



Otto H. York Department of Chemical, Biological and Pharmaceutical Engineering B.S. Program Requirements

Undergraduate Curriculum
Five Year Co-op Program Cycle A
Fall 2017

OTTO H. YORK
DEPARTMENT OF CHEMICAL, BIOLOGICAL AND PHARMACEUTICAL ENGINEERING
Tiernan Hall – Room 150
Main Telephone Number: (973) 596-3568
Department Website: www.njit.edu/che

		<u>Location</u>	<u>Phone</u>
OFFICE: MAIN TELEPHONE NUMBER		150T	3568
Chair	Dr. Lisa Axe		
Lisa Axe	Axe@njit.edu		2477
Associate Chair for Graduate Studies (PhD Advisor)	Edward Dreizin	326 YCEES	5751
	dreizin@njit.edu		
Associate Chair for Undergraduate Studies	Ecevit Bilgili	234 YCEES	2998
	Bilgece@njit.edu		
<u>ADVISORS:</u>			
Chemical Engineering:	Undergraduate Advisor:	Obuskovic, Gordana	150H T 5451
		Gordana.Obuskovic@njit.edu	
	Graduate Advisor MS	Reginald Tomkins	357 T 5656
		Tomkinsr@njit.edu	
Pharmaceutical Engineering (PhEN):	Program Director:	Armenante, Piero	120 YCEES 3548
		Piero.Armenante@njit.edu	

DEPARTMENT STAFF:

Assistant to the Chair/Administration	Wos, Cynthia	150T	642-4383
	Cynthia.M.Wos@njit.edu		
Assistant to Chair/Labs	Yetman, Shawn	150C T	642-7076
	Shawn.Yetman@njit.edu		
Administrative Assistants:	Arthur, Brenda	321C T	8479
	Arthur@njit.edu		
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	Manning@njit.edu		
	Tomlinson, Kathy	150T	3570
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DEPARTMENT FACULTY: CHEMICAL ENGINEERING

<u>Name</u>	<u>Advisor #</u>	<u>Location</u>	<u>Phone</u>
Armenante, Piero	080	120 YCEES	3548
Axe, Lisa	210	150H	2477
Baltzis, Basil	081	382 Fenster	3619
Barat, Robert	082	380 T	5605
Basuray, Sagnik	088	361 T	5706
Bilgili, Ecevit	090	382 T	2998
Dave, Rajesh	445	2080 YCEES	5860
Elele, Ezinwa		387 T	5706
Gogos, Costas	116	3404 GITC	642-7365
Gor, Gennady	214	364T	2944
Guvendiren, Murat	217	204 YCEES	2932
Dreizin, Edward	115	326 YCEES	5751
Hanesian, Deran	085	374T	3597
Khusid, Boris	114	215 FMH	3316
Mc Ennis, Kathleen	093	382 T	6598
Moldetsky, Irina		350 T	3599
Perna, Angelo	089	376T	3616
Sebastian, Donald		400 Fenster	8449
Simon, Laurent	103	400 Fenster	5263
Sirkar, Kamalesh K.	071	371T	8447
Tomkins, Reginald P.T.	145	357T	5656
Wang, Xianqin	119	360 T	5707
Xu, Xiaoyang	091	362T	5359
Voronov, Roman	212	387T	642-4762

Joint Appointment

Michael Boufadel	130	232 YCEES	3459
Joseph Bozzelli	182	435 Colton	5657
Alexei Khalizov	158	356 Tiernan	3583
Somenath Mitra	148	151T	5611
Kumar, Vivek	061	316CEES	5577

CHEMICAL ENGINEERING PROGRAM

Chemical engineers use chemistry, biology, physics and math in an integrated engineering mode in order to manufacture materials and products essential to modern society. They are involved with the full scale of processes, from the laboratory bench to the pilot plant and eventually to the manufacturing facility. The academic training of chemical engineers provides a strong background for a variety of areas, including:

- Process Design
- Pharmaceutical Engineering
- Production Engineering
- Research and Development
- Marketing/Technical Sales
- Environmental and Waste Management
- Safety

At present, chemical engineers are involved in areas such as producing more effective pharmaceuticals and more durable plastics, developing biotechnology, genetic engineering applications, and producing electronic materials. They are also involved in the more traditional areas of petroleum refining and chemical manufacturing. A chemical engineer may choose to work in a variety of industries, which include chemicals, pharmaceuticals, food, energy, and environmental control. A chemical engineering degree also serves as a good preparation for law, business, or medical school.

