

: ACCELERATED PROGRAM

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In Workflow

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Approval Path

1. Wed, 11 Dec 2019 20:58:44 GMT
Carl R Sovinec (csovinec): Approved for EGR PHYS Dept. Approver
2. Wed, 11 Dec 2019 23:12:11 GMT
Sara K Hagen (skhagen): Approved for EGR College Admin Reviewer

New Program Proposal

Date Submitted: Wed, 11 Dec 2019 20:55:06 GMT

Viewing: : Accelerated Program

Last edit: Wed, 11 Dec 2019 20:58:30 GMT

Changes proposed by: csovinec

Final Catalog

Rationale for Inactivation

Name of the school or college academic planner who you consulted with on this proposal.

Name
Sara Hagen - EGR

Proposal Abstract/Summary:

We are proposing an Accelerated named option for the Engineering Mechanics Master of Science degree. The distinguishing feature from the Research named option is that the new program is a coursework-only degree that can be completed in 12 to 16 months. There are two informal coursework tracks that focus study on topics for either aerospace engineering or the mechanics of solids.

Type of Approval

Governance Approval Needed

If approved, what term should the proposed change be effective?

Select yes if this proposal is only to add, remove, or rearrange curricular requirements, and will change less than 50% of the curriculum.

Basic Information

Program State:

Type of Program:

Named Option

Parent Program:

MAJ: Engineering Mechanics MS

Upload the Approved Notice of Intent and UW System Approval Memo.

Upload completed draft of the full Board of Regents Authorization Proposal for this program.

Parent Audience:

Graduate or professional

Who is the audience?

Parent Home Department:

EGR PHYS

Home Department:

Parent School/College:

College of Engineering

School/College:

The program will be governed by the home department/academic unit as specified. Will an additional coordinating or oversight committee be established for the program?

No

Describe procedures under which the coordinating/oversight committee will operate, including how the committee chair is appointed, to whom the chair reports, how participating faculty and staff are identified, provisions for transitions in the committee, and processes for interaction with the home department.

Parent is in the Graduate School:

Yes

Is this in the Graduate School?

Award:

Other Award Name:

SIS Code:

SIS Code (BS):

SIS Description:

SIS Description (BS):

Transcript Title:

Accelerated Program

Will this name change apply to all enrolled students in the same term (turn-key)?

Named Options:

400MSAPMCH: Fndmtls of Applied Mechanics

Sub Plan 1084: No Title Found

Sub Plan 1120: No Title Found

Does the parent program offer this as an additional major as well?

No

Will this be offered as an additional major as well?

Explain the program's process for reviewing joint degree proposals from students.

Describe the reason for offering the program as an additional major. Include evidence of student interest and demand, how the additional major benefits the students' learning experience, and describe how the program has capacity in course offerings and advising to support the additional major.

Provide information on which degree/majors it will likely be combined with most frequently and provide evidence that such combinations will not extend student time to degree beyond the standard four academic years.

Briefly describe the process the student follows to get permissions to declare the additional major from the primary degree/major and the additional major offering unit.

Will a doctoral minor be required?

Explain the rationale for the decision.

Describe the alternate breadth training resources that will be made available to/required of students.

Is this a non-admitting master's degree?

Suspension and Discontinuation

What is the date by which you will submit a plan to resolve the suspended status, if approved?

What is the last term that a student could declare this program?

What is the last term that students may be enrolled in or complete the program?

What is the timeline and advance communication plan?

Explain the precipitating circumstances or rationale for the proposal.

What is the potential impact on enrolled students?

What is the potential impact on faculty and staff?

Explain and provide evidence of efforts made to confer with and to notify faculty and staff.

Explain and provide evidence of efforts made to confer with and to notify current students.

Explain and provide evidence of efforts made to confer with and to notify alumni and other stakeholders.

Teach-out plan - How will program quality be maintained during the suspended period or the teach-out period for discontinued programs?

Teach-out plan: A) For currently enrolled students, how will required courses, curricular elements, advising and other student services be provided?

Teach-out plan: B) For prospective students in the admissions pipeline, how are any commitments being met or needs to notify them that their program of interest will not be available?

Teach-out plan: C) For stopped out students, what provisions are made for their re-entry? What program(s) will they be re-entered into?

Teach-out plan: D) Provide any other information relevant to teach-out planning.

Roles by Responsibility: List one person for each role in the drop down list. Use the green + to create additional boxes.

Role Type	Name (Last, First)	Email	Phone	Title
Faculty Director	Sovinec, Carl R	csovinec@wisc.edu	608/263-5525	Prof.

List the departments that have a vested interest in this proposal.

Departments
Mechanical Engineering (MECH EGR)
Material Science & Engineering (MAT SC EGR)
Mathematics (MATH)
Civil and Environmental Engr (CIV EN EGR)

Are all program reviews in the home academic unit up to date?

Yes

Please explain.

