

Co-Terminal Degree Proposal, Form 802 Attachment

Bachelor of Science in Chemical Engineering

Master of Computational 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 Computational Engineering (MCE) allows students interested in future careers focused in computational aspects of engineering to enter the job force very competitively positioned to pursue these opportunities within engineering-based industries.

Program Benefits: The Master of Computational 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 degree in computational engineering.

Market Analysis: BS CHE is a competitive degree offered by many institutions. The Master of Computational Engineering is a new degree program (Fall 2017). Please refer to the market analysis for the MCE 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 Computational Engineering

Program Overview: Students who thrive on solving complex equations and are energized by delving into computer simulations and mathematical algorithms would be a good fit for the Master of Computational Engineering program. This new and growing multidisciplinary field offers career possibilities ranging from calculating the trajectory of satellites to designing aircraft to simulating molecular mechanics. Students will learn computational methodologies, tools, analysis, processing, and modeling capabilities that are central to succeeding in this dynamic engineering field. There are four tracks: (a) Computational Mechanics, (b) Computational Chemical Engineering, (c) Biomedicine, or (d) Optimization, Machine Vision, and Decision Making. This co-terminal program applies to the Computational Chemical Engineering track.

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 MCE 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 MCE program Fall 2018. The BS CHE/MCE co-terminal degree is anticipated to add 2-4 additional students. A detailed justification for the MCE program can be found in the 2017 MCE degree application.

Program Resources: The co-terminal program does not require additional resources. The MCE curriculum leverages existing courses.

Program description: A detailed list of courses required for each track in the co-terminal degree follows. Students should have a minimum 3.0 GPA 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

c) Course substitutions or exceptions: None

Bachelor of Science in Chemical Engineering/Master of Computational 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 Computational Engineering Core Requirements^c (select 3 courses) ECE 505, ECE 511, MMAE 501, MMAE 502, MMAE 451, MMAE 532, CHE 506, CHE 536, MATH 577, MATH 581, BME 522, BME 553	3	9	9
Computational Chemical Engineering Specialization^{b,c} (select 4 courses) CHE 439, CHE 535, CHE 536, CHE 597	3	12	12
Master of Computational Engineering Elective Requirements^c (select 3 courses) Additional courses from core or any specialization	0	9	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
I PRO	6	0	6
Total	132-133	30	156-157
(131-132 CHE UG) + 30 (MCE) -6 (shared credits) = 155-156 (total)			

^aonly one track is required for the MCE program

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

(2) UG Technical Electives fulfilled by (2) Core, track or elective MCE courses

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	MCE Core	3
CHE 494	3	CHE 597	3
CHE 439	3		
Total	14	Total	12
Semester 9		Semester 10	
CHE 535	3	CHE 536	3
MCE Core	3	MCE Core	3
MCE Elective	3	MCE Elective	3
MCE Elective	3	Hum/SS Elective	3
Hum/SS Elective	3	IPRO II	3
Total	15	Total	15