The mission of the department is to:

1. educate undergraduate students for employment in industry and the pursuit of graduate studies;
2. educate graduate students for employment in industry, government, or academe;
3. educate students, both undergraduate and graduate, for leadership roles
4. engage in research to support the advanced education of graduate students, maintain the intellectual vitality of the faculty, and expand the frontiers of knowledge in areas of importance to the state and nation;
5. publish and present the results of our intellectual activities, resulting from both research as well as teaching advances;
6. serve our profession through membership and leadership on national and international societies, journals and editorial boards, and
7. serve our wider constituencies by offering our expertise to industries, state and local communities, and pre-college students and teachers.

CHEMICAL ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES

The Chemical Engineering Department will produce graduates possessing:

1. **Engineering Practice:** Graduates of our program are successfully engaged in the practice of chemical engineering within industry, academe and government working in a wide array of technical specialties including but not limited to process and plant design operations.
2. **Professional Growth:** Graduates of our program advance their skills through professional growth and development activities such as graduate study in engineering or complimentary disciplines, and continuing education; some graduates will transition into other professional fields such as business, law and medicine through further education.
3. **Service:** Graduates of our program perform service to the society and the engineering profession through participation in professional societies, government, civic organizations, and humanitarian endeavors.

CHEMICAL ENGINEERING PROGRAM OUTCOMES

Graduates of the Otto H. York Department of Chemical, Biological and Pharmaceutical Engineering will have:

- a) an ability to apply knowledge of mathematics, science, and engineering.
- b) an ability to design and conduct experiments, as well as to analyze and interpret data of importance to the design and analysis of chemical processes.
- c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- d) an ability to function on multi-disciplinary teams.
- e) an ability to identify, formulate, and solve engineering problems.
- f) an understanding of professional and ethical responsibility.
- g) an ability to communicate effectively through written reports and oral presentations.
- h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
- i) a recognition of the need for, and an ability to engage in life-long learning.
- j) an introduction to contemporary issues in chemical engineering.
- k) an ability to use the techniques, skills and modern engineering tools necessary for chemical engineering practice.

The program in Chemical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, MD. 21202-4012; (410) 347-7700; web: <http://www.abet.org>.

ADVISEMENT

Scheduling of advisement appointments is available online using Student Success Collaborative.

- Log in: My NJIT
- Click the link for Student Services
- Under Online Resources click Student Success Collaborative
- Choose Select Advising w/ Dr. Obuskovic and select available date & time

FRESHMAN ADVISEMENT

Some freshmen are assigned courses (Chem 121-122; Eng 095-HUM 099-HUM 100) and/or lightened credit loads. It is particularly important for these students to see **Dr. Gordana Obuskovic** to plan their courses for subsequent semesters. Completing pre-requisites for sophomore courses may involve attending summer sessions and/or spending an additional semester at NJIT.

**B.S. CHEMICAL ENGINEERING
Five Year Co-op Program Cycle A
FALL 2017**

FIRST YEAR

First Semester

Chem 125	General Chemistry I	3-0-3
FED 101	Fundamentals of Engineering Design	2-1-2
HUM 101	English Comp: Writing, Speaking, Thinking	3-0-3
Math 111	Calculus I	4-1-4
Phys 111	Physics I	3-0-3
Phys 111A	Physics I Laboratory	0-2-1
Frsh Sem	Freshman Seminar	1-0-0

Subtotal **16.0**

SECOND YEAR

First Semester

ChE 210	Chemical Process Calculations I	3-0-2
ChE 210W	CPC I Workshop	0-1-0
ChE 230	Chemical Engineering Thermodynamics I	3-0-3
ChE 230W	ChE Thermodynamics I Workshop	0-1-0
Chem 245	Organic Chemistry for Chemical Engineers	4-1-4
Math 211	Calculus III A	3-0-3
HUM 2xx	(Com/Eng/Lit/Hist/Phil/STS/Hum/Thtr: GER)	3-0-3
Engr 210	Careers Planning for Engineers	1-0-1

