



Otto H. York Department of Chemical and Materials Engineering B.S. Program Requirements



Undergraduate Curriculum
Fall 2019

New Jersey Institute of Technology
Newark, NJ 07102

OTTO H. YORK
DEPARTMENT OF CHEMICAL AND MATERIALS ENGINEERING
 Tiernan Hall – Room 150
 Main Telephone Number: (973) 596-3568
 Department Website: chemicaleng.njit.edu

	<u>Location</u>	<u>Phone</u>
OFFICE: MAIN TELEPHONE NUMBER	150T	3568
Chairperson		
	Dr. Lisa Axe Axe@njit.edu	150E 2477
Associate Chair for Graduate Studies (PhD Advisor)		
	Edward Dreizin Dreizin@njit.edu	326 YCEES 5751
Director for Materials Science & Engineering Program		
Option Materials Engineering (MS Advisor) (PhD Advisor)		
	David Venerus Venerus@njit.edu	204 YCEES 3158
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	Ecevit Bilgili Bilgece@njit.edu	234 YCEES 2998
<u>Program Director:</u>		
Chemical Engineering (BS/MS Che Advisor)		
Pharmaceutical Engineering (MS PhEn Advisor) (Co-op Advisor)		
	Obuskovic, Gordana Gordana@njit.edu	150H T 5451
<u>DEPARTMENT STAFF:</u>		
Assistant to the Chair/Administration	Wos, Cynthia Wos@njit.edu	150T 642-4383
Director of CME Labs/NCE Safety Coordinator	Yetman, Shawn Shawn.Yetman@njit.edu	150C T 642-7076
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		150T 3577
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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	150E	2477
Baltzis, Basil	081	382 Fenster	3619
Barat, Robert	082	374T	5605
Basuray, Sagnik	088	361 T	5706
Bilgili, Ecevit	090	234 YCEES	2998
Cimino, Richard		387T	5729
Dave, Rajesh	445	308 YCEES	5860
Dreizin, Edward	487	326 YCEES	5751
Gogos, Costas	116	3901 GITC	642-7365
Gor, Gennady	214	357T	2944
Guvendiren, Murat	217	330 YCEES	2932
Khusid, Boris	486	215 FMH	3316
Mc Ennis-Syverud, Kathleen	093	382 T	6598

Molodetsky, Irina		350 T	3599
Perna, Angelo	089	376T	3616
Reid, Nellone		364T	2995
Schoenitz, Mirko	114	218 YCEES	5260
Sebastian, Donald		400 Fenster	8449
Simon, Laurent	111	392 Fenster	3572
Sirkar, Kamallesh K.	071	371T	8447
Venerus, David	145	204 YCEES	3158
Voronov, Roman	212	378T	642-4762
Wang, Xianqin	119	360 T	5707
Xu, Xiaoyang	091	362T	5359
Young, Joshua	085	322 YCEES	642-4087

Joint Appointment

Alexei Khalizov	158	356 T	3583
Kumar, Vivek	061	316 YCEES	5577
Michel Boufadel	182	435 Colton	5657
Somenath Mitra	148	151T	5611

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 and Materials Engineering will have:

- 1.) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- 2.) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- 3.) an ability to communicate effectively with a range of audiences.
- 4.) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- 5.) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- 6.) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- 7.) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

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

All students are required to see their advisor at least once each semester prior registration for the following semester. Registration holds are removed following the meeting. All undergraduates must schedule their appointments with **Dr. Gordana Obuskovic**. Appointments can be made via following link <https://gordana.youcanbook.me> or by calling 973.596.3568.

FRESHMAN ADVISEMENT

Some freshmen are assigned courses (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.

**CURRENT APPROVED CURRICULUM
B.S. CHEMICAL ENGINEERING
ACADEMIC CURRICULUM FALL 2019**

FIRST YEAR

First Semester

Chem 125	General Chemistry I	3-0-3
FED 101	Fundamentals of Engineering Design	2-1-2
HUM 101	Eng. 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	2-1-2
ChE 230	Chemical Engineering Thermodynamics I	3-1-3
Chem 245	Organic Chemistry for Chemical Engineers	4-1-4
Math 211	Calculus III A	3-0-3
Elective	Humanities and History GER (200 level)*	3-0-3
Engr 210	Careers Planning for Engineers	1-0-1

Subtotal 16.0

THIRD YEAR

First Semester

ChE 342	Chemical Engineering Thermodynamics II	3-0-3
ChE 370	Heat and Mass Transfer	4-0-4
ChE 375	Structure, Properties and Proc. of Materials	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 13.0

FOURTH YEAR

First Semester

ChE 489	Process Dynamics and Control	2-2-3
ChE 495	Chemical Engineering Laboratory I	0-5-2
IE 492	Engineering Management	3-0-3
Elective	(Concentration)	3-0-3
Phil 334	Eng. Ethics and Technology Practice	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	Eng. 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	2-1-2
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 15.0

THIRD 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	3-0-3
ChE 365	Chemical Engineering Computing	3-0-3
Eng 352	Technical Writing	3-0-3

Subtotal 15.0

FOURTH YEAR

Second Semester

ChE 472	Process and Plant Design	4-0-4
ChE 496	Chemical Engineering Laboratory II	0-6-3
Elective	(Concentration)	3-0-3
Elective	Hum. and Soc. Sci. Senior Seminar ***	3-0-3

Subtotal 13.0

TOTAL CREDITS

120

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.

