

Co-Terminal Degree Proposal, Form 802 Attachment

Bachelor of Science in Aerospace Engineering
Master of Engineering in Advanced Manufacturing

Undergraduate Program

Undergraduate Program Type: Bachelor of Science in Aerospace Engineering

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

Program Description: Aerospace engineering explores both the design and manufacture of aircraft, as well as the design and flight of vehicles beyond the earth's atmosphere. Knowledge of aerodynamics, structures and materials, propulsion systems, and flight mechanics and controls are important to this field. Aerospace engineers are primarily employed in civil aeronautics, the defense industry and the space program. However, applications of aerospace technology are also found in related areas such as ground and undersea transportation systems, pollution control, wind power and the effects of wind on structures, and the development and use of advanced materials.

Program Purpose: The co-terminal program between the BS in Aerospace 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, such as the aerospace industry.

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 AE is a competitive degree offered by many institutions. However, most schools do not offer a co-terminal BS AE and advanced manufacturing.

Market Analysis: BS AE 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 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 AE 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 2-4 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 Aerospace Engineering

Required Courses

	Credit Hours		
	UG	grad	total
Aerospace Engineering Core Requirements	59	0	59
MMAE 100, 200, 202, 304, 305, 311, 312, 313, 315, 320, 350, 352, 372, 410, 411, 412, 414, 415, 443			
Master of Engineering in Advanced Manufacturing Core Requirements^b (12-14 cr)	3	12-14	12-14
MMAE 546, 547, 557, 560, 544, MMAE 534/ ENGR 534, ECE 411, 412, 438, 505			
Digital Manufacturing Specialization^{a, b} (select 9-10 cr)	0	9-10	9-10
MMAE 543, 545, 540, ECE 565, MMAE 587/ENGR 587, MMAE 539/ENGR 539			
Additive Manufacturing Specialization^{a, b} (select 9-10 cr)	0	9-10	9-10
MMAE 579, MMAE 588/ENGR 588, MMAE 572/ENGR 576			
Automation and Control Systems Specialization^{a, b} (select 9-10 cr)	0	9-10	9-10
ECE 437, 441, 481, 533, 535, 539, 540, 550, 551, 552, 549, 565			
Master of Engineering in Advanced Manufacturing Core Electives^b (6-9 cr)	3	6-9	6-9
MMAE 451, 532, 570, 594, ENGR 595, ECE 594			
Material Science Requirement	3	0	3
MS 201			
Physics Requirements	8	0	8
PHYS 123, 221			
Chemistry Requirements	4	0	4
CHEM 124			
Computer Science Requirements	2	0	2
CS 104			
Technical Elective (3 credits)	0	0	6
Free Elective (3 credits)	0	0	3
Mathematics Requirements	18	0	18
MATH 151, MATH 152, MATH 251, MATH 252			
Humanities and Social Science Requirements	21	0	21
I PRO	6	0	6
Total	127	30	127
(127 AE UG) + 30 (MAM) -6 (shared credits) = 151 (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 251	4	MMAE 305	3
PHYS 221	4	MMAE 313	3
Hum/SS Elective	3	MMAE 320	3
Humanities Elective (300+)	3	MATH 252	4
Total	17	Total	16
Semester 5	Credits	Semester 6	Credits
MMAE 311	3	MMAE 304	3
MMAE 312	3	MMAE 352	3
MMAE 315	4	MMAE 372	3
MMAE 350	3	MMAE 443	3
Social Science Elective (300+)	3	Social Science Elective (300+)	3
Total	15	Total	16
Semester 7		Semester 8	
MMAE 410	4	MMAE 412	3
MMAE 411	3	MMAE 415	3
MMAE 414	3	MAM Core	3
MAM Core	3	MAM Core	3
MAM Track Elective	3	MAM Elective	3
Total	16	Total	15
Semester 9		Semester 10	
MAM Track Elective	3	IPRO Elective II	3
IPRO Elective I	3	MAM Elective	3
MAM Core	3	MAM Elective	3
MAM Track Elective	3	Social Science Elective (300+)	3
Total	12	Total	12