Subtotal **16.0**

THIRD YEAR

First Semester

Engr 310	Co-op Work Experience I (Duration Summer through Fall)	0-0-12
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Subtotal **12.0**

FOURTH YEAR

First Semester

Engr 410	Co-op Work Experience II (Duration Summer through Fall)	0-0-12
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Subtotal **12.0**

FIFTH YEAR

First Semester

ChE 460	Separation Processes II	3-0-2
ChE 489	Process Dynamics and Control	2-2-3
ChE 495	Chemical Engineering Laboratory I	0-5-3
Elective	(Com/Eng/Lit/Hist/Phil/STS/Hum/Thtr: GER) *	3-0-3
Elective	(Concentration)	3-0-3

Subtotal **14.0**

FIRST YEAR

Second Semester

ChE 101	Introduction to Chemical Engineering	1-0-0
Chem 124	General Chemistry Laboratory	0-2-1
Chem 126	General Chemistry II	3-0-3
CS 115	Introduction to Computer Science I C++	3-0-3
HUM 102	English Comp: Writing, Speaking, Thinking	3-0-3
Math 112	Calculus II	4-1-4
Phys 121	Physics II	3-0-3
Phys 121A	Physics II Laboratory	0-2-1

Subtotal **18.0**

SECOND YEAR

Second Semester

Chem 238	Analytical/Organic Chem Lab for ChE's	0-4-2
ChE 240	Chemical Process Calculations II	3-0-3
ChE 240W	CPC II Workshop	0-1-0
ChE 260	Fluid Flow	3-0-3
Chem 236	Physical Chemistry for Chemical Engineers	4-1-4
Math 222	Differential Equations	4-0-4

Subtotal **16.0**

THIRD YEAR

Second Semester

ChE 342	Chemical Engineering Thermodynamics II	3-0-3
ChE 370	Heat and Mass Transfer	4-0-4
ChE 380	Introduction to Biotechnology	3-0-3
Eng 352	Technical Writing	3-0-3
Chem 339	Analytical/Physical Chem. Lab. for ChE's	0-4-2
Math 225	Survey of Probability and Statistics***	1-0-1

Subtotal **16.0**

FOURTH YEAR

Second Semester

ChE 312	Chemical Process Safety	3-0-3
ChE 349	Kinetics and Reactor Design	3-0-3
ChE 360	Separation Processes I	3-0-2
ChE 365	Techniques for Process Simulation	3-0-2
ChE 375	Structure, Properties and Proc. of Materials	3-0-3
IE 492	Engineering Management	3-0-3

Subtotal **16.0**

FIFTH YEAR

Second Semester

ChE 472	Process and Plant Design	4-0-4
ChE 496	Chemical Engineering Laboratory II (Concentration)	0-6-3
Elective	(Concentration)	3-0-3
Elective	(Concentration)	3-0-3
Elective	(HSS Capstone Seminar: GER) **	3-0-3

Subtotal **16.0**

TOTAL CREDITS **152**

Students must earn a 2.0 minimum GPA and must meet appropriate departmental regulations. These include an average GPA of 2.0 in all chemical engineering courses.

* Elective: One 300 level course in Literature, History, Philosophy or STS

** Capstone Seminar: All students must take one 400 level Capstone Seminar offered by the Department of Humanities and Social Sciences

*** Students must take Math 225 (Special Section for ChE and Chemistry) at the same time as Chem 339.

PRE-REQUISITES

It is the responsibility of the student to check the pre-requisites for each course before registering for that course. The Department will dismiss a student from any course for which he/she does not have the pre-requisites unless prior permission has been obtained from the department to register for the class. All student files will be checked to see that the pre-requisites are being strictly adhered to. Also, if you do not satisfy the pre-requisites, the on-line registration procedures will not allow you to register.

