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 second 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.

Curriculum Requirements

A minimum cumulative GPA of 3.0 is required in all courses.

Course Requirements

Technical Area Courses

Select one course in the relevant core technical 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

Select two of the following (at least one course with MATH prefix):

- MATH 521 Numerical Analysis
MATH 522  Numerical Solution of PDE
MATH 541  Modern Algebra
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  Mathematics Modeling
MATH 564  Intermediate Differential Equations
MATH 567  Advanced Calculus
MATH 568  Advanced Calculus
MATH 573  Graph Theory
STAT 513  Design of Experiments
STAT 545  Applied Regression Analysis
STAT 561  Theory of 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

Examinations
Qualifying Exam (Ph.D. qualifying examination)
Candidacy Exam (Dissertation research proposal defense)
Final Exam (Final dissertation defense)
The "Publication Requirement" must be satisfied prior to scheduling the final dissertation defense

Total Hours 42

* 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.
** 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

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Second Year

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<td>Additional Course</td>
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Any BIOM, CE, CHE, CHEM, CPE, CS, EE, IENG, IH&S, MAE, MATH, MINE, PNGE, PHYS, SAFM, SENG, or STAT courses 500-799

9
MAE 797  3 MAE 797  3

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Total credit hours: 42

**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.