

Co-Terminal Degree Proposal, Form 802 Attachment
Bachelor of Science in Materials Engineering
Master of Computational Engineering, Computational Mechanics Specialization

Undergraduate Program

Undergraduate Program Type: Bachelor of Science in Materials Engineering

Total Undergraduate Program Credit Hours (including shared credit): 127 hours

Program Description: The materials science and engineering program aims to develop an understanding of the structure, properties, processing, and service behavior of engineering materials, including metallic, ceramic, polymeric, and composite materials. This understanding fosters both development of new materials and improvement of existing materials in order to optimize manufactured products. Laboratory experience is an important part of the program and emphasizes microstructural characterization using modern analytical techniques, such as optical and electron microscopy and x-ray diffraction, materials processing, determination of the physical and mechanical behavior of materials, and materials and process selection. Graduating students find employment opportunities in a wide range of industries requiring knowledge of materials development and/or optimization, processing, and selection.

Program Purpose: The co-terminal program between the BS in Materials 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 MSE is a competitive degree offered by many institutions. However, most schools do not offer a co-terminal BS MSE and graduate degree in computational engineering.

Market Analysis: BS MSE 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 1-3 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 MSE 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, Computational Mechanics Specialization

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.

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 MSE/MCE co-terminal degree is anticipated to add 1-3 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) MMAE elective courses as GRAD: (2) Core, Track or Elective MMAE Course
- c) Course substitutions or exceptions: With advisor approval

Bachelor of Science in Materials Engineering/Master of Computational Engineering

Required Courses	Credit Hours		
	<i>UG</i>	<i>grad</i>	<i>total</i>
Materials Engineering Core Requirements MMAE 100, 200, 202, 232, 320, 365, 370, 372, 373, 463, 465, 470, 472, 476, 485	46	0	46
Master of Computational Engineering Core Requirements^b (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 Mechanics Specialization^{a,b} (select 4 courses) MMAE 450, MMAE 517, MMAE 518, MMAE 570, MMAE 532, CAE 530, CAE 534 CAE 535, CAE 536, CHE 536, CHE 560, MMAE 597, CAE 597	3	12	12
Master of Computational Engineering Elective Requirements^b (select 3 courses) Additional courses from core or any specialization	0	9	9
Material Science Requirement MS 201	3	0	3
Physics Requirements PHYS 123, 221, 224	11	0	11
Chemistry Requirements CHEM 124	4	0	4
Computer Science Requirements CS 104	2	0	2
Technical Elective (9 credits)	6	0	6
Free Elective (3 credits)	3	0	3
Engineering Elective (3 credits)	0	0	3
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	126	30	150

(126 MSE UG) + 30 (MCE) - 6 (shared credits) = 150 (total)

^aonly the Computational Mechanics Track applies to this co-terminal degree program

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

Any (2) Core, Track or Elective MMAE Course, will be count as electives for the UG program

Sample Schedule

Semester 1	Credits	Semester 2	Credits
MMAE 100	3	MS 201	3
MATH 151	5	MATH 152	5
CHEM 124	4	PHYS 123	4
Humanities 200- level	3	CS 104	2
		Social Science Elective	3
Total	15	Total	17
Semester 3	Credits	Semester 4	Credits
MMAE 200	3	MMAE 202	3
MMAE 232	3	MATH 252	4
MATH 251	4	PHYS 224	3
PHYS 221	4	Humanities Elective (300+)	3
Hum/SS Elective	3	Social Science Elective (300+)	3
Total	17	Total	16
Semester 5	Credits	Semester 6	Credits
MMAE 302	3	MMAE 372	3
MMAE 365	3	MMAE 463	3
MMAE 370	3	MMAE 465	3
MMAE 373	4	Technical Elective	3
Hum/SS Elective	3	Social Science Elective (300+)	3
Total	16	Total	15
Semester 7		Semester 8	
MMAE 470	3	MMAE 472	3
MMAE 476	3	MCE Core	3
MMAE 485	3	MCE Core	3
MCE Core	3	MCE Specialization	3
MCE Specialization	3		
Total	15	Total	12
Semester 9		Semester 10	
MCE Specialization	3	IPRO II	3
MCE Elective	3	MCE Specialization	3
MCE Elective	3	MCE Elective	3
IPRO Elective I	3	Free Elective	3
	3		
Total	15	Total	12