

DOCTOR OF PHILOSOPHY WITH A MAJOR IN ROBOTICS

Program website: <http://phdrobotics.gatech.edu>

Program requirements: <http://phdrobotics.gatech.edu/program>

Students pursuing a PhD in Robotics must take 36 credit hours of core research and elective courses, pass a comprehensive qualifying exam with written and oral components, and successfully complete, document, and defend a piece of original research culminating in a doctoral thesis. Students select a home school, such as ECE, AE, ME, or IC, and apply for admission to the PhD program in robotics through that home school.

All PhD programs must incorporate a standard set of Requirements for the Doctoral Degree.

Program of Study

The main emphasis of the Ph.D. program is the successful completion of an original and independent research thesis. The degree requirements are designed around this goal.

Minimum Requirements

- Completion of 36 semester hours of courses with a letter grade
- Passing a comprehensive qualifying exam with written and oral components.
- Successfully conducting, documenting, and defending a piece of original research culminating in a doctoral thesis.
- Note: A maximum of two classes (6 semester hours) at the 4000-level may be used to satisfy 36 semester hour requirement.

Code	Title	Credit Hours
CS/AE/ECE/ ME 7785	Introduction to Robotics Research	3
CS/AE/ECE/ ME 8750	Robotics Research Foundation I	3
CS/AE/ECE/ ME 8751	Robotics Research Foundation II	3
Foundation Courses ¹		9
Elective Courses ²		9
Courses Outside of the Major ³		9
Total Credit Hours		36

Ph.D. Candidacy

Prior to completing all of these requirements, Georgia Tech defines the Ph.D. Candidate milestones. Admission to candidacy requires that the student:

1. Complete all course requirements (except the minor);
2. Achieve a satisfactory scholastic record;
3. Pass the comprehensive examination;
4. Submit and receive approval naming the dissertation topic and delineating the research topic.

Core Area Courses

The following courses are in the robotics core areas of Mechanics, Control, Perception, Artificial Intelligence, and Human-Robot Interaction

(HRI). They are used to select three foundation courses and three targeted elective courses. Foundation courses are noted with a footnote.

Code	Title	Credit Hours
Mechanics		
AE 6120	Thermal Effects in Structures I ¹	3
AE 6211	Advanced Dynamics II	3
AE 6230	Structural Dynamics	3
AE 6263	Flexible Multi-body Dynamics	3
AE 6270	Applied Nonlinear Dynamics	3
AE 6520	Advanced Flight Dynamics	3
BMED 8813	Special Topics (Robotics) ¹	3
CS 7496	Computer Animation	3
ME 6405	Introduction to Mechatronics	3
ME 6407	Robotics ¹	3
ME 6441	Dynamics of Mechanical Systems	3
ME 6442	Vibration of Mechanical Systems	3
ME 7442	Vibration of Continuous Systems	3
Control		
AE 6252	Smart Structures and Structural Control	3
AE 6504	Modern Methods in Aircraft Flight Control	3
AE 6505	Random Processes and Kalman Filtering	3
AE 6506	Aerospace Guidance and Navigation	3
AE 6511	Optimal Guidance and Control	3
AE 6530	Multivariable Linear Systems and Control ¹	3
AE 6531	Aerospace Robust Control I	3
AE 6532	Aerospace Robust Control II	3
AE 6534	Control of Aerospace Structures	3
AE 6580	Aerospace Nonlinear Control	3
AE 8803	Special Topics (Nonlinear Stochastic Optimal Control)	3
ECE 6550	Linear Systems and Controls ¹	3
ECE 6551	Digital Control	3
ECE 6552	Nonlinear Systems and Control	3
ECE 6553	Optimal Control and Optimization	3
ECE 6554	Adaptive Control	3
ECE 6555	Optimal Estimation	3
ECE 6559	Advanced Linear Systems	3
ECE 6563	Networked Control and Multiagent Systems	3
ME 6401	Linear Control Systems ¹	3
ME 6402	Nonlinear Control Systems	3
ME 6403	Digital Control Systems	3
ME 6404	Advanced Control System Design and Implementation	3
Perception		
CS 6476	Introduction to Computer Vision GR ¹	3
CS 7476	Advanced Computer Vision	3
CS 7616	Pattern Recognition	3
CS 7636	Computational Perception	3
CS 7499	3D Reconstruction and Mapping in Computer Vision, Robotics, and Augmented Reality	3
CS 7626	Introduction to Behavioral Imaging	3

CS 7643	Deep Learning	3
ECE 6255	Digital Processing of Speech Signals	3
ECE 6258	Digital Image Processing	3
ECE 6273	Methods of Pattern Recognition with Application to Voice	3
ECE 6560	Partial Differential Equations in Image Processing and Computer Vision	3
ME 6406	Machine Vision ¹	3
Artificial Intelligence		
CS 3600	Introduction to Artificial Intelligence	3
CS 6601	Artificial Intelligence ¹	3
CS 7612	Artificial Intelligence Planning	3
CS 7640	Learning in Autonomous Agents	3
CS 7643	Deep Learning	3
CS 7648	Interactive Robot Learning	3
CS 8803	Special Topics (Mobile Manipulation)	3
CS 8803	Special Topics (Robot Intelligence)	3
CS 8803	Special Topics (Robot Motion Planning)	3
CS 8803	Special Topics (Computation and the Brain)	3
CS 8803	Special Topics (Statistical Techniques in Robotics)	3
CS/ECE 8803	Special Topics (Probabilistic Graph Models and ML in High Dimensions)	3
ECE 6254	Statistical Machine Learning	3
ECE 6556	Intelligent Control	3
Human-Robot Interaction (HRI) ²		
AE 6721	Evaluation of Human Integrated Systems ¹	3
CS 7633	Human-Robot Interaction ¹	3
CS 6455	User Interface Design and Evaluation	3
CS 6750	Human-Computer Interaction	3
CS 7648	Interactive Robot Learning ¹	3
CS 8803	Special Topics (Computational Social Robotics)	3
ISYE 6215	Models in Human-Machine Systems	3
ISYE 6224	Topics in Human-Integrated Systems	3
PSYC 6011	Cognitive Psychology	3
PSYC 6014	Sensation and Perception	3
PSYC 6017	Human Abilities	3
PSYC 7101	Engineering Psychology I: Methods	3
PSYC 7104	Psychomotor and Cognitive Skill Learning and Performance	3

¹ Foundation course² HRI includes two core courses. Students are encouraged, but not required to take both HRI core courses. Students taking both core courses may use their second core class in place of an HRI elective course.