Are all assessment plans in the home academic unit up to date?

Yes

Please explain.

Are all assessment reports in the home academic unit up to date?

Yes

Please explain.

Mode of Delivery:

Face-to-Face (majority face-to-face courses)

Provide information on how any lab courses required for the degree will be handled.

Will this program be part of a consortial or collaborative arrangement with another college or university?

No

Upload proposal:

Will instruction take place at a location geographically separate from UW-Madison?

No

Upload proposal:

Parent has outside accreditation:

No

Will this program have outside accreditation?

Parent Guide Accreditation tab

Guide Accreditation tab

Will graduates of this program seek licensure or certification after graduation?

Graduates of parent program seek licensure or certification after graduation.

No

Parent Guide Certification/Licensure tab

Guide Certification/Licensure tab

First term of student enrollment:

Fall 2020 (1212)

When will the application for the first term of enrollment open?

Spring 2020 (1204)

Which terms will you allow new students to enroll? What are the application deadlines for each term selected?

Start Term	Application Deadline MM/DD
Fall	03/31

Year of three year check-in to GFEC (3 years after first student enrollment):

2024

Year of first program review (5 years after first student enrollment):

2026

If this proposal is approved, describe the implementation plan and timeline.

The proposed tracks are composed of classes that are currently being taught by the Departments of Engineering Physics and Mechanical Engineering. Depending on interest, the EP Department may need to open a second section of the EMA 522 Aerodynamics Laboratory. Enrollment in other courses can, at least initially, be accommodated with existing sections. Thus, academic implementation is essentially 'turn-key.'

Rationale and Justifications

How does the named option relate to the major and to other named options in the major, if relevant?

The Engineering Physics Department offers an MS degree in the fields of Engineering Mechanics (EM) and in Nuclear Engineering and Engineering Physics (NEEP). The parent plan for the EM MS has been oriented toward research; it has a thesis track and an independent-study track, and a number of these students continue to the PhD program. To accommodate administrative requirements, the parent plan is being moved into the new 'Research' named option. The 'Accelerated' named option that is proposed here will focus on getting students through a rigorous masters-level engineering program with minimal interruption to their professional engineering careers. While students in the 'Research' option can use the same coursework to satisfy degree requirements, their independent-study, and possible thesis research, requires additional time to complete the MS degree.

The Engineering Physics Department also offers the Fundamentals of Applied Mechanics named option of the EM MS degree. This program is designed to educate students with a non-engineering scientific background in fundamental methods of engineering so that they are equipped to pursue a career in engineering. In contrast, the proposed Accelerated option is designed for students who have completed undergraduate degrees in engineering and would like to learn advanced topics that will further their careers.

Why is the program being proposed? What is its purpose?

The program is coursework-only graduate education in the engineering mechanics field with particular emphasis on either aerospace or solid-mechanics topics. All students will learn theoretical and computational methods for engineering analysis and take a track-relevant laboratory class for hands-on experience. The aerospace-topics includes fluid mechanics, rigid-body dynamics, structural dynamics, mechanics of aerospace structures. It is not intended to provide the depth of a strict aerospace engineering degree but instead provides a more general mechanics foundation with an aerospace emphasis. Graduates will have a unique combination of skills that will be attractive to industry.

The solids track will include advanced topics such as continuum mechanics, visco-elasticity, advanced mechanics of materials, theory and physics of plasticity, advanced finite element method, fracture mechanics, mechanics of composite and advanced materials, and micro- and nano-scale mechanics. This program of study will give each student a very strong education in the

important fundamentals of the topic of solid mechanics to enable them to thrive technically in their careers and enable a strong foundation for leadership roles.

While students in our research-oriented MS will also learn the topics and skills discussed above, the accelerated program will allow the students planning to pursue a career in industry a shorter path to completion. Our intent is to also attract employer interest to fund their engineering employees with a limited time commitment.

How is the certificate program designed to complement the degree/major of participating students?

What is its relation to the institution's mission? (Consider the mission broadly as a major research university with missions in teaching, research, service, and the Wisconsin Idea.) How does it contribute to the mission of the sponsoring unit(s)?

Do current students need or want the program? Provide evidence.

There is evidence that current students want the type of accelerated MS program that is proposed here. Considering data that is posted by the College of Engineering Career Services (<https://ecs.wisc.edu/students/offers-and-negotiation>; see the summary reports in the B.S. Salary Information tab), approximately 1/4 of Engineering Mechanics and Astronautics undergraduates go directly to graduate school. Among those students, we gauge those going into MS programs from the degree recipient data in the MS and PhD Profiles for Engineering Mechanics (see links under <https://grad.wisc.edu/academic-programs/?program=G400&type=view>) as approximately 75% of those going to graduate school. Furthermore, students from other majors (i.e. Mechanical Engineering, Civil Engineering, etc...) frequently express interest in pursuing an emphasis in Aerospace Engineering in graduate school, and so they provide a large pool of students from which this degree might attract applicants.

