

Co-Terminal Degree Proposal, Form 802 Attachment

Bachelor of Science in Chemical Engineering

Master of Pharmaceutical engineering

Undergraduate Program

Undergraduate Program Type: Bachelor of Science in Chemical Engineering

Total Undergraduate Program Credit Hours (including shared credit): 132-133 hours

Program Description: The objective of the undergraduate program is to educate chemical engineering students and prepare them for careers in professional practice and/or for advanced studies at the graduate level. The program specifically aims to develop a new breed of engineers who are not only well schooled in the basics and fundamentals of chemical and biological engineering, but who also possess the skills necessary for success in today's workplace. In recognition of the recent shift of the chemical engineering profession into a more prominent involvement in biotechnology and biological engineering, the department has redesigned the undergraduate curriculum in order to ensure that its graduates will possess additional knowledge and skills in biology and biological engineering as predicated by the changing needs of industry.

Program Purpose: The co-terminal program between the BS in Chemical Engineering and Master of Pharmaceutical Engineering (MPE) allows students interested in future careers in pharmaceutical engineering to enter the job force very competitively positioned to pursue opportunities in pharmaceutical companies and other life sciences industries.

Program Benefits: The Master of Pharmaceutical Engineering degree was one of six new interdisciplinary engineering degrees approved for Fall 2017. These interdisciplinary degrees reflect contemporary shifts in engineering education and increase the attractiveness of IIT with potential graduate students. By offering these new interdisciplinary graduate degrees as co-terminal programs with our current undergraduate degrees, we are providing our current undergraduate engineering students a path to greater competitiveness while they retain undergraduate financial aid benefits. Furthermore, engineering transfer students often face significant course sequencing challenges within engineering curriculums. Some transfer students solve this problem by pursuing co-terminal programs, and some choose to leave IIT. This co-terminal program will increase the options available to transfer students and potentially improve retention.

Course requirements and sample curriculum: Course requirements and a sample curriculum are included in this document.

Competitive Programs: BS CHE is a competitive degree offered by many institutions. However, most schools do not offer a co-terminal BS CHE and graduate pharmaceutical engineering.

Market Analysis: BS CHE is a competitive degree offered by many institutions. The Master of Pharmaceutical Engineering is a new degree program (Fall 2017). Please refer to the market analysis for the MPE degree provided in the 2017 degree program application for further information.

Marketing and Advertising: Both degrees are currently marketed. The co-terminal degree will be included in current co-terminal degree marketing and additional marketing by the Armour College of Engineering.

Enrollment Estimates: Estimated enrollment in this co-terminal program is 2-4 new students/year.

Retention Estimates: It is anticipated that retention may be improved for transfer students as the co-terminal program allows more flexibility for scheduling each semester.

Economic Analysis: There are no additional costs for the co-terminal program. It is expected that this co-terminal program will draw from a group of students separate from those who pursue the other CHE co-terminal programs. Therefore, it is expected that additional tuition revenue will be generated equivalent to 24 credits/student enrolled in the program.

Graduate Program

Graduate Program: Master of Pharmaceutical engineering

Program Overview: In the Master of Pharmaceutical Engineering program, students first learn the basics of pharmaceutical engineering, drug delivery, bioprocess engineering, and entrepreneurship/intellectual property management before selecting from elective courses covering topics ranging from crystal growth to cardiovascular fluid mechanics to nanoscale imaging.

Program Justification: The Armour College of Engineering is committed to be a lifelong educational partner with our community, from pre-college to professional advancement. The MPE degree program contributes to this commitment by enhancing the overall offerings within the Armour College of Engineering. It is anticipated that approximately 20 students will enroll in the MPE program Fall 2018. The co-terminal degree is anticipated to add 2-4 additional students. A detailed justification for the MPE program can be found in the 2017 PE degree application.

Program Resources: The co-terminal program does not require additional resources. The MPE curriculum includes existing courses and a few new courses that will be developed according to program demand.

Program description: A detailed list of courses required for each track in the co-terminal degree follows. Students should have a 3.0 GPA in order to be accepted into the co-terminal program. Students will be accepted into the program beginning Fall 2018.

