

# The Master of Science in Robotics and Autonomous Systems: Non-Thesis Program Planning Sheet



Student Name: \_\_\_\_\_

BU ID# \_\_\_\_\_

Email Address: \_\_\_\_\_

Advisor Name: \_\_\_\_\_

Expected Graduation Date: \_\_\_\_\_

## 1) Core Course Requirement – 4 credits

| <u>Course #</u> | <u>Course Name</u>                                 | <u>Credits</u> | <u>Semester/Year</u> | <u>Grade</u> |
|-----------------|----------------------------------------------------|----------------|----------------------|--------------|
| EK 505 A1       | Introduction to<br>Robotics and Autonomous Systems | 4              | Fall _____           | _____        |

## 2) Robotics Core Requirement – 16 credits

| <u>Area</u> | <u>Course #</u> | <u>Course Name</u> | <u>Credits</u> | <u>Semester/Year</u> | <u>Grade</u> |
|-------------|-----------------|--------------------|----------------|----------------------|--------------|
| <u>C</u>    | _____           | _____              | _____          | _____                | _____        |
| <u>D</u>    | _____           | _____              | _____          | _____                | _____        |
| <u>P</u>    | _____           | _____              | _____          | _____                | _____        |
| <u>ML</u>   | _____           | _____              | _____          | _____                | _____        |

## 3) Technical Elective Requirement – 12 credits

| <u>Course #</u> | <u>Course Name</u> | <u>Credits</u> | <u>Semester/Year</u> | <u>Grade</u> |
|-----------------|--------------------|----------------|----------------------|--------------|
| _____           | _____              | _____          | _____                | _____        |
| _____           | _____              | _____          | _____                | _____        |
| _____           | _____              | _____          | _____                | _____        |

Approved By:

\_\_\_\_\_  
Advisor Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Student Signature

\_\_\_\_\_  
Date

## The Master of Science in Robotics & Autonomous Systems Curricular Requirements

*The program requires 32 credit hours at the 500-level or above. At least 24 credits must be taken at Boston University. To graduate, a cumulative grade point average of at least 3.0 (B) must be attained.*

*If necessary, students can take more than 32 credits and drop the lowest grade(s). Grades of C– or lower are not acceptable for master's degrees under any circumstance. Successful completion of a 3-credit course in either the College of Arts and Sciences or the Questrom School of Business does not obviate the need to complete 32 credits. Students are permitted to take a single course multiple times to achieve the GPA requirement, but will only receive 4 credits if used against the degree requirements. Courses from the Metropolitan College (MET) cannot be used to satisfy any of the degree requirements.*

### 1. Core Course Requirement (4 credits)

All students are required to take and pass ENG EK505 A1 (*Introduction to Robotics and Autonomous Systems*) in order to receive their Master's degree. This course covers the fundamentals that will be built upon in the robotics core requirements.

### 2. Robotics Core Requirement (16 credits)

Students must choose a course from the list below in each of the four areas of Control (C), Perception (P), Design (D), and Machine Learning (ML). Each selected course can only satisfy one core area. Note that not every course is offered every year.

| Course Number                 | Course Name                                  | Area  |
|-------------------------------|----------------------------------------------|-------|
| ENG ME 762 <sup>2</sup>       | Nonlinear Systems and Control                | C     |
| ENG ME 570                    | Robot Motion Planning                        | C,P   |
| ENG ME/SE 740                 | Vision, Robotics, and Planning               | C, P  |
| ENG ME/SE/EC 701 <sup>3</sup> | Optimal and Robust Control                   | C     |
| ENG ME 501                    | Dynamic Systems Theory                       | C     |
| CAS CS 585                    | Image and Video Computing                    | P     |
| ENG EC 720 <sup>4</sup>       | Digital Video Processing                     | P     |
| ENG EC 535                    | Introduction to Embedded Systems             | D     |
| ENG EC 545                    | Cyberphysical Systems                        | D     |
| ENG ME557                     | Additive Manufacturing                       | D     |
| ENG ME 571                    | Medical Robotics                             | D     |
| ENG ME 568                    | Soft Robotics                                | D     |
| ENG ME 560                    | Precision Machine Design and Instrumentation | D     |
| ENG EC 503 <sup>1, 5</sup>    | Learning from Data                           | ML    |
| CAS CS 542 <sup>5</sup>       | Machine Learning                             | ML    |
| ENG EC/CAS CS 523             | Deep Learning                                | ML    |
| CAS CS 541 <sup>5</sup>       | Applied Machine Learning                     | ML    |
| ENG EC 518                    | Robot Learning                               | ML, P |

<sup>1</sup>If interested in the cybersecurity specialization, students must take EC 503 for ML requirement

<sup>2</sup>If interested in taking ME 762, the natural progression is to take ME 501 prior, although this is not a strong requirement

<sup>3</sup>If interested in taking, ME 701 students should have a solid knowledge of undergraduate Ordinary Differential Equations (engineering or the physical sciences), and have taken a class in signals and systems, or classical control

(undergrad level). While ME 501 (linear state space control) is listed as a pre-req, taking this class is helpful but not required.

<sup>4</sup>The content of CS 585 is complementary to the content of EC 720. Students can but are not required to take both courses.

<sup>5</sup>CS 541, CS 542 and EC 503 all have similar content; however, CS 541 and CS 542 are designed assuming a computer science background, whereas EC 503 is tailored toward students with an engineering background. Furthermore, EC 503 and CS 542 emphasize theory over application, while CS 541 emphasizes practical applications over theory.

Optional courses to help further develop coding skills (can be counted towards technical electives):

ENG EC602: Design by Software

ENG EC504: Advanced Data Structures

ENG EC530: Software Engineering Principles

### **3. Technical Elective Requirement (12 credits)**

Each student must complete three graduate-level courses in engineering, math, or the physical sciences to fulfill this Requirement. These courses may be taken in any department or division of the College of Engineering or in the College of Arts and Sciences and include those on the list above of robotics core (if not used to satisfy a core requirement). Students can also take and petition for an Independent Study to fulfill this requirement. The advisor must approve the three courses used to fulfill this requirement.