Moreover, comparing starting salaries for entry-level positions for those with BS and MS degrees from the ECS data, the MS graduates can expect to earn approximately \$12,000 more per year whether using the national MS data from either the Mechanical Engineering or Aerospace Engineering fields.

This program is also designed to be attractive for employer-sponsored continuing education which can be supported by our private sector relationships and especially in-state entities. This program is also seamless to existing undergraduate students wishing to add an additional year to earn an MS degree. This would therefore be a strong option for all students in various tracks of study.

What is the market, workforce, and industry need for this program? Provide evidence.

The accelerated MS includes Aerospace Engineering and Solid Mechanics tracks. The aerospace industry is currently ripe with opportunity for several reasons:

- Commercial spaceflight (e.g. SpaceX, Blue Origin) continues to open new employment opportunities for graduate and undergraduate students. The industry is transitioning from one in which the government was the key player to one that is driven commercially. Space access is as important as ever and as the funding landscape evolves new funding opportunities will continue to emerge.
- China and Russia are investing heavily in research in hypersonic aircraft, and this has prompted the U.S. to increase funding in this area. U.S. funding will need to continue to grow dramatically to keep pace with our competitors, and so significant increases are expected.
- Industry has begun to pursue research into supersonic business jets, and several companies anticipate having commercial products in the coming years. The FAA's restrictions on supersonic flight over land are expected to be relaxed, potentially leading to a resurgence in high speed flight as a major business area. While aircraft were historically designed with large budgets and a reliance on testing, modern aircraft design is driven by simulations and advances in several areas will be needed to develop this next generation of aircraft.
- Sierra-Nevada Corporation has greatly expanded its office and workforce in Middleton, WI, and has hired several of our students.
- Continuing education and MS level employees have long been desirable to private sector employees which prepares them well for leadership roles.

How does the program represent emerging knowledge, or new directions in professions and disciplines?

In what ways will the program prepare students through diverse elements in the curriculum for an integrated and multicultural society (may include diversity issues in the curriculum or other approaches)?

What gap in the program array is it intended to fill?

UW-Madison has long had a well-recognized undergraduate program in Engineering Mechanics and Astronautics (similar to aerospace engineering) and a strong MS program in mechanics that has sent many students to work in industry. This creates an new accelerated track for this MS and enhances the focus on aerospace engineering and mechanics of solids for those who are interested in a more concentrated focus. The Aerospace and Solids tracks appeal to different sectors of employers and would therefore be a highly complementary offering for the department.

What is the rationale for this change?

What evidence do you have that these changes will have the desired impact?

What is the potential impact of the proposed change(s) on enrolled students?

What is the potential impact of the proposed change(s) on faculty and staff?

Faculty and Staff Resources

List the core program faculty and staff with title and departmental affiliation(s) who are primarily involved and will participate in the delivery and oversight.

Name (Last, First)	Department	Title
Allen, Matthew S	Engineering Physics (EGR PHYS)	Professor
Bonazza, Riccardo	Engineering Physics (EGR PHYS)	Professor
Bronkhorst, Curt Allan	Engineering Physics (EGR PHYS)	Professor
Choy, Jennifer Tze-Heng	Engineering Physics (EGR PHYS)	Assistant Professor
Crone, Wendy C	Engineering Physics (EGR PHYS)	Professor
Franck, Jennifer A	Engineering Physics (EGR PHYS)	Assistant Professor
Lakes, Roderic S	Engineering Physics (EGR PHYS)	Professor
Notbohm, Jacob K	Engineering Physics (EGR PHYS)	Assistant Professor
Thevamaran, Ramathanan	Engineering Physics (EGR PHYS)	Assistant Professor

What resources are available to support faculty, staff, labs, equipment, etc. ?

As this program of study will offer courses which are currently being offered to graduate students across the COE, this program will not require support resources other than additional funding for faculty for the additional student workload anticipated and planned.

Program advisor(s) with title and departmental affiliation(s).

Name (Last, First)	Department	Title
Bronkhorst, Curt Allan	Engineering Physics (EGR PHYS)	Professor
Allen, Matthew S	Engineering Physics (EGR PHYS)	Professor
Bonazza, Riccardo	Engineering Physics (EGR PHYS)	Professor

How will the resource load for the additional advising be met?

Describe how student services and advising will be supported.

As this program of study will offer courses which are currently being offered to graduate students across the COE, this program will be self-supporting through direct funding to the EP Department

Describe the advising and mentoring practices that will be used in this program, including how annual assessment of student progress will be communicated.

Confirm that the program advisor(s) or coordinator(s) have been consulted and reviewed this proposal.

Yes

Select the Graduate Research Scholars Community for this program.

Resources, Budget, and Finance

Is this a revenue program?

Yes

What is the tuition structure for this program?

