

Co-Terminal Degree Proposal, Form 802 Attachment

Bachelor of Science in Materials Engineering

Master of Engineering in Advanced Manufacturing

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 Engineering in Advanced Manufacturing (MAM) allows students interested in specialized areas of advanced manufacturing to enter the job force very competitively positioned to pursue these opportunities within manufacturing-based industries.

Program Benefits: The Master of Engineering in Advanced Manufacturing 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 advanced manufacturing.

Market Analysis: BS MSE is a competitive degree offered by many institutions. The Master of Engineering in Advanced Manufacturing is a new degree program (Fall 2017). Please refer to the market analysis for the MAM 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 Engineering in Advanced Manufacturing

Program Overview: Many companies in the automotive, aerospace, and chemical industries are advancing standard manufacturing practices to include innovative technology. In the Master of Engineering in Advanced Manufacturing program, students will explore the latest technologies, such as digital manufacturing and additive manufacturing, as well as learn more traditional hardware-based methodologies.

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 MAM 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 MAM program Fall 2018. The BS co-terminal degree is anticipated to add 1-3 additional students. A detailed justification for the MAM program can be found in the 2017 MAM degree application.

Program Resources: The co-terminal program does not require additional resources. The MAM 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) 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

Required Courses	Credit Hours		
	UG	grad	total
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 Engineering in Advanced Manufacturing Core Requirements^b (12-14 cr) MMAE 546, 547, 557, 560, 544, MMAE 534/ ENGR 534, ECE 411, 412, 438, 505	3	12-14	12-14
Digital Manufacturing Specialization^{a, b} (select 9-10 cr) MMAE 543, 545, 540, ECE 565, MMAE 587/ENGR 587, MMAE 539/ENGR 539	0	9-10	9-10
Additive Manufacturing Specialization^{a, b} (select 9-10 cr) MMAE 579, MMAE 588/ENGR 588, MMAE 572/ENGR 576	0	9-10	9-10
Automation and Control Systems Specialization^{a, b} (select 9-10 cr) ECE 437, 441, 481, 533, 535, 539, 540, 550, 551, 552, 549, 565	0	9-10	9-10
Master of Engineering in Advanced Manufacturing Core Electives^b (6-9 cr) MMAE 451, 532, 570, 594, ENGR 595, ECE 594	3	6-9	6-9
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 (MAM) -6 (shared credits) = 150 (total)

^aOnly one track is required for the MAM 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	Free Elective	3
Total	17	Total	16
Semester 5	Credits	Semester 6	Credits
MMAE 320	3	MMAE 372	3
MMAE 365	3	MMAE 463	3
MMAE 370	3	MMAE 465	3
MMAE 373	4	Technical Elective	3
Social Science Elective (300+)	3	Humanities Elective (300+)	3
Total	16	Total	15
Semester 7		Semester 8	
MMAE 470	3	MMAE 472	3
MMAE 476	3	MAM Track Elective	3
MMAE 485	3	MAM Core	3
MAM Core	3	MAM Core	3
MAM Track Elective	3		
Total	15	Total	12
Semester 9		Semester 10	
MAM Core	3	IPro Elective II	3
IPro Elective I	3	MAM Elective	3
MAM Elective	3	MAM Elective	3
MAM Track Elective	3	Technical Elective	3
		Social Science Elective (300+)	3
Total	12	Total	15