

# ROBOTICS ENGINEERING (BS) / ROBOTICS ENGINEERING (MS) (COMBINED OPTION)

## Program Map

### BS/MS Robotics Engineering Non-Thesis Option 1

Course	Title	Credit Hours
<b>First Year</b>		
<b>Fall</b>		
ENGL 1101	English Composition I (minimum grade of C)	3
MATH 1131	Calculus with Analytic Geometry I (minimum grade of C)	4
CHEM 1211	Principles of Chemistry I (minimum grade of C)	3
CHEM 1211L	Principles of Chemistry I Lab (minimum grade of C)	1
ENGR 1701	Introduction to Robotics (minimum grade of C)	1
ENGR 2255	Engineering Graphics and Computer Aided Design (minimum grade of C)	3
Area B2	Institutional Options Elective <sup>1</sup>	1
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
ENGL 1102	English Composition II (minimum grade of C)	3
MATH 1132	Calculus with Analytic Geometry II (minimum grade of C)	4
PHYS 2211	Principles of Physics I (minimum grade of C)	3
PHYS 2311	Principles of Physics I Lab (minimum grade of C)	1
Area H	Elective (minimum grade of C) <sup>2</sup>	3
KINS 1106 or PHED 1205	Lifetime Wellness or Concepts of Fitness	2
<b>Credit Hours</b>		<b>16</b>
<b>Second Year</b>		
<b>Fall</b>		
MATH 2115	Introduction to Linear Algebra (minimum grade of C)	3
PHYS 2212	Principles of Physics II (minimum grade of C)	3
PHYS 2312	Principles of Physics II Lab (minimum grade of C)	1
ENGR 2115	Statics (minimum grade of C)	3
ENGR 2221	Computing for Engineers 1 (minimum grade of C)	3
Area E	Behavioral Science Elective <sup>3</sup>	3
<b>Credit Hours</b>		<b>16</b>

<b>Spring</b>		
MATH 3107	Differential Equations (minimum grade of C)	3
ENGR 2206	Digital Logic (minimum grade of C)	4
ENGR 2125	Dynamics of Rigid Bodies (minimum grade of C)	3
Area H	Elective (minimum grade of C) <sup>2</sup>	3
Area B1	Institutional Options Elective <sup>4</sup>	3
<b>Credit Hours</b>		<b>16</b>

<b>Third Year</b>		
<b>Fall</b>		
MATH 2135	Calculus with Analytic Geometry 3 (minimum grade of C)	4
ENGR 3235	Circuit Analysis (minimum grade of C)	3
ENGR 3236	Introduction to Signal Processing (minimum grade of C)	3
ENGR 5245U	minimum grade of C	2
Area C1	Humanities Elective <sup>5</sup>	3
<b>Credit Hours</b>		<b>15</b>

<b>Spring</b>		
MATH 3175	Introduction to Probability (minimum grade of C)	3
ENGR 3255	Sensors and Actuators (minimum grade of C)	3
ENGR 3275	Feedback Control Systems (minimum grade of C)	3
Area H	Elective (minimum grade of C) <sup>2</sup>	3
PEDS	Physical Education course 1***	1
Area C2	Fine Arts Elective <sup>6</sup>	3
<b>Credit Hours</b>		<b>16</b>

<b>Fourth Year</b>		
<b>Fall</b>		
ENGR 4391	Robotics Senior Design 1 (minimum grade of C)	2
ENGR 5161U	Elements of Machine Intelligence (minimum grade of C)	3
ENGR 5176U	Kinematics and Dynamics (minimum grade of C)	3
ENGR 5236G	Microelectronic Circuits	3
Area E	American History <sup>7</sup>	3
<b>Credit Hours</b>		<b>14</b>

<b>Spring</b>		
ENGR 4392	Robotics Senior Design 2 (minimum grade of C)	2
ENGR 5238G	Introduction to Embedded Systems	3
ENGR 5151U	Computer Vision 1 (minimum grade of C)	3
POLS 1101	American Government	3
Area E	World Cultures Elective <sup>8</sup>	3
<b>Credit Hours</b>		<b>14</b>

<b>Fifth Year</b>		
<b>Fall</b>		
Area 1	Graduate Elective <sup>9</sup>	3
Area 1	Graduate Elective <sup>9</sup>	3
Area 1	Graduate Elective <sup>9</sup>	3

ENGR 6399	Graduate Research Project	3
<b>Credit Hours</b>		<b>12</b>
<b>Spring</b>		
Area 1	Graduate Elective <sup>9</sup>	3
Area 1	Graduate Elective <sup>9</sup>	3
Area 2	Graduate elective from Area 1 list <sup>9</sup>	3
ENGR 6399	Graduate Research Project	3
<b>Credit Hours</b>		<b>12</b>
<b>Total Credit Hours</b>		<b>147</b>

