

## Robotics Undergraduate Certificate Requirements

|                       | Course Number  | Course Title  |
|-----------------------|--|---|
| <b>Date completed</b> | <b>(1 set of 2 courses) FOUNDATIONAL COURSE REQUIREMENT</b>  |   |
|                       | ME EN 3220<br>ME EN 3220   | Dynamic Systems & Control<br>Mechatronics                           |
|                       | ECE 3610<br>ECE 5615   | Fund. of Robotics & Cyberphysical Sys.<br>Classical Control Systems |
|                       | CS 4300<br>CS 4640   | Artificial Intelligence<br>Image Processing Basics                  |
| <b>Date completed</b> | <b>(3) CORE COURSE REQUIREMENT</b>   |   |
|                       | Robot Mechanics Core Area ( <b>Required</b> ):<br>ROBOT 5000/ CS 5310/ ECE 5650/ ME EN 5220                | Robotics I: Mechanics   |
|                       | <b>Choose 2 from different areas (a,b, or c):</b><br>a) Robot Control Core Area:<br>ROBOT 5100/ ME EN 5230 | Robotics II: Control  |
|                       | b) Cognition Core Area:<br>ROBOT 6200/ CS 6370/ ME EN 6225<br>or CS 4300                                   | Motion Planning<br>Artificial Intelligence                          |
|                       | c) Perception Core Area:<br>CS 4640/ BME 4640<br>or CS 5320  | Image Processing<br>Computer Vision                                 |
| <b>Date completed</b> | <b>(1) ELECTIVE COURSE REQUIREMENT</b>   |   |
|                       | <b>Robot Mechanics Category Electives:</b>   |   |
|                       | ROBOT 7000/ ME EN 7230/ CS 7310  | Manipulation and Mobility   |
|                       | ROBOT 7010/ CS 7320/ ME EN 7220  | System ID for Robotics  |
|                       | <b>Robot Control Category Electives:</b>   |   |
|                       | ME EN 5200 or ECE 5615   | Classical Control Systems   |
|                       | ECE 5670   | Control of Electric Motors  |
|                       | ME EN 5210/ ECE 5652/ CH EN 5203   | State Space Control   |
|                       | ME EN 7200   | Nonlinear Control   |
|                       | ME EN 7210   | Optimal Control   |
|                       | ECE 6570   | Adaptive Control  |
|                       | <b>Cognition Category:</b>   |   |
|                       | CS 5350  | Machine Learning  |
|                       | CS 5958  | Robot Learning  |
|                       | <b>Perception Category:</b>  |   |
|                       | CS 7640  | Advanced Image Processing   |
|                       | CS 5353  | Deep Learning for Image Analysis                                    |
|                       | ECE 5530   | Digital Signal Processing   |
|                       | <b>Human-Robot Interaction Category:</b>   |   |
|                       | CS 5360  | Virtual Reality   |
|                       | ROBOT 7400/ ME EN 7240   | Haptics   |
|                       | ROBOT 6400/ BME 6440/ ECE 6654   | Neuro-Robotics  |
|                       | <b>Robot Design Category:</b>  |   |
|                       | ROBOT 6500/ ME EN 5240   | Advanced Mechatronics   |
|                       | ROBOT 6510   | Wearable Robotics   |
|                       | ECE 5780/ CS 5780  | Embedded System Design  |
|                       | ECE 5960   | Robotic Millisystems  |
|                       | CS 6956  | Medical Robotics  |
| <b>Date completed</b> | <b>SEMINAR REQUIREMENT (1 cr)</b>  |   |
|                       | ROBOT 5800   | Robotics Seminar  |
| <b>Date completed</b> | <b>PROJECT REQUIREMENT (1 cr)</b>  |   |
|                       | ROBOT 5920   | Project   |