CHEMICAL ENGINEERING

<u>COURSE</u>	<u>PRE-REQUISITES</u>
ChE 210	Chem 126 (or Chem 122), Math 112, CS 115 (co-requisite)
ChE 230	Chem 126 (or Chem 122), Phys 111, Math 211 (or Math 213) (co-requisite)
ChE 240	ChE 210, ChE 230
ChE 260	ChE 230, ChE 240 (co-requisite), Math 222 (co-requisite)
ChE 342	ChE 230, Chem 236, Math 211 (or Math 213)
ChE 349	ChE 370, Chem 236, Math 222, ChE 342
ChE 360	ChE 342, ChE 370
ChE 365	ChE 370, ChE 360 (co-requisite)
ChE 370	ChE 240, ChE 260, Math 222
ChE 375	Chem 236, (or Chem 235),
ChE 380	Chem 126 (or Chem 122)
ChE 460	ChE 360
ChE 472	ChE 349, ChE 365, ChE 375, ChE 380, ChE 460(co-requisite), IE 492
ChE 489	ChE 349, ChE 365
ChE 495	ChE 370, Eng 352, Math 225A (co-requisite)
ChE 496	ChE 349, ChE 360, Chem 339, ChE 380, ChE 495, Math 225A, ChE 460 (co-requisite), ChE 489 (co-requisite)

CHEMISTRY

<u>COURSE</u>	<u>PRE-REQUISITES</u>
Chem 125	Placement Exam Required
Chem 124	Chem 126 (or Chem 122) (co-requisite)
Chem 126	Chem 125
Chem 236	Chem 126 (or Chem 122), ChE 230, Math 222 (co-requisite)
Chem 245	Chem 126 (or Chem 122)
Chem 238	Chem 124, Chem 245
Chem 339	Chem 236, Math 225A (co-requisite)

TECHNICAL ELECTIVE CONCENTRATION AREA

Seniors in Chemical Engineering are *strongly* recommended to use their three technical electives to form a "concentration" area. The Undergraduate Advisor for Chemical Engineering must be consulted to assure a coherent selection of electives. The concentration area can be based in engineering, science, or mathematics. Students are encouraged to build a concentration in an area of personal interest, perhaps in preparation for future endeavors such as employment or graduate school. In the absence of a technical concentration area, one of the electives must be within Chemical Engineering. The choices of the remaining two technical electives should be approved by the advisor.

Students should always consult the current university catalog for prerequisites and course descriptions of all electives. Since courses, especially electives, are usually not offered every term, it is important that planning, in consultation with the Departmental Advisor, for the concentration area occurs before senior year. Recognition should also be made that not all courses listed in the current university catalog are offered every year. Therefore, for courses outside of Chemical Engineering, it is advisable that the home departments of desired courses be contacted to verify future course offerings.

Generally, a technical elective may be any 300-level or higher course from engineering, science, or mathematics. Students with a GPA greater than 3.0 may request enrollment in a concentration-appropriate graduate course. If appropriate, students may request one semester of independent study in active research within the concentration area provided the effort is supervised by a research-active faculty member.

While there are many possible concentration areas, some *example* concentration areas are listed here:

Chemistry	Bio/Pharmaceutical	Environmental
Applied Physics	Pre-Med	Materials
Mathematics	Polymers	Bio-Medical