Standard resident/MN/nonresident graduate tuition

Select a tuition increment:

What is the rationale for selecting this tuition increment?

Will segregated fees be charged?

If segregated fees will not be charged, please explain.

Upload the proposal for market based tuition:

Provide a summary business plan.

The Aerospace Engineering and Mechanics of Solids tracks of study anticipated with this proposed program rely upon an accelerated curriculum of coursework using existing graduate level courses. This is the basis for the business plan for this proposed program of study which is also meant to minimize the cost involved with this new offering from the EP department. Because of this, we do not anticipate costs beyond those already covered in the overhead charge sharing with campus and college administrations

Provide an overview of plans for funding the program including but not limited to program administration, instructional/curricular delivery, technology needs and program assessment.

As this program of study will offer courses which are currently being offered to graduate students across the COE, this program will be self-supporting through direct funding to the EP Department

What is the marketing plan?

We will market this proposed program through the Division of Continuing Studies. We anticipate significant enrollment from existing students in Engineering Physics, Mechanical Engineering and Civil Engineering and expect to attract enough students to keep the program viable with minimal advertising.

Describe resource and fiscal considerations - A. Provide an overview of plans for funding the program including program administration, instructional/curricular delivery, academic and career advising, technology needs, marketing (if relevant), financial aid and scholarships (if relevant), capacity for student learning outcomes assessment and program review.

Describe resource and fiscal considerations - B. Are the faculty, instructional staff and key personnel existing or new faculty and staff? If they already serve existing programs, how are they able to add this workload? If new faculty and staff will be added, how will they be funded?

Describe resource and fiscal considerations - C. What impacts will the program have on staffing needs beyond the immediate program? How are those needs being met?

Describe resource and fiscal considerations - D. For graduate programs, describe plans for funding students including but not limited to funding sources and how funding decisions will be made.

UW System Administration and the Board of Regents require submission of budget information in a specific format. These forms will be completed in collaboration with APIR after school/college approval and before submission to UWSA for Board consideration. These forms are uploaded here by APIR.

Given considerations associated with the proposed change, describe the academic unit's fiscal capacity to support the instructional and curricular requirements, academic and career advising, student support services, technology needs, and relevant assessment of student learning and program review requirements. Is there sufficient capacity in the curricular and academic support services to meet the additional workload? For research graduate programs, include information on how the program will be administered and how

student funding will be handled. For undergraduate programs, include information on academic advising, career advising, student support services.

Does the program or change require substantial new resources other than those just described? Describe the needs. Confirm that the dean is committed to providing the resources.

No substantial new resources will be required. The COE Dean is encouraging of these programs.

Are new Library resources needed to support this program?

No

Provide a summary of the requirements.

Memo from the Libraries confirming that the needs can be addressed.

Describe plans for funding students including but not limited to funding sources and how funding decisions are made.

This named option will not include funding to support students.

Will you be seeking federal financial aid eligibility for this Capstone program?

Capstone program students are eligible for federal financial aid (usually loans) if they participate in Gainful Employment (GE) requirements, that is, the prepare students for employment in a recognized occupation. For information about gainful employment requirements see: <https://studentaid.ed.gov/sa/about/data-center/school/ge>

Identify the SOC codes most closely associated with the occupational preparation the Capstone provides.

What program-specific financial aid, if any, is available for this program?

What is time period that this program is designed to be completed in by the typical student?

Gainful Employment requirements come with the need to track employment of graduates and provide additional reports – does the program have the capacity to complete these requirements?

Curriculum and Requirements

If you are proposing a change to the curriculum, what percentage of the curriculum is changing?

Provide an explanation of the reasons for such a substantial curricular change, the potential impact on students, availability of courses, and plan for transition.

Which students are eligible for the certificate?

List the specific schools and colleges.

Provide justification for the limits.

Is this certificate available to University Special (non-degree seeking students)?

Which University Special students are eligible for the certificate?

Describe certificate program procedures to advise students who do not complete the certificate to notify the program advisor if they re-enroll as a University Special student to complete the certificate.

Describe certificate program procedures to notify Adult Career and Special Student Services (ACSSS) of those University Special students who are formerly unaffiliated with the program who intend to complete a certificate.

Describe certificate program procedures to report to the Registrar's Office when a University Special student has completed the certificate and supply a list of courses that student used to fulfill certificate requirements. (Note that SIS eDeclaration and DARS are not available for University Special students.)

Parent Plan Admissions/How To Get In Requirements

Students apply to the Master of Science in Engineering Mechanics through one of the named options:

- Research [REGISTRAR'S OFFICE ADD LINK ONCE PAGE IS BUILT]
- Accelerated [REGISTRAR'S OFFICE ADD LINK ONCE PAGE IS BUILT]
- Fundamentals of Applied Mechanics (<https://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/engineering-mechanics-fundamentals-applied-mechanics-ms/>)

Guide Admissions/How to Get In tab

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. **Applicants must meet** the minimum requirements (<https://grad.wisc.edu/apply/requirements/>) **of the Graduate School as well as the program(s)**. Once you have researched the graduate program(s) you are interested in, apply online (<https://grad.wisc.edu/apply/>).

