AEROSPACE ENGINEERING, PHD

More Information: https://engineering.case.edu/mechanical-aerospace-engineering/academics/aerospace-engineering/doctor-philosophy
Degree: Doctor of Philosophy (PhD)
Field of Study: Aerospace Engineering

Program Overview

Students wishing to pursue an Aerospace Engineering PhD must successfully pass the doctoral qualifying examination. Qualifying exams (QE) are offered in the spring and fall semesters for each of the research concentration areas listed below and they originate from the three required courses for each concentration area. Full-time students should take the QE with the consent of their advisor after taking their three required classes and before the start of their 4th semester in the program.

PhD Policies

For PhD policies and procedures, please review the School of Graduate Studies section of the General Bulletin.

Program Requirements

The Aerospace Engineering PhD minimum course requirements are as follows:

Depth Courses

All programs of study must include a minimum of 18 credit hours (six graduate-level courses) in aerospace engineering and/or the student's research concentration area beyond the student's BS degree. These courses should follow a logical development in the student's research concentration area and be determined in conjunction with the student's dissertation advisor to meet the objectives of the student's dissertation research topic.

Breadth and Basic Science Courses

A minimum of 18 credit hours (six graduate-level courses) beyond the student's BS degree are required to fulfill the breadth and basic science courses. The basic science requirement is satisfied by taking two courses in science or mathematics. Four additional courses are needed to provide breadth outside the student's area of research.

Dissertation Research

All doctoral programs must include a minimum of 18 credit hours of thesis research, EMAE 701

Residence and Teaching Requirements

All doctoral programs must meet the residency requirements of the School of Graduate Studies and the teaching requirements of the Case School of Engineering.

In addition to these requirements, students in this program must complete a three-semester sequence of 0-credit hour courses to confirm attendance at departmental seminars.

Concentration Requirements

Depending on their research area of interest, students should select courses from the list below to fulfill the depth requirement and with the approval of their advisor. Other technical, math and science courses within and outside of EMAE may also be acceptable with approval of their advisor.

Aeronautics

Code	Title	Credit Hours
Required Courses:		
EMAE 453	Advanced Fluid Dynamics I	3
EMAE 482	Propulsion	3
EMAE 483	Flight Mechanics	3
Recommended Courses:		
EMAE 454	Advanced Fluid Dynamics II	3
EMAE 457	Combustion	3
EMAE 471	Computational Fluid Dynamics	3

Biomechanics

Code	Title	Credit Hours
Required Courses:		
EMAE 407	Fundamentals of Biomechanics	3
EMAE 415	Introduction to Musculo-skeletal Biomechanics	3
EMAE 456	Micro-Electro-Mechanical Systems in Biology and Medicine (BioMEMS)	3
Recommended Courses:		
EBME 427	Movement Biomechanics and Rehabilitation	3
EBME 474	Biotransport Processes	3
EMAE 480	Fatigue of Materials	3

Dynamics, Control and Manufacturing

Code	Title	Credit Hours
Required Courses:		
EMAE 481	Advanced Dynamics I	3
EMAE 489	Robotics I	3
EMAE 487	Vibration Problems in Engineering	3
or EMAE 560	Sustainable Manufacturing	
Recommended Courses:		
EMAE 479	Mechanics and Control of Compliant Robotics	3
EMAE 540	Advanced Dynamics II	3
CSDS 473	Modern Robot Programming	3
CSDS 491	Artificial Intelligence: Probabilistic Graphical Models	3

Fluids and Thermal Sciences

Code	Title	Credit Hours
Required Courses:		
EMAE 453	Advanced Fluid Dynamics I	3
EMAE 455	Advanced Thermodynamics	3
EMAE 459	Advanced Heat Transfer	3

Recommended Courses:		
EMAE 454	Advanced Fluid Dynamics II	3
EMAE 457	Combustion	3
EMAE 460	Theory and Design of Fluid Power Machinery	3
EMAE 461	Chemistry of Fire Safe Polymers and Composites	3
EMAE 463	Fire Dynamics	3
EMAE 471	Computational Fluid Dynamics	3
EMAE 494	Energy Systems	3
EMAE 554	Turbulent Fluid Motion	3
EMAE 557	Convective Two-Phase Flow and Heat Transfer	3
EMAE 559	Hypersonics and Gas Dynamics	3

Solid Mechanics

Code	Title	Credit Hours
Required Courses:		
EMAE 401	Mechanics of Continuous Media	3
ECIV 435	Elasticity and Data-driven Mechanics	3
EMAE 475	Finite Element Analysis	3
Recommended Courses:		
EMSE 421	Fracture of Materials	3
EMAE 450	Advanced Mechanical Engineering Analysis	3
EMAE 480	Fatigue of Materials	3

Interdisciplinary

Take any three of the above required courses with the consent of your instructor and satisfy the other degree requirements.