ENGINEERING MECHANICS: AEROSPACE ENGINEERING

The aerospace engineering option in engineering mechanics prepares students for design, development, and research, with an emphasis on applied mathematics and aerospace engineering. Its purpose is to improve and expand the educational opportunities of students at the university who wish to pursue careers in aerospace engineering and related areas. This is accomplished by providing in-depth exposure to course sequences in flight dynamics, dynamics of aerospace structures and orbital mechanics, as well as a core curriculum of structural and material analysis, advanced dynamics, and vibrations. The program requires a minimum of 128 credits; students selecting this option must submit an option declaration form to the dean's office in room 2620 Engineering Hall.

REQUIREMENTS

The following curriculum applies to students who entered the College of Engineering beginning in Fall 2020.

SUMMARY OF REQUIREMENTS

Code	Title	Credits
Mathematics and Statistics		22
Science		10
Engineering Science		27
Engineering Mechanics/Aerospace Engineering Core		40
Technical Electives		5
Communication Skills		8
Liberal Studies		16
Total Credits		**128**

MATHEMATICS AND STATISTICS

Code	Title	Credits
MATH 221	Calculus and Analytic Geometry 1	5
or MATH 217	Calculus with Algebra and Trigonometry II	
or MATH 275	Topics in Calculus I	
MATH 222	Calculus and Analytic Geometry 2	4
or MATH 276	Topics in Calculus II	
MATH 234	Calculus--Functions of Several Variables	4
MATH 320	Linear Algebra and Differential Equations	3
MATH 321	Applied Mathematical Analysis	3
STAT 324	Introductory Applied Statistics for Engineers	3
Total Credits		**22**

SCIENCE

Code	Title	Credits
Select one of the following:		5-9
CHEM 109	Advanced General Chemistry	
CHEM 103 & CHEM 104	General Chemistry I and General Chemistry II	
PHYSICS 202	General Physics	5
Total Credits		**10-14**

ENGINEERING SCIENCE

Code	Title	Credits
INTEREGR 170	Design Practicum	3
M E 231	Geometric Modeling for Design and Manufacturing	3
E P 271	Engineering Problem Solving I	3
or COMP SCI 310	Problem Solving Using Computers	
M E 361	Thermodynamics	3
M E 363	Fluid Dynamics	3
or CIV ENGR 310	Fluid Mechanics	
E C E 376	Electrical and Electronic Circuits	3
or PHYSICS 321	Electric Circuits and Electronics	
M E 364	Elementary Heat Transfer	3
E C E 332	Feedback Control Systems	3
or M E 346	Introduction to Feedback Control for Mechanical Engineers	
or M E 446	Automatic Controls	
Computing Elective (select one)		3
COMP SCI 300	Programming II	
COMP SCI 412	Introduction to Numerical Methods	
E M A/E P 471	Intermediate Problem Solving for Engineers	
E M A/E P 476	Introduction to Scientific Computing for Engineering Physics	
Total Credits		**27**

ENGINEERING MECHANICS/AEROSPACE ENGINEERING CORE

Code	Title	Credits
E M A 201	Statics	3
E M A 202	Dynamics	3
or M E 240	Dynamics	
E M A 303	Mechanics of Materials	3
or M E 306	Mechanics of Materials	
E M A/M E 307	Mechanics of Materials Lab	1
E M A 405	Practicum in Finite Elements	3
E M A 469	Design Problems in Engineering	3
E M A 506	Advanced Mechanics of Materials I	3
Experimental Mechanics Elective (select one)		3
E M A/M E 540	Experimental Vibration and Dynamic System Analysis	
E M A/M E 570	Experimental Mechanics	
E M A 611	Advanced Mechanical Testing of Materials	
E M A 522	Aerodynamics Lab	
E M A 521	Aerodynamics	3
or M E 563	Intermediate Fluid Dynamics	
E M A 542	Advanced Dynamics	3

E M A 545	Mechanical Vibrations	3
E M A 569	Senior Design Project	3
Spacecraft & Structural Dynamics Elective (select one)		3
E M A/ ASTRON 550	Astrodynamics	
E M A 610	Structural Finite Element Model Validation	
E M A 642	Satellite Dynamics	
Aerospace Fluid Mechanics Elective (select one)		3
E M A 523	Flight Dynamics and Control	
E M A 524	Rocket Propulsion	
Total Credits		**40**

TECHNICAL ELECTIVES

Code	Title	Credits
Choose five credits from:		5
E M A 1	Cooperative Education Program (no more than 3 credits)	
300+ level courses in the CoE except for E P D/ INTEREGR		
300+ level courses in MATH, PHYSICS, COMP SCI, STAT (except STAT 301), ASTRON, MED PHYS, and CHEM departments		
PHYSICS 205 or 241 for E M/E M A students only		
Students may also propose any class that they feel will benefit their education path with pre-requisite of two physics or calculus classes. For these courses the advisor will review the request and if approved, recommend a DARS substitution.		
Total Credits		**5**