Requirements	Detail
Fall Deadline	December 15
Spring Deadline	October 1
Summer Deadline	December 15
GRE (Graduate Record Examinations)	Required.*
English Proficiency Test	Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements (https://grad.wisc.edu/apply/requirements/#english-proficiency).
Other Test(s) (e.g., GMAT, MCAT)	n/a
Letters of Recommendation Required	3

* Except for current UW-Madison NE/EP/EMA undergraduate students.

The Graduate School sets minimum requirements for admissions (<https://grad.wisc.edu/admissions/requirements/>). Academic program admission requirements are often more rigorous than those set by the Graduate School. Please check the program website (<https://www.engr.wisc.edu/department/engineering-physics/academics/ms-engineering-mechanics/>) for details and admissions deadlines.

Describe plans for recruiting students to this program.

We will recruit students for this program from the existing pool of undergraduate students as well as with in-state and out-of-state employers.

What is the recruiting and admissions strategy for underrepresented students?

Will students be declared in an intended major while completing the admission requirements?

Describe how the students will be advised and the transition to other degree granting program if they are not admitted.

Projected Annual Enrollment:

Year	Projected Enrollment
Year 1	8
Year 2	16
Year 3	28

Year 4	36
Year 5	40

Maximum enrollment that can be supported with existing instructional and student services resources:

Describe plans for supporting enrollments that are much higher or much lower than the anticipated enrollment.

Are international students permitted to enroll in this program?

Those who are not familiar with using the html editor fields may upload a document with information about the curriculum for use by those who will format and edit the content that will appear in the Guide.

Select the school or college degree requirements that will be used.

Will this program have Honors in the Major?

Parent Requirements

Minimum Graduate School Requirements

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

Major Requirements

MODE OF INSTRUCTION

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

Mode of Instruction Definitions

Evening/Weekend: These programs are offered in an evening and/or weekend format to accommodate working schedules. Enjoy the advantages of on-campus courses and personal connections, while keeping your day job. For more information about the meeting schedule of a specific program, contact the program.

Online: These programs are offered primarily online. Many available online programs can be completed almost entirely online with all online programs offering at least 50 percent or more of the program work online. Some online programs have an on-campus component that is often designed to accommodate working schedules. Take advantage of the convenience of online learning while participating in a rich, interactive learning environment. For more information about the online nature of a specific program, contact the program.

Hybrid: These programs have innovative curricula that combine on-campus and online formats. Most hybrid programs are completed on-campus with a partial or completely online semester. For more information about the hybrid schedule of a specific program, contact the program.

Accelerated: These on-campus programs are offered in an accelerated format that allows you to complete your program in a condensed time-frame. Enjoy the advantages of on-campus courses with minimal disruption to your career. For more information about the accelerated nature of a specific program, contact the program.

CURRICULAR REQUIREMENTS

Requirements	Detail
Minimum Credit Requirement	See Named Options for policy information.
Minimum Residence Credit Requirement	See Named Options for policy information.
Minimum Graduate Coursework Requirement	See Named Options for policy information.
Overall Graduate GPA Requirement	See Named Options for policy information.
Other Grade Requirements	See Named Options for policy information.
Assessments and Examinations	See Named Options for policy information.
Language Requirements	See Named Options for policy information.

Required COURSES

Select a Named Option (<https://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/#NamedOptions>) for courses required.

Named Options (Sub-Majors)

A named option is a formally documented sub-major within an academic major program. Named options appear on the transcript with degree conferral. Students pursuing the Master of Science in Engineering Mechanics must select one of the following named options:

View as listView as grid

- Engineering Mechanics: Fundamentals of Applied Mechanics, M.S. (<http://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/engineering-mechanics-fundamentals-applied-mechanics-ms/>)
- Engineering Mechanics: Research, M.S. (<http://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/engineering-mechanics-research-ms/>)

Guide Requirements tab

Credits Requirement: 30

There are two informal coursework tracks: Aerospace Engineering and Mechanics of Solids. In either track, students must take at least one class in EMA at the 700-level or above.

Aerospace Engineering Track

To establish sufficient depth in aerospace sciences, the courses selected must involve completion of at least two of the following topical areas. You should check the future course offerings plans¹ when choosing since not all courses are offered every year (and hence not all topic 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 Aerospace Track Courses listed below.

- ¹
- Engineering Physics website - Click on 'Courses' under 'Degree Information' (<https://www.engr.wisc.edu/department/engineering-physics/academics/bs-engineering-mechanics/>)
 - Mechanical Engineering website - Click on 'Courses' under 'Program Details' (<https://www.engr.wisc.edu/department/mechanical-engineering/academics/bachelor-of-science-in-mechanical-engineering/>)

Aerospace Track Topics

Fluid Mechanics

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 775	Turbulent Heat and Momentum Transfer	

Rigid Body Dynamics

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	

Structural Dynamics

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	

Aerospace Mechanics and Materials

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	

Computation

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	

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.