* One 200 level course in Communication, English, Literature, History, Philosophy, STS, Humanities or Theater

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

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

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. In addition, 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, Math 112
ChE 230	Chem 126, 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 342, ChE 370, Chem 236, Math 222
ChE 360	ChE 342, ChE 370
ChE 365	ChE 370, CS 115, ChE 360 (co-requisite)
ChE 370	ChE 240, ChE 260, Math 222
ChE 375	Chem 236, (or Chem 235)
ChE 472	ChE 349, ChE 365, ChE 375, IE 492
ChE 489	ChE 349, ChE 365
ChE 495	ChE 370, Eng 352, Math 225
ChE 496	ChE 349, ChE 360, ChE 495, Chem 339, Math 225, ChE 489 (co-requisite)

CHEMISTRY

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

ELECTIVE CONCENTRATION AREA

Seniors in Chemical Engineering are *strongly* recommended to use their three 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 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, an elective may be any 300-level or higher course from engineering, science, or mathematics or courses taken within the minor. Students with a GPA greater than 3.0 may request enrollment in a concentration-appropriate graduate course with or without declaring BS/MS or BS/MBA program. If appropriate, students may request two semesters of independent study (CHE491 and CHE492) 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
FALL 2019**

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	2-1-2	_____	_____	Chem 238	0-4-2	_____	_____
ChE 230	3-1-3	_____	_____	ChE 240	2-1-2	_____	_____
Chem 245	4-1-4	_____	_____	ChE 260	3-0-3	_____	_____
Math 211	3-0-3	_____	_____	Chem 236	4-1-4	_____	_____
Hum and Hist. GER 200	3-0-3	_____	_____	Math 222	4-0-4	_____	_____
Engr 210	1-0-1	_____	_____				
Subtotal	16.0			Subtotal	15.0		

THIRD YEAR - Term 5	Year	Sem.	Grade	THIRD YEAR - Term 6	Year	Sem.	Grade
ChE 342	3-0-3	_____	_____	ChE 312	3-0-3	_____	_____
ChE 370	4-0-4	_____	_____	ChE 349	3-0-3	_____	_____
ChE 375	3-0-3	_____	_____	ChE 360	3-0-3	_____	_____
Chem 339	0-4-2	_____	_____	ChE 365	3-0-3	_____	_____
Math 225	1-0-1	_____	_____	Eng 352	3-0-3	_____	_____
Subtotal	13.0			Subtotal	15.0		

FOURTH YEAR - Term 7	Year	Sem.	Grade	FOURTH YEAR - Term 8	Year	Sem.	Grade
ChE 489	2-2-3	_____	_____	ChE 472	4-0-4	_____	_____
ChE 495	0-5-2	_____	_____	ChE 496	0-6-3	_____	_____
IE 492	3-0-3	_____	_____	Elective (Concentration)	3-0-3	_____	_____
Phil 334	3-0-3	_____	_____	Hum & SS Sen.Sem GER 400+	3-0-3	_____	_____
Elective (Concentration)	3-0-3	_____	_____				
Subtotal	14.0			Subtotal	13.0		

OTHER COURSES:

HUM 099 _____	Math 108 _____
HUM 100 _____	Math 139 _____

COURSE REGISTRATION POLICY

Upon successful admission to the BS degree program in Chemical Engineering, all students are subject to curriculum requirements in place when beginning the program. Please note prerequisites and co-requisites for each course in this curriculum (Page 6). Please note that course prerequisites are strictly enforced by the Department. The chemical engineering curriculum is developed to ensure fundamentals learned are applied in progressive courses; strict adherence to meeting prerequisites will be enforced to complete the BS degree.

Every semester, prior to registration, you will need to meet with your Academic Advisor and go through course selection based on the curriculum. You may only register for a course if you are not missing the prerequisites. Students who wish to withdraw from courses or wish to change their schedule should first determine if the withdrawal or change will affect their full-time status, financial support, academic standing, and progress. Students must consult with their Academic Advisor in advance of withdrawing from a course or changing the schedule agreed upon with your Advisor.

