Aerospace Engineering, Ph.D.

Curriculum in Doctor of Philosophy – Aerospace Engineering

A candidate for the Ph.D. degree with a major in aerospace engineering must comply with the rules and regulations as outlined in the WVU Graduate Catalog and the specific requirements of the Statler College and the Mechanical and Aerospace Engineering Department.

Program Requirements

The doctor of philosophy degree with a major in aerospace engineering is administered through the college's interdisciplinary Ph.D. program. The research work for the doctoral dissertation must show a high degree of originality on the part of the student and must constitute an original contribution to the art and science of aerospace engineering.

All Ph.D. degree candidates are required to perform research and follow a planned program of study. The student's research advisor, in conjunction with the student's Advising and Examining Committee (AEC) will be responsible for determining the plan of study appropriate to the student's needs. The underlying principle of the planned program is to provide the students with the necessary support to complete their degree and prepare them for their career.

The doctoral courses of study are selected to fit the particular interests and objectives of the student, with proper attention given to broadening related areas of study. The research work for the doctoral dissertation may entail a fundamental investigation into a specialized area or a broad and comprehensive study in a related subject.

All students pursuing a Ph.D. degree in the MAE department are expected to engage in research and complete and successfully defend a Ph.D. dissertation. They should identify a subject for their Ph.D. dissertation, form a five-member advisory and examining committee, and file a plan of study by the end of their first semester of enrollment in the graduate program. At least one member of the graduate faculty from outside the department is required to serve on the advisory and examining committee.

PUBLICATION REQUIREMENT

Prior to scheduling the dissertation defense, Ph.D. students are required to provide written documentation that they have received formal proof of submission of either:

a.) At least one manuscript, generally co-authored with their research supervisor and about some portion of their PhD dissertation research, to an archival journal for publication, or

b.) At least one patent disclosure, also generally about some portion of their PhD dissertation research.

Curriculum Requirements

Code	Title	Hours
A minimum cumulative GPA of 3.0 is required in all courses.		
Course Requirements [*]		
Core Area Courses		**3**
Select one course in the relevant core area from the following: [**]		
Area A: Fluid Mechanics and Aerodynamics (FMA)		
MAE 532	Dynamics of Viscous Fluids	
MAE 624	Convection Heat Transfer	
MAE 636	Fundamentals of Turbulent Flow	
Area B: Thermal Sciences and Systems (TSS)		
MAE 521	Advanced Thermodynamics 1	
MAE 532	Dynamics of Viscous Fluids	
MAE 624	Convection Heat Transfer	
Area C: Dynamics and Controls (D&C)		
MAE 642	Intermediate Dynamics	
MAE 653	Advanced Vibrations	
MAE 660	Feedback Control in Mechanical Engineering	
Area D: Solid Mechanics and Design (SMD)		
MAE 543	Advanced Mechanics of Materials	
MAE 640	Continuum Mechanics	
MAE 642	Intermediate Dynamics	

MAE 653	Advanced Vibrations	
Area E: Materials Science (MS)		
MAE 580	Crystallography and Crystals	
MAE 583	Thermodynamics and Kinetics of Materials	
MAE 649	Microscopy of Materials	
Mathematics Requirements		**6**
Select two of the following (at least one course with MATH prefix or MAE 515):		
MATH 521	Numerical Analysis	
MATH 522	Numerical Solution of PDE	
MATH 541	Modern Algebra 1	
MATH 543	Linear Algebra	
MATH 545	Number Theory 1	
MATH 551	Real Variables 1	
MATH 555	Complex Variables 1	
MATH 560	Introduction to Dynamical Systems and Applications	
MATH 563	Mathematical Modeling	
MATH 564	Intermediate Differential Equations	
MATH 566	Intermediate Partial Differential Equations	
MATH 567	Advanced Calculus 1	
MATH 568	Advanced Calculus	
MATH 573	Graph Theory	
STAT 513	Design of Experiments	
STAT 545	Applied Regression Analysis	
STAT 561	Theory of Probability and Statistics 1	
STAT 562	Theory of Statistics 2	
MAE 515	Analytical Methods in Engineering	
MAE 623	Conduction Heat Transfer	
MAE 633	Computational Fluid Dynamics	
MAE 640	Continuum Mechanics	
MAE 645	Energy Methods in Applied Mechanics	
CHE 531	Mathematical Methods in Chemical Engineering	
EE 515	Linear Control Systems	
EE 517	Optimal Control	
IENG 518	Technology Forecasting	
IENG 553	Applied Linear Programming	
PHYS 611	Introduction to Mathematical Physics	
Research		24
MAE 797	Research	
Any BIOM, BMEG, CE, CHE, CHEM, CPE, CS, EE, IENG, IH&S, MAE, MATH, MINE, PNGE, PHYS, SAFM, SENG, EXPH 583, or STAT courses 500-795, as approved by the student's AEC.		9
Milestones		
Plan of Study		
Qualifying Exam (Ph.D. qualifying examination)		
Candidacy Exam (Dissertation research proposal defense)		
Publication Requirement		
Final Exam (Final dissertation defense)		
Dissertation		
Total Hours		42

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Students who do not hold a baccalaureate degree in aerospace engineering are required to take a set of undergraduate aerospace courses above and beyond the minimum coursework requirements.
For these students, a minimum of fifty-four hours of coursework and thirty hours of independent research beyond a bachelor's degree, or eighteen hours of coursework and twenty-four hours of independent research beyond an M.S. degree are required.

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PhD students who also earn their MS degree in the MAE Department are expected to select the third core course in their technical area.

First Year			
Fall	**Hours**	**Spring**	**Hours**
Core Area Course		3 Math Course	3
Math Course		3 Additional Course	3
MAE 797		3 MAE 797	3
		9	9
Second Year			
Fall	**Hours**	**Spring**	**Hours**
Additional Course		3 Additional Course	3
MAE 797		6 MAE 797	6
		9	9
Third Year			
Fall	**Hours**	**Spring**	**Hours**
MAE 797		9 MAE 797	9
		9	9

Total credit hours: 54

JOURNAL PAPER PUBLICATION REQUIREMENT FOR ALL PHD STUDENTS:

Beginning with all PhD students admitted for the summer or fall of 2016 and thereafter, every Ph.D. student, prior to his/her dissertation defense, will be required to provide written documentation that they have received formal proof of submission of either:

a.) At least one manuscript, generally co-authored with their research supervisor and about some portion of their PhD dissertation research, to an archival journal for publication, or

b.) At least one patent disclosure, also generally about some portion of their PhD dissertation research.

This publication requirement will have to be satisfied prior to scheduling the defense of the Ph.D. Dissertation.

Major Learning Outcomes

AEROSPACE ENGINEERING

The MAE Department is committed to deliver high quality education and research experience to all graduate students in order to enable them to achieve success in their careers, though the following Learning Goals:

- Expertise, depth and breadth in a chosen field of aerospace engineering.
- Capacity to engage in original research, advanced technological discovery and innovation in order to advance the frontiers of knowledge in the science of the aerospace engineering discipline.
- Capacity of effective high level communication in order to document, disseminate and transfer knowledge of the science of the aerospace engineering discipline in educational, research or applied workplace settings.
- Appreciation and understanding of the role of the science of the aerospace engineering discipline in a global and societal context.