**Footnotes**

- <sup>1</sup> Area B2: ITDS 1779 (2) or LEAD 1705 (2) or PERS 1506 (1; may be repeated with different topic) or PERS 1507 (2).
- <sup>2</sup> Area H: ENGR 1000+, MATH/STAT 3000+, CPSC 3000+, MATH 2125, Science 1000+
- <sup>3</sup> ECON 2105 or ECON 2106 (recommended)
- <sup>4</sup> Area B1: COMM 1110 or FL 1001, 1002, 2001, 2002
- <sup>5</sup> Area C1: ENGL 2111, 2112; ITDS 1145, 1155, 2125; PHIL 2010
- <sup>6</sup> Area C2: ARTH 1100, 2125, 2126; ITDS 1145, MUSC 1100, THEA 1100
- <sup>7</sup> HIST 2111 or HIST 2112
- <sup>8</sup> World Culture: ANTH 1105, 1107, 2105, 2136; HIST 1111, 1112; ENGL 2136, GEOG 1101, ITDS 1156
- <sup>9</sup> Area 1 Graduate electives:
- ENGR 6137 Dynamic Optimization
  - ENGR 6145 Human-Robot Interactions
  - ENGR 6148 Military Applications in Robotics
  - ENGR 6152 Computer Vision 2
  - ENGR 6162 Machine Intelligence and Synthesis
  - ENGR 6167 Multi-Robot Systems
  - ENGR 6172 Multivariable Linear Controls
  - ENGR 6173 Nonlinear Controls
  - ENGR 6178 Biomechanics
  - ENGR 6239 Embedded Systems Design
  - ENGR 6555 Selected Topics in Robotics
  - any 5000+ CPSC/MATH class with advisor approval

**BS/MS Robotics Engineering Non-Thesis Option 2**

Course	Title	Credit Hours
<b>First Year</b>		
<b>Fall</b>		
ENGL 1101	English Composition I (minimum grade of C)	3
MATH 1131	Calculus with Analytic Geometry I (minimum grade of C)	4
CHEM 1211	Principles of Chemistry I (minimum grade of C)	3
CHEM 1211L	Principles of Chemistry I Lab (minimum grade of C)	1
ENGR 1701	Introduction to Robotics (minimum grade of C)	1
ENGR 2255	Engineering Graphics and Computer Aided Design (minimum grade of C)	3

Area B2	Institutional Options Elective <sup>1</sup>	1
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
ENGL 1102	English Composition II (minimum grade of C)	3
MATH 1132	Calculus with Analytic Geometry II (minimum grade of C)	4
PHYS 2211	Principles of Physics I (minimum grade of C)	3
PHYS 2311	Principles of Physics I Lab (minimum grade of C)	1
Area H	Elective (minimum grade of C) <sup>2</sup>	3
KINS 1106 or PHED 1205	Lifetime Wellness or Concepts of Fitness	2
<b>Credit Hours</b>		<b>16</b>

**Second Year**

<b>Fall</b>		
MATH 2115	Introduction to Linear Algebra (minimum grade of C)	3
PHYS 2212	Principles of Physics II (minimum grade of C)	3
PHYS 2312	Principles of Physics II Lab (minimum grade of C)	1
ENGR 2115	Statics (minimum grade of C)	3
ENGR 2221	Computing for Engineers 1 (minimum grade of C)	3
Area E	Behavioral Science Elective <sup>3</sup>	3
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
MATH 3107	Differential Equations (minimum grade of C)	3
ENGR 2206	Digital Logic (minimum grade of C)	4
ENGR 2125	Dynamics of Rigid Bodies (minimum grade of C)	3
Area H	Elective (minimum grade of C) <sup>2</sup>	3
Area B1	Institutional Options Elective <sup>4</sup>	3
<b>Credit Hours</b>		<b>16</b>

**Third Year**

<b>Fall</b>		
MATH 2135	Calculus with Analytic Geometry 3 (minimum grade of C)	4
ENGR 3235	Circuit Analysis (minimum grade of C)	3
ENGR 3236	Introduction to Signal Processing (minimum grade of C)	3
ENGR 5245U	minimum grade of C	2
Area C1	Humanities Elective <sup>5</sup>	3
<b>Credit Hours</b>		<b>15</b>
<b>Spring</b>		
MATH 3175	Introduction to Probability (minimum grade of C)	3
ENGR 3255	Sensors and Actuators (minimum grade of C)	3
ENGR 3275	Feedback Control Systems (minimum grade of C)	3

Area H	Elective (minimum grade of C) <sup>2</sup>	3
PEDS	Physical Education course 1***	1
Area C2	Fine Arts Elective <sup>6</sup>	3
<b>Credit Hours</b>		<b>16</b>

