



# ROBOTICS

THE UNIVERSITY OF UTAH

# Graduate Certificate Requirements

Minimum 18 credits

## CORE COURSES 12 credits

## SEMINAR 1 credit

### MECHANICS

**ROBOT 6000/ CS 6310/  
ECE 6650/ ME EN 6220  
(3 cr)** Robotics I:  
Mechanics

### CONTROL

**ROBOT 6100/  
CS 6330/ ECE 6651/  
ME EN 6230 (3 cr)**  
Robotics II:  
Control

### COGNITION

**\* ROBOT 6200/ CS 6370/  
ME EN 6225 (3 cr)**  
Motion Planning  
or  
**CS 6300 (3 cr)** AI

### PERCEPTION

**CS 6640 / BME 6640  
(3 cr)** Image Processing  
or  
**\* CS 6320 (3 cr)**  
Computer Vision

**ROBOT 6800 (1 cr)**  
Robotics Seminar

## ELECTIVE COURSES 3 credits

Select **1 course** from any different category:

## PROJECT 2 credits

### MECHANICS

**ROBOT 7000 / ME EN 7230/  
CS 7310 (3 cr)**  
Manipulation, Mobility  
**ROBOT 7010 / ME EN 7220/  
CS 7320 (3 cr)**  
System Identification

### CONTROL

**ME EN 6200/ ECE 6615 (3 cr)**  
Classical Control Systems  
**ECE 6670 (3 cr)**  
Control of Electric Motors  
**ME EN 6210/ECE 6652/  
CH EN 6203 (3 cr)**  
State Space Control  
**ME EN 7200 (3 cr)**  
Nonlinear Control  
**ME EN 7210 (3 cr)**  
Optimal Control  
**ECE 6570 (3 cr)**  
Adaptive Control

### DESIGN

**\* ROBOT 6500/ME EN 6240  
(4 cr)** Adv. Mechatronics  
**\* ROBOT 6960 (3 cr)**  
Wearable Robotics  
**ECE 6780/ CS 6780 (3 cr)**  
Embedded System Design  
**ECE 6960 (3 cr)**  
Robotic Millisystems  
**CS 6956 (3 cr)**  
Medical Robotics

### \* Approved Intensive Project Courses

\* Students choosing to take project-intensive courses to double count as CORE and PROJECT *may need to take additional approved electives or the Robotics Seminar* to reach the 18 credit hour minimum.

### COGNITION

**CS 6350 (3 cr)**  
Machine Learning  
**CS 6958**  
Robot Learning (3 cr)

**ROBOT 6500/ ME EN 6240 (4 cr)**  
Advanced Mechatronics  
**ROBOT 6960 (3 cr)**  
Wearable Robotics  
**ROBOT 6200/ CS 6370/ ME EN 6225 (3 cr)**  
Motion Planning  
**CS 6320 (3 cr)**  
Computer Vision  
**ROBOT 6400/ BME 6640/ ECE 6654 (4 cr)**  
Neural Engineering

### PERCEPTION

**CS 7640 (3 cr)**  
Adv. Image Processing  
**CS 6353 (3 cr)**  
Deep Learning  
**ECE 6530 (3 cr)**  
Digital Signal Processing

or **ROBOT 6920** Graduate Project

### HUMAN-ROBOT INTERACTION