

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

**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 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 AE is a competitive degree offered by many institutions. However, most schools do not offer a co-terminal BS AE and graduate degree in computational engineering.

Market Analysis: BS AE 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 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 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 AE/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) 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/Master of Computational Engineering

Required Courses	Credit Hours		
	<i>UG</i>	<i>grad</i>	<i>total</i>
<b>Aerospace Engineering Core Requirements</b> MMAE 100, 200, 202, 304, 305, 311, 312, 313, 315, 320, 350, 352, 372, 410, 411, 412, 414, 415, 443	56	0	56
<b>Master of Computational Engineering Core Requirements<sup>b</sup></b> (select 3 courses) ECE 505, ECE 511, <b>MMAE 501, MMAE 502, MMAE 451, MMAE 532,</b> CHE 506, CHE 536, MATH 577, MATH 581, BME 522, BME 553	<b>3</b>	9	9
<b>Computational Mechanics Specialization<sup>a,b</sup></b> (select 4 courses) <b>MMAE 450, MMAE 517, MMAE 518, MMAE 570, MMAE 532,</b> CAE 530, CAE 534 CAE 535, CAE 536, CHE 536, CHE 560, MMAE 597, CAE 597	<b>3</b>	12	12
<b>Master of Computational Engineering Elective Requirements<sup>b</sup></b> (select 3 courses) Additional courses from core or any specialization	0	9	9
<b>Material Science Requirement</b> MS 201	3	0	3
<b>Physics Requirements</b> PHYS 123, 221	8	0	8
<b>Chemistry Requirements</b> CHEM 124	4	0	4
<b>Computer Science Requirements</b> CS 104	2	0	2
<b>Technical Elective<sup>b</sup> (3 credits)</b>	<b>0</b>	0	6
<b>Free Elective (3 credits)</b>	<b>0</b>	0	3
<b>Mathematics Requirements</b> MATH 151, MATH 152, MATH 251, MATH 252	18	0	18
<b>Humanities and Social Science Requirements</b>	21	0	21
<b>I PRO</b>	6	0	6
<b>Total</b>	<b>127</b>	<b>30</b>	<b>151</b>
(127 AE UG) + 30 (MCE) -6 (shared credits) = 151 (total)			

<sup>a</sup>only the Computational Mechanics Track applies to this co-terminal degree program

<sup>b</sup>shared 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
<b>Total</b>	<b>15</b>	<b>Total</b>	<b>17</b>
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
<b>Total</b>	<b>17</b>	<b>Total</b>	<b>16</b>
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
<b>Total</b>	<b>15</b>	<b>Total</b>	<b>16</b>
Semester 7		Semester 8	
MMAE 410	4	MMAE 12	3
MMAE 411	3	MMAE 415	3
MMAE 414	3	MCE Core	3
MCE Core	3	MCE Core	3
MCE Specialization	3	MCE Specialization	3
<b>Total</b>	<b>16</b>	<b>Total</b>	<b>15</b>
Semester 9		Semester 10	
IPro Elective I	3	IPro II	3
MCE Specialization	3	MCE Specialization	3
MCE Elective	3	MCE Elective	3
MCE Elective	3	Social Science Elective (300+)	3
<b>Total</b>	<b>12</b>	<b>Total</b>	<b>12</b>