**Fourth Year**
**Fall**

ENGR 4391	Robotics Senior Design 1 (minimum grade of C)	2
ENGR 5161U	Elements of Machine Intelligence (minimum grade of C)	3
ENGR 5176U	Kinematics and Dynamics (minimum grade of C)	3
ENGR 5236G	Microelectronic Circuits	3
Area E	American History <sup>7</sup>	3
<b>Credit Hours</b>		<b>14</b>

**Spring**

ENGR 4392	Robotics Senior Design 2 (minimum grade of C)	2
ENGR 5238G	Introduction to Embedded Systems	3
ENGR 5151U	Computer Vision 1 (minimum grade of C)	3
POLS 1101	American Government	3
Area E	World Cultures Elective <sup>8</sup>	3
<b>Credit Hours</b>		<b>14</b>

**Fifth Year**
**Fall**

Area 1	Graduate Elective <sup>9</sup>	3
Area 1	Graduate Elective <sup>9</sup>	3
Area 1	Graduate Elective <sup>9</sup>	3
ENGR 6689	Supervised Graduate Internship	3
<b>Credit Hours</b>		<b>12</b>

**Spring**

Area 1	Graduate Elective <sup>9</sup>	3
Area 1	Graduate Elective <sup>9</sup>	3
Area 2	Graduate elective from Area 1 list <sup>9</sup>	3
ENGR 6689	Supervised Graduate Internship	3
<b>Credit Hours</b>		<b>12</b>

**Total Credit Hours** **147**

**Footnotes**

<sup>1</sup> Area B2: ITDS 1779 (2) or LEAD 1705 (2) or PERS 1506 (1; may be repeated with different topic) or PERS 1507 (2)

<sup>2</sup> Area H: ENGR 1000+, MATH/STAT 3000+, CPSC 3000+, MATH 2125, Science 1000+

<sup>3</sup> ECON 2105 or ECON 2106 (recommended)

<sup>4</sup> Area B1: COMM 1110 or FL 1001, 1002, 2001, 2002

<sup>5</sup> Area C1: ENGL 2111, 2112; ITDS 1145, 1155, 2125; PHIL 2010

<sup>6</sup> Area C2: ARTH 1100, 2125, 2126; ITDS 1145, MUSC 1100, THEA 1100

<sup>7</sup> HIST 2111 or HIST 2112

<sup>8</sup> World Culture: ANTH 1105, 1107, 2105, 2136; HIST 1111, 1112; ENGL 2136, GEOL 1101, ITDS 1156

<sup>9</sup> Area 1 Graduate electives:

- ENGR 6137 Dynamic Optimization
- ENGR 6145 Human-Robot Interactions
- ENGR 6148 Military Applications in Robotics

- ENGR 6152 Computer Vision 2
- ENGR 6162 Machine Intelligence and Synthesis
- ENGR 6167 Multi-Robot Systems
- ENGR 6172 Multivariable Linear Controls
- ENGR 6173 Nonlinear Controls
- ENGR 6178 Biomechanics
- ENGR 6239 Embedded Systems Design
- ENGR 6555 Selected Topics in Robotics
- any 5000+ CPSC/MATH class with advisor approval

**BS/MS Robotics Engineering Thesis Option**

Course	Title	Credit Hours
<b>First Year</b>		
<b>Fall</b>		
ENGL 1101	English Composition I (minimum grade of C)	3
MATH 1131	Calculus with Analytic Geometry I (minimum grade of C)	4
CHEM 1211	Principles of Chemistry I (minimum grade of C)	3
CHEM 1211L	Principles of Chemistry I Lab (minimum grade of C)	1
ENGR 1701	Introduction to Robotics (minimum grade of C)	1
ENGR 2255	Engineering Graphics and Computer Aided Design (minimum grade of C)	3
Area B2	Institutional Options Elective <sup>1</sup>	1
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
ENGL 1102	English Composition II (minimum grade of C)	3
MATH 1132	Calculus with Analytic Geometry II (minimum grade of C)	4
PHYS 2211	Principles of Physics I (minimum grade of C)	3
PHYS 2311	Principles of Physics I Lab (minimum grade of C)	1
Area H	Elective (minimum grade of C) <sup>2</sup>	3
KINS 1106 or PHED 1205	Lifetime Wellness or Concepts of Fitness	2
<b>Credit Hours</b>		<b>16</b>
<b>Second Year</b>		
<b>Fall</b>		
MATH 2115	Introduction to Linear Algebra (minimum grade of C)	3
PHYS 2212	Principles of Physics II (minimum grade of C)	3
PHYS 2312	Principles of Physics II Lab (minimum grade of C)	1
ENGR 2115	Statics (minimum grade of C)	3
ENGR 2221	Computing for Engineers 1 (minimum grade of C)	3