**B.S. CHEMICAL ENGINEERING
ACADEMIC CURRICULUM CHECK LIST
Five Year Co-op Program Cycle A
FALL 2017**

Name: _____

I. D. No. _____

FIRST YEAR - Term 1	Year	Sem.	Grade	FIRST YEAR - Term 2	Year	Sem.	Grade
Chem 125	3-0-3	_____	_____	ChE 101	1-0-0	_____	_____
FED 101	2-1-2	_____	_____	Chem 124	0-2-1	_____	_____
HUM 101	3-0-3	_____	_____	Chem 126	3-0-3	_____	_____
Math 111	4-1-4	_____	_____	CS 115	2-1-3	_____	_____
Phys 111	3-0-3	_____	_____	HUM 102	3-0-3	_____	_____
Phys 111A	0-2-1	_____	_____	Math 112	4-1-4	_____	_____
Freshman Seminar	1-0-0	_____	_____	Phys 121	3-0-3	_____	_____
				Phys 121A	0-2-1	_____	_____
Subtotal	16.0			Subtotal	18.0		
SECOND YEAR - Term 3	Year	Sem.	Grade	SECOND YEAR - Term 4	Year	Sem.	Grade
ChE 210	3-0-2	_____	_____	Chem 238	0-4-2	_____	_____
ChE 210W	0-1-0	_____	_____	ChE 240	3-0-3	_____	_____
ChE 230	3-0-3	_____	_____	ChE 240W	0-1-0	_____	_____
ChE 230W	0-1-0	_____	_____	ChE 260	3-0-3	_____	_____
Chem 245	4-1-4	_____	_____	Chem 236	4-1-4	_____	_____
Math 211	3-0-3	_____	_____	Math 222	4-0-4	_____	_____
HUM 2xx	3-0-3	_____	_____				
Engr 210	1-0-1	_____	_____				
Subtotal	16.0			Subtotal	16.0		
THIRD YEAR - Term 5	Year	Sem.	Grade	THIRD YEAR - Term 6	Year	Sem.	Grade
Engr 310	0-0-12	_____	_____	ChE 342	3-0-3	_____	_____
				ChE 370	4-0-4	_____	_____
				ChE 380	3-0-3	_____	_____
				Eng 352	3-0-3	_____	_____
				Chem 339	0-4-2	_____	_____
				Math 225	1-0-1	_____	_____
Subtotal	12.0			Subtotal	16.0		
FOURTH YEAR - Term 7	Year	Sem.	Grade	FOURTH YEAR - Term 8	Year	Sem.	Grade
Engr 410	0-0-12	_____	_____	ChE 312	3-0-3	_____	_____
				ChE 349	3-0-3	_____	_____
				ChE 360	3-0-2	_____	_____
				ChE 365	3-0-2	_____	_____
				ChE 375	3-0-3	_____	_____
				IE 492	3-0-3	_____	_____
Subtotal	12.0			Subtotal	16.0		
FIFTH YEAR - Term 9	Year	Sem.	Grade	FIFTH YEAR - Term 10	Year	Sem.	Grade
ChE 460	3-0-2	_____	_____	ChE 472	4-0-4	_____	_____
ChE 489	2-2-3	_____	_____	ChE 496	0-6-3	_____	_____
ChE 495	0-5-3	_____	_____	Elective (Concentration)	3-0-3	_____	_____
Elective (Lt/Hs/Ph/STS)GER	3-0-3	_____	_____	Elective (Concentration)	3-0-3	_____	_____
Elective (Concentration)	3-0-3	_____	_____	Elective (HSS Cap.Sem GER)	3-0-3	_____	_____
Subtotal	14.0			Subtotal	16.0		

POLICY ON WITHDRAWING FROM A COURSE

Students **will not be** allowed to withdraw from a course after the ninth week of the semester without obtaining the signatures of the Department Chairman, faculty member involved and the office of the Dean of Student Services.

CO-OPERATIVE EDUCATION

The Co-operative Education Program gives the student an opportunity to enhance the academic degree program offered by the Department. Early in the sophomore year interested and qualified students with grade point averages of 2.2 or better may apply for Co-op. Co-op consists of supervised, paid employment related to the student's area of study. Participation in Co-op extends the minimum time required for the degree program to four and one-half or five years. A limited number of summer internships are also available. A substantial salary, which helps defray college and other living expenses, is earned during Co-op work periods. ChE 310 and ChE 311 may be used for additive credit only. Further information may be obtained from the Office of Co-operative Education and Internships and from the Co-op Advisor, (**Dr. Gordana Obuskovic**).

GRADUATION

Students who expect to receive their degree in May must apply for graduation from November through mid-December. August graduates must apply for graduation from May through June. January graduates must apply for graduation by mid-October.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS (AIChE)

The American Institute of Chemical Engineers has a very successful student chapter at NJIT. The Chapter usually meets every week during the Monday common hour. Meetings include talks by professional engineers, plant trips and a variety of social activities. The officers of the Chapter will be pleased to meet with you. **Location:** 103 Tiernan Hall. **Faculty Advisor:** Dr. Reginald Tomkins.

OMEGA CHI EPSILON

Omega Chi Epsilon is the National Chemical Engineering Honor Society. It is intended to honor students of merit. Members pursue many activities beneficial to their own professional advancement and that of their colleagues, the profession and the department. Tutoring and external public service projects are two of the activities in which the members participate. **Location:** 103 Tiernan Hall. **Faculty Advisor:** Dr. Angelo Perna.

EXIT INTERVIEWS

All graduating seniors are required to arrange an interview with the Department Chairperson towards the end of their final semester. Please check in the department office for the interview schedule.