor, Mathematics and Chemistry are additional minors that only require a few extra classes to complete due to our overlapping curriculum. Both require a minimum GPA of 2.0 in their related coursework.

Minor in Mathematics

Additional classes:

- MAT 208
- In addition, any **four** of the upper division courses (except MAT 394, 395, 400, 461, 462, 463, 491, 492, 493, 494, 495, 496, 497, STA 309, 315)*

  *No more than two upper division STA courses & no more than one of MAT 317 or MAT 318

Units Total: 41

Minor in Chemistry

Additional classes:

- CHM 221/L, CHM 123L, CHM 301/A, CHM 304/A or CHM 311*
- In addition, **4 units** of any 300-400 level Chemistry course(s)

  *If you take CHM 311, you need 6 additional units from any 300-400 level Chemistry courses

Units Total: 29