Fall Semester 13 Credits

Required:

- E P/E M A 547 Engineering Analysis I, 3 credits
- E M A 601 Special Topics in Engineering Mechanics, 1 credit
- Choose 3 additional courses

Spring Semester 13 Credits

Required:

- E M A 601 Special Topics in Engineering Mechanics, 1 credit
- Choose 4 additional courses

Typical Transfer Credit or 3rd Semester

- (Two courses), 6 credits

Aerospace Track Elective Courses

Fall 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 622	Mechanics of Continua	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 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 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 775	Turbulent Heat and Momentum Transfer	3

Fall/Spring 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 545	Fluid Power	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

Mechanics of Solids Track

To complete the mechanics of solids track you must complete the courses shown below, as well as enough electives to meet the 30 credit minimum. The elective courses must be selected from the list below.

Mechanics of Solids Track Topics

30 credits

Required³:

Code	Title	Credits
E P/E M A 547	Engineering Analysis I	3
E M A 506	Advanced Mechanics of Materials I	3
E M A 605	Introduction to Finite Elements	3
E M A 622	Mechanics of Continua	3
18 additional credits		18

Total Credits	30
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³ If you have already completed a course that is equivalent to one in the list, select one or more additional courses from the Mechanics of Solids Track Elective Courses list to meet the 30-credit requirement.

Mechanics of Solids Track Elective Courses:

Code	Title	Credits
E M A 519	Fracture Mechanics	3
E M A/M S & E 541	Heterogeneous and Multiphase Materials	3
E M A 601	Special Topics in Engineering Mechanics ⁴	1
E M A 610	Structural Finite Element Model Validation	3
E M A 611	Advanced Mechanical Testing of Materials	3
E M A/E P 615	Micro- and Nanoscale Mechanics	3
E M A 630	Viscoelastic Solids	3
E M A 700	Theory of Elasticity	3
E M A/M E 703	Plasticity Theory and Physics	3
E M A 705	Advanced Topics in Finite Elements	3
E M A 747	Nonlinear and Random Mechanical Vibrations	3
E P/E M A 548	Engineering Analysis II	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/ B M E 603	Topics in Bio-Medical Engineering (Must be topic: Finite Element Analysis for Biomechanics)	3
M E/ B M E 615	Tissue Mechanics	3
M E 753	Friction, Lubrication and Wear	3
M S & E 551	Structure of Materials	3
M S & E 750	Imperfections and Mechanical Properties	3

⁴ E M A 601 Special Topics in Engineering Mechanics can be taken up to three times.

Total credits required:

30

Semesters to completion:

Parent Plan Graduate Policies

Graduate School Policies

The Graduate School's Academic Policies and Procedures (<https://grad.wisc.edu/acadpolicy/>) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

Major-Specific Policies

Graduate Program Handbook

The Graduate Program Handbook (<https://www.engr.wisc.edu/department/engineering-physics/academics/ms-engineering-mechanics/>) is the repository for all of the program's policies and requirements.

Prior Coursework

Graduate Work from Other Institutions

See Named Options (<https://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/#NamedOptions>) for policy information.

UW–Madison Undergraduate

See Named Options (<https://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/#NamedOptions>) for policy information.

UW–Madison University Special

See Named Options (<https://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/#NamedOptions>) for policy information.

Probation

See Named Options (<https://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/#NamedOptions>) for policy information.

ADVISOR / COMMITTEE

See Named Options (<https://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/#NamedOptions>) for policy information.

CREDITS PER TERM ALLOWED

See Named Options (<https://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/#NamedOptions>) for policy information.

Time Constraints

See Named Options (<https://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/#NamedOptions>) for policy information.

Other

See Named Options (<https://guide.wisc.edu/graduate/engineering-physics/engineering-mechanics-ms/#NamedOptions>) for policy information.

Guide Graduate Policies tab

Graduate School Policies

The Graduate School's Academic Policies and Procedures (<https://grad.wisc.edu/acadpolicy/>) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

Named Option-Specific Policies

Graduate Program Handbook

The Graduate Program Handbook (<https://www.engr.wisc.edu/department/engineering-physics/academics/master-science-engineering-mechanics-fundamentals-applied-mechanics-option/>) is the repository for all of the program's policies and requirements.

Prior Coursework

Graduate Work from Other Institutions

No transfer credits are allowed.