COMMUNICATION SKILLS

Code	Title	Credits
ENGL 100	Introduction to College Composition	3
or COM ARTS 100	Introduction to Speech Composition	
or LSC 100	Science and Storytelling	
or ESL 118	Academic Writing II	
E P D 275	Technical Presentations	2
INTEREGR 397	Engineering Communication (was EPD 397 before Fall 2020)	3
Total Credits		**8**

LIBERAL STUDIES

Code	Title	Credits
College of Engineering Liberal Studies Requirements		
Complete Requirements (http://guide.wisc.edu/undergraduate/engineering/#requirementstext) [1]		16
Total Credits		**16**

[1] Students must take 16 credits that carry H, S, L, or Z breadth designators. These credits must fulfill the following subrequirements:

1. A minimum of two courses from the same department or program. At least one of these two courses must be designated as above the elementary level (I, A, or D) in the course listing.
2. A minimum of 6 credits designated as humanities (H, L, or Z in the course listing), and an additional minimum of 3 credits designated as social science (S or Z in the course listing). Foreign language courses count as H credits. Retroactive credits for language courses may not be used to meet the Liberal Studies credit requirement (they can be used for subrequirement 1 above).
3. At least 3 credits in courses designated as ethnic studies (lower case "e" in the course listing). These courses may help satisfy subrequirements 1 and 2 above, but they count only once toward the total required. *Note:* Some courses may have "e" designation but not H, S, L, or Z designation; these courses do not count toward the Liberal Studies requirement.

For information on credit load, adding or dropping courses, course substitutions, pass/fail, auditing courses, dean's honor list, repeating courses, probation, and graduation, see the College of Engineering Official Regulations (http://guide.wisc.edu/undergraduate/engineering/#policiesandregulationstext).

FOUR-YEAR PLAN

EXAMPLE FOUR YEAR PLAN

First Year

Fall	Credits	Spring	Credits
CHEM 109[1]	5	E M A 201[3]	3
MATH 221	5	MATH 222	4
Commucations A	3	M E 231	3
INTEREGR 170[2]	3	Liberal Studies Elective	3
		Liberal Studies Elective	3
	16		**16**

Second Year

Fall	Credits	Spring	Credits
MATH 234	4	MATH 320	3
PHYSICS 202	5	Technical Elective	3
E M A 202[4]	3	M E 361	3
E P 271 or COMP SCI 310	3	E M A 303[4]	3
E P D 275 or COM ARTS 105	2	E M A/M E 307[4]	1
		Liberal Studies Elective	3
	17		**16**

Third Year

Fall	Credits	Spring	Credits
E M A 506	3	E M A 545	3
E M A 405	3	INTEREGR 397 (was EPD 397)	3
E M A 542	3	M E 364	3
M E 363 or CIV ENGR 310	3	STAT 324	3
MATH 321	3	Computing Elective	3
		Experimental Mechanics Course[5]	3
	15		**18**

Fourth Year

Fall	Credits	Spring	Credits
E M A 469	3	E M A 569	3
E M A 521[6]	3	E M A 523 or 524[7]	3
E C E 376 or PHYSICS 321	3	E M A/ASTRON 550, 610, or 642	3

E C E 332, M E 346, or M E 446	3 Tech Elective	2
Liberal Studies Elective	4 Liberal Studies Elective	3
	16	**14**

Total Credits 128

1. It is recommended that students take CHEM 109 Advanced General Chemistry for 5 credits. However, depending on their high school chemistry experience, students may substitute CHEM 103 General Chemistry I and CHEM 104 General Chemistry II for a total of 9 credits.
2. Students who were not able to take INTEREGR 170 Design Practicum as freshmen may, with the approval of their advisor, substitute a course offered in the College of Engineering or in the departments of Chemistry, Computer Sciences, Mathematics, and Physics.
3. Students may substitute PHYSICS 201 General Physics, 5 credits, for E M A 201 Statics, 3 credits, with the approval of their advisor.
4. After completing E M A 201 Statics, students may take E M A 202 Dynamics and E M A 303 Mechanics of Materials/E M A/M E 307 Mechanics of Materials Lab in either order or concurrently.
5. E M A 611 Advanced Mechanical Testing of Materials or E M A/M E 540 Experimental Vibration and Dynamic System Analysis or E M A/M E 570 Experimental Mechanics or E M A 522 Aerodynamics Lab. Note that E M A/M E 540 Experimental Vibration and Dynamic System Analysis and E M A/M E 570 Experimental Mechanics are typically offered in the fall. E M A 611 Advanced Mechanical Testing of Materials and E M A 522 Aerodynamics Lab are typically offered in the spring.
6. M E 563 Intermediate Fluid Dynamics may be substituted for E M A 521 Aerodynamics. Note that M E 563 Intermediate Fluid Dynamics is offered in the spring semester only.
7. E M A 523 Flight Dynamics and Control is offered in the Spring semester only. E M A 524 Rocket Propulsion is offered in the Fall semester only.