ENGINEERING MECHANICS: AEROSPACE ENGINEERING, M.S.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/#policiesandrequirementstext), in addition to the program requirements listed below.

NAMED OPTION REQUIREMENTS

MODE OF INSTRUCTION

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	Yes

Mode of Instruction Definitions

Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

Evening/Weekend: Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

Face-to-Face: Courses typically meet during weekdays on the UW-Madison Campus.

Hybrid: These programs combine face-to-face and online learning formats. Contact the program for more specific information.

Online: These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

CURRICULAR REQUIREMENTS

Requirement	Detail
Minimum Credit Requirement	30 credits
Minimum Residence Credit Requirement	16 credits
Minimum Graduate Coursework Requirement	15 credits must be graduate-level coursework. Details can be found in the Graduate School's Minimum Graduate Coursework (50%) policy (https://policy.wisc.edu/library/UW-1244 (https://policy.wisc.edu/library/UW-1244/)).
Overall Graduate GPA Requirement	3.00 GPA required. This program follows the Graduate School's GPA Requirement policy (https://policy.wisc.edu/library/UW-1203 (https://policy.wisc.edu/library/UW-1203/)).
Other Grade Requirements	Courses in which grades of BC, C, or below are received cannot be counted toward the degree except as follows: 1) Credits of C will be allowed provided they are balanced by twice as many credits of A or by four times as many credits of AB, 2) Credits of BC will be allowed provided they are balanced by twice as many credits of AB or by an equal number of credits of A.
Assessments and Examinations	No formal examination required.
Language Requirements	No language requirements.

REQUIRED COURSES

First Year

Fall	Credits	Spring	Credits	Summer	Credits
E P/E M A 547	3	E M A 601 (Mechanics Seminar)	1	If needed, 4 additional credits[1]	4
E M A 601 (Mechanics Seminar)	1	Select an additional 12 credits	12		
Select an additional 9 credits	9				
	13		**13**		**4**

Total Credits 30

- Students must take at least one class (3 credits) in E M A in any course numbered 700 or greater. Seminar, research, and co-op courses (such as E M A 790 Master's Research and Thesis, E M A 890 Pre-Dissertator Research, E M A 990 Research and Thesis, and E M A 702 Graduate Cooperative Education Program) are not eligible to satisfy this requirement.
- To establish sufficient depth in aerospace sciences, the courses selected must involve completion of at least two of the following five topical areas. You should check the future course offerings plans when choosing, since not all courses are offered every year (and hence not all topical areas can be completed every year).
- The additional courses required to meet the 30-credit minimum for completion of the degree should be selected from among the courses listed below.

1

Some credit can be transferred in.

TOPICAL AREAS

Fluid Mechanics [1]

Code	Title	Credits
E M A 521	Aerodynamics [2]	3
Select one:		3
M E 563	Intermediate Fluid Dynamics	
E M A 524	Rocket Propulsion	
M E 572	Intermediate Gas Dynamics	

M E/CIV ENGR/ E M A 775	Turbulent Heat and Momentum Transfer

1

These pathways are internal to the program and represent different curricular paths a student can follow to earn this degree. Pathway names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

2

If you have already completed an equivalent course as an undergrad then you may take two courses total from the second list and meet this requirement.

Rigid Body Dynamics [1]

Code	Title	Credits
E M A 542	Advanced Dynamics [2]	3
Select one:		3
E M A 523	Flight Dynamics and Control	
E M A/ ASTRON 550	Astrodynamics	
E M A 642	Satellite Dynamics	
M E 451	Kinematics and Dynamics of Machine Systems	

1

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2

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Structural Dynamics [1]

Code	Title	Credits
Select one: [2]		3
M E 440	Intermediate Vibrations	
E M A 545	Mechanical Vibrations	
E C E 717	Linear Systems	
Select one:		3
M E/E M A 540	Experimental Vibration and Dynamic System Analysis	
E M A 610	Structural Finite Element Model Validation	
E M A 747	Nonlinear and Random Mechanical Vibrations	

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2

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Aerospace Mechanics and Materials [1]

Code	Title	Credits
Select two courses:		6
E M A 506	Advanced Mechanics of Materials I	
E M A/ M S & E 541	Heterogeneous and Multiphase Materials	
E M A/CIV ENGR/ M E 508	Composite Materials	
E M A 622	Mechanics of Continua	
E M A 630	Viscoelastic Solids	
E M A 700	Theory of Elasticity	
E M A/M E 703	Plasticity Theory and Physics	

1

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Computation [1]

Code	Title	Credits
Select one: [2]		3
E M A 605	Introduction to Finite Elements	
M E 573	Computational Fluid Dynamics	
Select one:		3
E M A 705	Advanced Topics in Finite Elements	
M E 548	Introduction to Design Optimization	
M E 748	Optimum Design of Mechanical Elements and Systems	
MATH/ COMP SCI 714	Methods of Computational Mathematics I	
E M A/COMP SCI/ E C E/E P/ M E 759	High Performance Computing for Applications in Engineering	

1

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2

If you have already completed an equivalent course as an undergrad then you may take two courses total from the second list and meet this requirement.

ELECTIVE COURSES
Fall Elective Course Offerings

Code	Title	Credits
E C E 717	Linear Systems	3
E M A 506	Advanced Mechanics of Materials I	3
E M A 521	Aerodynamics	3
E M A 524	Rocket Propulsion	3
E M A/M S & E 541	Heterogeneous and Multiphase Materials	3
E M A 605	Introduction to Finite Elements	3
E M A/M E 703	Plasticity Theory and Physics	3
E P/E M A 547	Engineering Analysis I	3

M E 440	Intermediate Vibrations	3
M E/E M A 540	Experimental Vibration and Dynamic System Analysis	3
M E/E M A 570	Experimental Mechanics	3
M E 573	Computational Fluid Dynamics	3

Spring Elective Course Offerings

Code	Title	Credits
E M A 522	Aerodynamics Lab	3
E M A 523	Flight Dynamics and Control	3
E M A/ASTRON 550	Astrodynamics	3
E M A/M E 570	Experimental Mechanics	3
E M A 610	Structural Finite Element Model Validation	3
E M A 611	Advanced Mechanical Testing of Materials	3
E M A 622	Mechanics of Continua	3
E M A 630	Viscoelastic Solids	3
E M A 642	Satellite Dynamics	3
E M A 705	Advanced Topics in Finite Elements	3
E M A 747	Nonlinear and Random Mechanical Vibrations	3
M E 563	Intermediate Fluid Dynamics	3
M E 569	Applied Combustion	3
M E 572	Intermediate Gas Dynamics	3
M E 769	Combustion Processes	3
M E/CIV ENGR/ E M A 775	Turbulent Heat and Momentum Transfer	3

Fall/Spring Elective Course Offerings (offering varies)

Code	Title	Credits
E M A 700	Theory of Elasticity	3
MATH 705	Mathematical Fluid Dynamics	3
M E/N E 520	Two-Phase Flow and Heat Transfer	3
M E 561	Intermediate Thermodynamics	3
M E 564	Heat Transfer	3
M E 761	Topics in Thermodynamics	3
M E 764	Advanced Heat Transfer I-Conduction	3
M E 770	Advanced Experimental Instrumentation	3
M E 774	Chem Kinetics of Combust Systems	3

Other Policy

Students in this program may not take courses outside the prescribed curriculum without faculty advisor and program director approval. Students in this program cannot enroll concurrently in other undergraduate or graduate degree programs.