Co-Terminal Degree Proposal, Form 802 Attachment

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

Undergraduate Program

Undergraduate Program Type: Bachelor of Science in Computer Engineering

Total Undergraduate Program Credit Hours (including shared credit): 131-134 hours

Program Description: Computer engineering involves the design and application of computer hardware and computer software. Computer hardware consists of the physical components that implement a computer system: processor and memory chips, circuit boards, and peripheral devices. Computer software consists of computer programs that accomplish a specific task using sequences of simple, programmable steps. Computers have become an integral part of many large systems that require sophisticated control, including automobiles, medical instrumentation, telecommunication systems, and factory automation. Computers are a driving force behind many of today's exciting new technologies, including wireless communications, interactive multimedia, and high-speed computer networks. Computer engineers must have detailed knowledge of both hardware and software to design, build, and use complex information processing systems for a wide range of applications.

Program Purpose: The co-terminal program between the BS in Computer 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 CPE is a competitive degree offered by many institutions. However, most schools do not offer a co-terminal BS CPE and advanced manufacturing.

Market Analysis: BS CPE 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 2-6 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 CPE 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 2-6 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: Apply (1) Professional ECE Elective as GRAD: ECE 505

UG: Apply (1) of ECE 411, 412, or 438 as Professional ECE Elective as GRAD: Core Requirement

c) Course substitutions or exceptions: None

Bachelor of Science in Computer Engineering

Required Courses	Credit Hours		
	UG	*grad*	*total*
Computer Engineering Core Requirements ECE 100, 211, 213, 218, 242, 311, 441, 485	28	0	28
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**	**8**	6-8	12-14
Digital Manufacturing Specialization[a] *(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] *(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] *(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 (6-9 cr) MMAE 451, 532, 570, 594, ENGR 595, ECE 594	0	6-9	6-9
Computer Science Major Requirement CS 115, 116, 330, 331, 351, 450	16	0	16
Physics Requirements PHYS 123, 221, 224	11	0	11
Chemistry Requirements CHEM 122	3	0	3
Computer System/ Software Elective ECE 408	3	0	3-4
Junior Computer Engineering Elective ECE 308	3	0	3-4
Hardware Design Elective ECE 429 or ECE 446	4	0	4
Engineering Science Requirement MMAE 200 or 320	3	0	3
Science Elective BIOL 105, 114, CHEM 126, MS 201	3	0	3
Mathematics Requirements MATH 151, 152, 251, 252, 333 or 350, 374	24	0	24
Humanities and Social Science Requirements	21	0	21

IPRO	6	0	6
Total	133	30	157

(133 CPE UG) + 30 (MAM) - 6 (shared credits) = 157 (total)

[a]only one track is required for the MAM program

[b]shared courses between undergraduate and graduate curricula (6 cr)

ECE 411, ECE 412 or ECE 438 as MAM Core

ECE 505 as UG Professional Elective

Sample Schedule

Semester 1	Credits
ECE 100	3
MATH 151	5
CHEM 122	3
CS 115	2
Humanities 200- level Course	3
Total	**16**

Semester 2	Credits
MATH 152	5
PHYS 123	4
CS 116	2
Social Science Elective	3
Science Elective	3
Total	**17**

Semester 3	Credits
MATH 252	4
PHYS 221	4
ECE 211	3
ECE 218	4
CS 331	3
Total	**18**

Semester 4	Credits
MATH 251	4
PHYS 224	3
ECE 213	4
ECE 242	3
CS 330	3
Total	**17**

Semester 5	Credits
ECE 311	4
CS 351	3
MMAE 200 or 300	3
MATH 333 or 350	3
Humanities Elective (300+)	3
Total	**16**

Semester 6	Credits
CS 450	3
MATH 374	3
ECE 308	3
IPRO Elective I	3
Social Science Elective (300+)	3
Total	**15**

Semester 7	
ECE 441	4
ECE 485	3
ECE 411 (MAM Core)	4
MAM Track Elective	3
Total	**14**

Semester 8	
ECE 429 or 446	4
MMAE 200 or 320	3
ECE 412 (MAM Core)	4
ECE 438 (MAM Core)	3
Total	**14**

Semester 9	
IPRO II	3
Humanities Elective (300+)	3
ECE 505 (MAM Core)	3
MAM Elective	3
MAM Track Elective	3
Total	**15**

Semester 10	
MAM Track Elective	3
MAM Elective	3
ECE408	3
Hum/ SS Elective	3
Social Science Elective (300+)	3
Total	**15**