Description of courses shared between Undergraduate and Graduate programs:

a) Shared required courses: none

b) Shared elective courses:

UG: (2) Technical Elective as GRAD: (2) CHE Core courses or electives

CHE 426 is recommended to fulfill one of these course requirements

c) Course substitutions or exceptions: None

Bachelor of Science in Chemical Engineering

Required Courses

| | Credit Hours | | |
|---|----------------|-------------|----------------|
| | <i>UG</i> | <i>grad</i> | <i>total</i> |
| Chemical Engineering Core Requirements CHE 100, 101, 202, 239, 301, 302, 311, 317, 351, 406, 418, 423, 433, 435, 451, 494, 496 | 47 | 0 | 47 |
| Master of Pharmaceutical Engineering Core Requirements^a CHE 583, 585, 577, 506 | 3 | 12 | 12 |
| Master of Pharmaceutical Engineering Electives^a (select 18 cr) CHE 426, 560, 545, 580, 551, 508, 582, 594, 593 , MMAE 519, 556, 561, BIOL 515, BME 525, 516, 502 (others by approval) | 3 | 18 | 9 |
| Electrical and Computer Engineering Requirement ECE 211 or 218 | 3-4 | 0 | 3-4 |
| Physics Requirements PHYS 123, 221 | 8 | 0 | 8 |
| Chemistry Requirements CHEM 125, 237, 239, 343, 344 or BIO 403 | 18 | 0 | 18 |
| Computer Science Requirements CS 104 or 105 | 2 | 0 | 2 |
| Technical Elective^a (3 courses) | 3 | 0 | 9 |
| Mathematics Requirements MATH 151, MATH 152, MATH 251, MATH 252 | 18 | 0 | 18 |
| Humanities and Social Science Requirements | 21 | 0 | 21 |
| IPRO | 6 | 0 | 6 |
| Total | 132-133 | 30 | 156-157 |
| (132-133 CHE UG) + 30 (MPE) -6 (shared credits) = 156-157 (total) | | | |

^ashared courses between undergraduate and graduate curricula (6 cr)

(2) UG Technical Electives fulfilled by (2) Core or elective MPE courses; CHE 426 recommended

Sample Schedule

| Semester 1 | Credits | Semester 2 | Credits |
|---|--------------|--|-----------|
| CHE 100 | 2 | CHE 101 | 2 |
| MATH 151 | 5 | MATH 152 | 5 |
| CHEM 125 | 4 | PHYS 123 | 4 |
| CS 104 or 105 | 2 | Social Science Elective | 3 |
| Humanities 200- level Course | 3 | Hum/ SS Elective | 3 |
| Total | 16 | Total | 17 |
| Semester 3 | Credits | Semester 4 | Credits |
| CHE 202 | 3 | CHE 239 | 3 |
| MATH 252 | 4 | CHE 301 | 3 |
| CHEM 237 | 4 | MATH 251 | 4 |
| PHYS 221 | 4 | CHEM 239 | 3 |
| Humanities Elective (300+) | 3 | CHEM 343 | 3 |
| Total | 18 | Total | 16 |
| Semester 5 | Credits | Semester 6 | Credits |
| CHE 302 | 3 | CHE 317 | 2 |
| CHE 311 | 3 | CHE 433 | 3 |
| CHE 351 | 3 | CHE 451 | 3 |
| ECEE 211 or 218 | 3-4 | CHEM 433 or BIOL 403 | 4 |
| Humanities Elective (300+) | 3 | IPRO Elective I | 3 |
| | | Technical Elective | 3 |
| Total | 15-16 | Total | 18 |
| Semester 7 | | Semester 8 | |
| CHE 418 | 2 | CHE 406 | 3 |
| CHE 423 | 3 | CHE 496 | 3 |
| CHE 435 | 3 | CHE 585 Drug Delivery | 3 |
| CHE 494 | 3 | CHE 583 Introduction to Pharmaceutical Eng | 3 |
| CHE 506 Entrepreneurship and Intellectual Property Management | 3 | MPE Elective | 3 |
| Total | 14 | Total | 15 |
| Semester 9 | | Semester 10 | |
| CHE 577 Bioprocess Engineering | 3 | IPRO Elective II | 3 |
| Social Science Elective (300+) | 3 | MPE Elective | 3 |
| MPE Elective | 3 | MPE Elective | 3 |
| MPE Elective | 3 | Social Science Elective (300+) | 3 |
| MPE Elective | 3 | | |
| Total | 15 | Total | 12 |