UW–Madison Undergraduate

With program approval, students are allowed to count up to 7 credits of coursework from the following list of courses:

Code	Title	Credits
E P/E M A 547	Engineering Analysis I	3
E P/E M A 548	Engineering Analysis II	3
E M A 303	Mechanics of Materials	3
E M A/M E 307	Mechanics of Materials Lab	1
E M A 405	Practicum in Finite Elements	3
E M A 405	Practicum in Finite Elements	3
E M A 506	Advanced Mechanics of Materials I	3
E M A/CIV ENGR/M E 508	Composite Materials	3
E M A 519	Fracture Mechanics	3
E M A 542	Advanced Dynamics	3
E M A/M E 570	Experimental Mechanics	3
E M A 605	Introduction to Finite Elements	3
E M A 611	Advanced Mechanical Testing of Materials	3
E M A 622	Mechanics of Continua	3
E M A 642	Satellite Dynamics	3
E M A 705	Advanced Topics in Finite Elements	3

These may be counted toward the Minimum Graduate Degree Credit Requirement as applicable. No credits may be counted toward the minimum graduate residence credit requirement. Coursework earned five or more years prior to admission to a master's degree is not allowed to satisfy requirements.

UW–Madison University Special

With program approval, students are allowed to count up to 15 credits of coursework numbered 400 or above taken as a UW–Madison Special student toward the minimum graduate residence credit requirement, and the minimum graduate degree credit requirement. UW–Madison coursework taken as a University Special student would not be allowed to count toward the 50% graduate coursework minimum unless taken at the 700 level or above. Coursework earned five or more years prior to admission to a master's is not allowed to satisfy requirements.

Probation

A semester GPA below 3.0 will result in the student being placed on academic probation. If a semester GPA of 3.0 is not attained during the subsequent semester of full time enrollment (or 12 credits of enrollment if enrolled part-time) the student may be dismissed from the program or allowed to continue for one additional semester based on advisor appeal to the Graduate School.

ADVISOR / COMMITTEE

Each student is required to meet with his or her advisor prior to registration every semester.

CREDITS PER TERM ALLOWED

15 credits

Time Constraints

Students are expected to complete the FAM degree program in one calendar year, i.e., 12 months (summer session plus two semesters). One additional semester is permitted to complete the requirements, if needed.

Other

Students in the accelerated Fundamentals of Applied Mechanics (M.S.) program are not eligible for graduate assistantships; as it is an accelerated program students are not expected to accommodate time for assistantship work.

Guide Four Year Plan tab

Discuss expected progress to degree and time to degree. For undergraduate programs discuss considerations for supporting students to complete the degree in four academic years.

A credit requirement to graduate will be 30. This is achievable within 12-16 months for full-time students and 24 months for part-time students.

Provide detail on how breadth will be achieved.

Describe part-time format (<8 credits fall and spring semesters < 4 credits summer term) here.

Describe full-time, time-compressed, intensive format here.

Describe other format here.

Program Learning Outcomes and Assessment

Parent Program Learning Outcomes

Demonstrate a strong understanding of mathematical, scientific, and engineering principles in the field.

Demonstrate an ability to formulate, analyze, and independently solve advanced engineering problems.

Apply the relevant scientific and technological advancements, techniques, and engineering tools to address these problems.

Recognize and apply principles of ethical and professional conduct.

List the program learning outcomes.

Summarize the assessment plan.

Approved Assessment Plan:

Related Programs

List majors and certificates that may not be earned in combination with this program.

List majors that are anticipated to frequently be completed in combination with the proposed program. For each, describe how the proposed program can be completed in combination with the major without increasing time to degree.

Provide information in related programs offered by other UW System institutions and explain the extent to which the proposed program is distinct and how it overlaps or duplicates those programs.

Commitments

All required courses are approved through the school/college level.

Yes

Courses are offered on a regular basis to allow timely completion.

Yes

Courses have enrollment capacity.

Yes

Courses in the curriculum are numbered 300 or higher.

Courses in the curriculum are numbered 699 or lower.

Courses in which a student elects the pass/fail option will not count toward completion of requirements.

Special topics courses are only used if all topics count for the certificate.

All requirements must be met; exceptions that amount to waiving requirements are not permitted.

Course substitutions to the curriculum should be kept to a minimum; if substitutions are being made on a regular basis, the curriculum should be re-examined. When course substitutions are made, the substituted course should be formally added to the curriculum through governance for inclusion in the curriculum the following academic year.

Substitutions are not permitted for any course unless the substitution would be provided for every student with the same substitution request.

When the proposed certificate is made available to University Special students it is only available to those who have earned a baccalaureate degree.

Certificate program faculty and staff understand that Adult Career and Special Student Services (ACSSS) in the Division of Continuing Studies will serve as the advising, admissions, and academic dean's office for all University Special students.

Certificate program faculty and staff will work with ACSSS to monitor and advise University Special students seeking a certificate.

Certificate courses have the enrollment capacity to accommodate University Special students. Certificate program faculty and staff understand that University Special students completing the certificate will not have enrollment priority over degree-seeking undergraduate students nor University Special students enrolled in capstone certificate programs.

