Ph.D. Requirements (minimum total of 30 credits post-M.S., 47 credits for post B.S. students))

Core Course Requirement - 12 Credits
- **Robotics Mechanics Core Area**
  - ROBOT 6000 Robotics I: Mechanics | 3 Credits
- **Robot Control Core Area**
  - ROBOT 6100 Robotics II: Control | 3 Credits
- **Cognition Core Area (Pick One)**
  - ROBOT 6200 Motion Planning | 3 Credits (spring)
  - CS 6300 | Artificial Intelligence | 3 Credits (fall)
- **Perception Core Area (Pick One)**
  - CS 6640 | Image Processing | 3 Credits (fall)
  - CS 6320 | Computer Vision | 3 Credits (fall)

Elective Course Requirement * 9 Cr
Select 3 classes from **two** categories

**Robot Mechanics Category Electives**
- ROBOT 7000 Manipulation and Mobility
- ROBOT 7010 System Identification for Robotics

**Robot Control Category Electives**
- ME EN 6200 OR ECE 6615 | Classical Control Systems
- ECE 6670 | Control of Electric Motors
- ME EN 6210 OR ECE 6652 OR CH EN 6203 | State Space Control
- ME EN 7200 | Nonlinear Control
- ME EN 7210 | Optimal Control
- ECE 6570 | Adaptive Control

**Cognition Category**
- CS 6350 | Machine Learning
- CS 6958 | Robot Learning

**Perception Category**
- CS 7640 | Advanced Image Processing
- CS 6353 | Deep Learning for Image Analysis

**Human-Robot Interaction Category**
- CS 6360 | Virtual Reality
- ROBOT 7400 | Haptics for VR, Teleoperation, and Physical Human-Robot Interaction
- ROBOT 6400 Neural Engineering and NeuroRobotics

All electives are 3 credits, with the exception of ROBOT 6400, 6500, ECE/CS 6780 (which are each 4 credits).

Core courses not used to fulfill a core area requirement may also be considered.

Allied Courses ** 9-10 Credits
- Remaining courses to reach the 30-credit hour coursework minimum requirement

Seminar Requirement 3 Credits
- **Department Seminar** | 1 Credit
  - ME EN 6890 OR ECE 6900-001 OR CS 7930-001
  - (Enroll in the seminar associated with your thesis advisor)

- **ROBOT 6800 Robotics Seminar** | 2 Credits
  - (Enroll in 2 semesters for 1 credit each semester)

Dissertation Requirement *** 14 Credits
- ROBOT 7970 Ph.D. Dissertation | 14 Credits (Advisors’ section)
Example Program of Study for an Ph.D. (Post-B.S.) in Robotics

Below is one possibility for a program of study that satisfies the Ph.D. degree and milestone requirements. At least 9 credits per semester is required to qualify for tuition benefit. Course selections may change based on faculty advisement.

**Pre-Candidacy**

Year 1
(1) Fall
ROBOT 6000
3 cr
ROBOT 6100
3 cr
Elective
3 cr
Department Seminar
1 cr
Robotics Seminar
1 cr
ROBOT 6970 or 7970
2 cr
Establish Faculty Advisor

Year 2
(3) Fall
Perception Core: CS 6640 or CS 6320
3 cr
*Cognition Core: ROBOT 6200 (or CS 6300 in fall)
3 cr
Robotics Seminar
1 cr
Robotics Seminar
1 cr
ROBOT 6970 or 7970
2 cr

**Qualifying Exam**

(2) Spring
ROBOT 6100
3 cr
Elective
3 cr

**Advance to Candidacy**

(4) Spring
Allied
3 cr
Robotics Seminar
1 cr
Read Thesis Handbook

(5) Fall
Allied
3 cr
Robotics Seminar
1 cr
Dissertation Proposal (Oral Qualifier)

(6) Spring
ROBOT 7970
6 cr
Dissertation Defense (Final Oral Exam)

**Dissertation**

(7) Fall
ROBOT 7970
9 cr
Final Program of Study Approved by Committee

(8) Spring
ROBOT 7970
9 cr
Submit Preliminary Review to Thesis Office

(9) Fall
ROBOT 7970
9 cr
Dissertation Defense (Final Oral Exam)

(10) Spring
ROBOT 7970
9 cr
Manuscript Approval

**Graduation!**

Final Program of Study Approved by Committee

* Only 1 Cognition Core option is required. If not completing both, substitute 1 with an elective course (3 electives required)