Registering for a course does not mean you satisfy the prerequisites unless you successfully passed the course. We reserve the right to drop students from courses that they have enrolled in if they do not satisfy the prerequisites. If you fail a course, you must immediately meet with your Academic Advisor to revise your schedule for the following semester according to course registration requirements.

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 (Co-op) gives the student an opportunity to enhance the academic degree program offered by the Department. Early in the sophomore year, after successfully completing “Career Planning for Engineers” (ENGR210) seminar, 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. The two co-op experiences are available and listed as courses: ENGR 310 and ENGR 410. Registering for ENGR 310 or ENGR 410 provides students full-time status (without paying for tuition); students may register for no more than two courses when enrolled in either ENGR310 or ENGR410. These courses are taken during the semester the student is in the co-op experience and extend into the summer (i.e, January through August or May through December). Further information may be obtained from the Office of Career Development Services (**Ms. Dominique Clarke**) 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.

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.

STUDENT OPPORTUNITIES



Location: Room 103 Tiernan Hall

Faculty Advisor: Dr. Roman Voronov

The **American Institute of Chemical Engineers (AICHE)** has a very active and successful student chapter at NJIT. The student chapter usually meets every week during the Wednesday Common Hour (2:30-3:30pm). Each meeting features a guest speaker to speak on a variety of topics pertinent to the chemical engineering student body, which include: industry presentations, career development and advisement, and recruitment opportunities. In addition to the weekly meetings, NJIT AICHE also hosts and participates in a number of events, which include:

- Plant Tours and Industry Field Trips
- Regional and National Student Conferences
- Community Service and K-12 Outreach
- On-Campus Collaborations

There are numerous opportunities for student members to participate in through the NJIT AICHE. The Chapter is constantly looking for students to get involved in many of their activities and events. Some opportunities available students include:

Chem-E-Car



The Chem-E-Car Competition® aims to engage college students in designing and constructing a car powered by a chemical engineering source, that will safely carry a specified load over a given distance, and stop. NJIT AICHE has an active team that has competed in numerous regional and national competitions.

In 2016, NJIT AICHE won **3rd Place** in the World amongst 30+ schools at the Annual Student Conference in San Francisco, CA!

Event Planning, Community Service, and Fundraising



Throughout the semester, NJIT AICHE requests the help of the student members to participate in numerous activities that help the organization on campus.

Visit NJIT AICHE's Social Media



Omega Chi Epsilon (ΩXE) Chemical Engineering Honor Society



Omega Chi Epsilon is the National Chemical Engineering Honor Society. It is intended to honor students of merit and academic achievement at NJIT. OXE is in charge of the chemical engineering department's **Tutoring Program** and **Mentorship Program** as well as relevant research opportunities. Both programs aim to supplement and reinforce classroom teachings and professional development throughout the academic year to all chemical engineering students.

Location: Room 103 Tiernan Hall
Faculty Advisor: Dr. Angelo Perna

B.S. in Chemical Engineering

Otto H. York Department of Chemical and Materials Engineering
Cooperative Education



A Sampling of Companies Hiring Co-ops in Chemical Engineering

- ◆ Colgate Palmolive
- ◆ Croda, Inc.
- ◆ Exxon Mobil
- ◆ Infineum USA L.P.
- ◆ L'Oreal USA
- ◆ Philadelphia Energy Solution
- ◆ Chemetall
- ◆ Saint-Gobain
- ◆ Advaxis Inc
- ◆ Johnson & Johnson

Cooperative Education Program (co-op)

Cooperative Education (co-op) is a structured program that combines the classroom education with work experience. This program provides students with the unique opportunity to gain practical work experience in a professional environment while pursuing a bachelor's degree in Chemical Engineering. Co-op students work on a full time basis for a company that agreed to hire, train and pay the student during a specific co-op cycle.

Co-op Work Cycles. Students may work in one or more co-op cycles depending on personal preference. Students should apply the semester before the cycle in which they would like to work. Typical cycles are:

- January through August
- May to through December
- Other options are available

Co-op Schedule. Students may do their first assignment after completing their Sophomore year.

Co-op Salaries. The average monthly gross co-op salaries for Chemical Engineering Co-op students are between \$3,300 to \$4,300.

Contact Information

If you are interested in learning more about the benefits that Co-op program has to offer, visit njit.edu/cds or you can **contact**

Dr. Gordana Obuskovic

Otto H. York Department of CME
gordana@njit.edu

Ms. Dominique Clarke

Career Development Services
Dominique.clarke@njit.edu



New Jersey Institute of Technology
University Heights
Newark, NJ 07102-1982
973.596.3568
973.596.8436 fax
che@njit.edu

Otto H. York
Department of Chemical and
Materials Engineering



Tiernan Hall is the home of Otto H. York Department of Chemical and Materials Engineering.



chemicaleng.njit.edu