If completing the certificate as a University Special student, at least 12 credits towards the certificate must be earned in residence at UW-Madison, either while enrolled as a University Special student or from coursework earned while enrolled as an undergraduate at UW-Madison. (Note this is a higher residency requirement than is used for degree-seeking students.)

All of the Capstone certificate credits must be earned "in residence" (which includes on campus and distance-delivered courses) at UW-Madison while enrolled in the Capstone certificate program. Because a Capstone certificate is comprised of just a few courses, it is not appropriate for students who already have completed the same or similar coursework at UW-Madison or another institution.

At least half of the credits must be earned in residence (UW-Madison on campus, study abroad, or distance courses); exceptions to the minimum residency requirement are not permitted.

Students must earn a minimum 2.000 GPA on required certificate coursework. Completed courses listed within the certificate curriculum, whether or not they meet a specific requirement, are included in the calculation of the GPA.

Students must earn a minimum 3.000 GPA on required certificate coursework. Completed courses listed within the certificate curriculum, whether or not they meet a specific requirement, are included in the calculation of the GPA.

Students must earn a minimum grade of C on all attempted Capstone certificate coursework.

The program faculty/staff will ensure the program is encoded into DARS and will work with the Registrar's Office DARS liaison to keep approved revisions to the curriculum current.

All students will be declared into the appropriate plan code in SIS via either an admission process or e-declaration. If the student does not have the plan code on their student record in SIS the student is not considered to be in the program.

Students may complete only 1 named option within a plan code.

Yes

The program faculty/staff will ensure the program website, Advance Your Career materials if applicable, and other presentations are consistent with the Guide information for this program.

Yes

Certificate requires no more than half of the credits required for a major in a related field.

Credential will not be awarded retroactively to students who completed all of the requirements before the credential was approved.

Yes

Degree-seeking students may not be concurrently enrolled in a Capstone certificate program.

Students enrolled in Capstone certificate programs are NOT eligible for teaching assistant (TA), research assistant (RA), project assistant (PA) nor graduate fellowship support. Programs must disclose this program policy to Capstone certificate students in the recommendation of admission letter, program website, program handbook, and program orientation.

To be eligible for admission to a Capstone program, a student must hold an earned bachelor's degree or equivalent credential from an accredited college or university.

Supporting Information

List name and department of those who are in support of this proposal.

If those supporting the proposal provided a letter or email of support upload here. A letter is NOT required. Upload any other explanatory information about support from other UW-Madison units.

Additional Information:

EMA_nonPooled_Fall2019_Budget v5.xlsx

Approvals

Department Approval - This proposal has been approved by the faculty at the department/academic unit level. The program faculty confirm that the unit has the capacity and resources (financial, physical, instructional, and administrative) to meet the responsibilities associated with offering the program, including offering the necessary courses, advising students, maintaining accurate information about the program in the Guide and elsewhere, conducting student learning assessment and program review, and otherwise attend to all responsibilities related to offering this program.

Enter any notes about approval here:

The Engineering Physics Department reviewed and approved this program proposal at its November 12, 2019 faculty meeting.

Entered by:

Carl Sovinec

Date entered:

12/11/2019

School/College Approval - This proposal has been approved at the school/college level and it is submitted with the Dean's support. The Dean and program faculty confirm that the unit has the capacity and resources (financial, physical, instructional, and administrative) to meet the responsibilities associated with offering the program, including offering the necessary courses, advising students, maintaining accurate information about the program in the Guide and elsewhere, conducting student learning assessment and program review, and otherwise attend to all responsibilities related to offering this program.

Enter any notes about approval here:

Entered by and date:

Date entered:

GFEC Approval - This proposal has been approved by the Graduate Faculty Executive Committee and the Dean of the Graduate School.

Enter any notes about the approval here:

Entered by:

Date entered:

UAPC Approval - This proposal has been approved by the University Academic Planning Council and the Provost.

Enter any notes about approval here:

Entered by:

Date entered:

For Administrative Use

Admin Notes:

Guide URL:

Effective date:

Effective Guide Edition:

Career:

SIS Program Code:

SIS Program Code (BS):

SIS Short Description:

SIS code for additional major:

SIS code for intended major:

SIS code for honors in the major:

SIS code for honors in the major (BS):

SIS code for honors in the major (BMAJ):

SIS code for special student certificate:

Other plan codes associated with this program:

Diploma Text:

Diploma Text 2:

Degree:

Degree (BS):

Field of Study:

Program Length:

National Student Clearing House Classification:

Plan Group:

Educational Level:

Award Category:

Enrollment Category:

CIP Code:

STEMOPT:

UWSTEM:

HEALTH:

Educational Innovation Program:

Distance Education Program:

Non Traditional Program:

Special Plan Type:

CDR certificate category:

Added to UW System Crosswalk:

Reviewer Comments

Key: 1120