Area E	Behavioral Science Elective <sup>3</sup>	3
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
MATH 3107	Differential Equations (minimum grade of C)	3
ENGR 2206	Digital Logic (minimum grade of C)	4
ENGR 2125	Dynamics of Rigid Bodies (minimum grade of C)	3
Area H	Elective (minimum grade of C) <sup>2</sup>	3
Area B1	Institutional Options Elective <sup>4</sup>	3
<b>Credit Hours</b>		<b>16</b>
<b>Third Year</b>		
<b>Fall</b>		
MATH 2135	Calculus with Analytic Geometry 3 (minimum grade of C)	4
ENGR 3235	Circuit Analysis (minimum grade of C)	3
ENGR 3236	Introduction to Signal Processing (minimum grade of C)	3
ENGR 5245U	minimum grade of C	2
Area C1	Humanities Elective <sup>5</sup>	3
<b>Credit Hours</b>		<b>15</b>
<b>Spring</b>		
MATH 3175	Introduction to Probability (minimum grade of C)	3
ENGR 3255	Sensors and Actuators (minimum grade of C)	3
ENGR 3275	Feedback Control Systems (minimum grade of C)	3
Area H	Elective (minimum grade of C) <sup>2</sup>	3
PEDS	Physical Education course 1***	1
Area C2	Fine Arts Elective <sup>6</sup>	3
<b>Credit Hours</b>		<b>16</b>
<b>Fourth Year</b>		
<b>Fall</b>		
ENGR 4391	Robotics Senior Design 1 (minimum grade of C)	2
ENGR 5161U	Elements of Machine Intelligence (minimum grade of C)	3
ENGR 5176U	Kinematics and Dynamics (minimum grade of C)	3
ENGR 5236G	Microelectronic Circuits	3
Area E	American History <sup>7</sup>	3
<b>Credit Hours</b>		<b>14</b>
<b>Spring</b>		
ENGR 4392	Robotics Senior Design 2 (minimum grade of C)	2
ENGR 5238G	Introduction to Embedded Systems	3
ENGR 5151U	Computer Vision 1 (minimum grade of C)	3
POLS 1101	American Government	3
Area E	World Cultures Elective <sup>8</sup>	3
<b>Credit Hours</b>		<b>14</b>
<b>Fifth Year</b>		
<b>Fall</b>		
Area 1	Graduate Elective <sup>9</sup>	3

Area 1	Graduate Elective <sup>9</sup>	3
Area 1	Graduate Elective <sup>9</sup>	3
ENGR 6999	Thesis Research	3
<b>Credit Hours</b>		<b>12</b>
<b>Spring</b>		
Area 1	Graduate Elective <sup>9</sup>	3
Area 1	Graduate Elective <sup>9</sup>	3
ENGR 6999	Thesis Research	3
ENGR 6999	Thesis Research	3
ENGR 6000	Thesis Defense	0
<b>Credit Hours</b>		<b>12</b>
<b>Total Credit Hours</b>		<b>147</b>

**Footnotes**

- <sup>1</sup> Area B2: ITDS 1779 (2) or LEAD 1705 (2) or PERS 1506 (1; may be repeated with different topic) or PERS 1507 (2)
- <sup>2</sup> Area H: ENGR 1000+, MATH/STAT 3000+, CPSC 3000+, MATH 2125, Science 1000+
- <sup>3</sup> ECON 2105 or ECON 2106 (recommended)
- <sup>4</sup> B1: COMM 1110 or FL 1001, 1002, 2001, 2002
- <sup>5</sup> Area C1: ENGL 2111, 2112; ITDS 1145, 1155, 2125; PHIL 2010
- <sup>6</sup> Area C2: ARTH 1100, 2125, 2126; ITDS 1145, MUSC 1100, THEA 1100
- <sup>7</sup> HIST 2111 or HIST 2112
- <sup>8</sup> World Culture: ANTH 1105, 1107, 2105, 2136; HIST 1111, 1112; ENGL 2136, GEOG 1101, ITDS 1156
- <sup>9</sup> Area 1 Graduate electives:
  - ENGR 6137 Dynamic Optimization
  - ENGR 6145 Human-Robot Interactions
  - ENGR 6148 Military Applications in Robotics
  - ENGR 6152 Computer Vision 2
  - ENGR 6162 Machine Intelligence and Synthesis
  - ENGR 6167 Multi-Robot Systems
  - ENGR 6172 Multivariable Linear Controls
  - ENGR 6173 Nonlinear Controls
  - ENGR 6178 Biomechanics
  - ENGR 6239 Embedded Systems Design
  - ENGR 6555 Selected Topics in Robotics
  - any 5000+ CPSC/MATH class with advisor approval