The master of science degree program advances knowledge through post-baccalaureate coursework. The program requires 32 credit hours. Students have the option of completing a thesis based on up to eight credit hours of research (MMAE 591) with the approval of a thesis adviser, or completing the program with courses, which may include up to six credit hours of projects (MMAE 594). In line with the department’s approach to its graduate programs, a student has considerable flexibility, in consultation with their adviser, in formulating an M.S. program. Registration and 80%-class session attendance—required for a passing grade—In the Seminar course MMAE 593 is required of all M.S. graduate students (Non-thesis or Thesis) and Ph.D. students. A satisfactory grade is required, in each semester of full-time enrollment, to fulfill degree requirements.

The above requirement reflects the change that “Students doing the MENG degree programs or non-thesis MS degree program are no longer required to attend the seminar for graduation requirements.” This change was approved by the MMAE faculty via a formal vote.

Before completion of the first semester of graduate study, full-time students should select a permanent adviser. Graduate students pursuing the M.S. degree on a part-time basis should select a permanent adviser before registering for their twelfth credit hour. The student, in consultation with the adviser, prepares a program of study that reflects individual needs and interests. The adviser as well as the department’s graduate studies committee and the department chair must approve this program. Students with the thesis option are required to pass an oral comprehensive examination on their thesis and related topics. The examination committee consists of at least three appropriate faculty members who are nominated by the thesis adviser and appointed by the department’s graduate studies committee.

Master of Science in Autonomous Systems and Robotics (Coursework Only Option)

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Credits Required</td>
<td>32</td>
</tr>
<tr>
<td>Maximum 400-Level Credit</td>
<td>9</td>
</tr>
<tr>
<td>Maximum 700-Level Credit</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMAE 501</td>
<td>Engineering Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 541</td>
<td>Advanced Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 543</td>
<td>Modern Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>Autonomous Systems and Robotics (ASR Electives) (23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select 23 credit hours from the following:</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>MMAE 410</td>
<td>Aircraft Flight Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 411</td>
<td>Spacecraft Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 445</td>
<td>Computer-Aided Design</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 500</td>
<td>Data Driven Modeling</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 502</td>
<td>Engineering Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 539</td>
<td>Robotic Motion Planning</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 540</td>
<td>Robotics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 545</td>
<td>Advanced CAD/CAM</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 549</td>
<td>Optimal Control</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 550</td>
<td>Optimal State Estimation</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 552</td>
<td>Intro to the Space Environment</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 555</td>
<td>Intro to Navigation Systems</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 594</td>
<td>Proj for Master of Engg Stud</td>
<td>1-3</td>
</tr>
<tr>
<td>MMAE 597</td>
<td>Special Topics</td>
<td>1-3</td>
</tr>
<tr>
<td>ECE 505</td>
<td>Applied Optimization Engrgs</td>
<td>3</td>
</tr>
<tr>
<td>ECE 565</td>
<td>Compt Vision Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>ECE 566</td>
<td>Machine and Deep Learning</td>
<td>3</td>
</tr>
<tr>
<td>ECE 567</td>
<td>Statistical Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>CS 557</td>
<td>Cyber-Physical Sys Sec/Dsgn</td>
<td>3</td>
</tr>
<tr>
<td>CS 584</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>MATH 484</td>
<td>Regression</td>
<td>3</td>
</tr>
<tr>
<td>MATH 545</td>
<td>Stochastic Partial Diff Equatn</td>
<td>3</td>
</tr>
<tr>
<td>MATH 554</td>
<td>Discrete Applied Math II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 564</td>
<td>Applied Statistics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 574</td>
<td>Bayesian Computational Stats</td>
<td>3</td>
</tr>
<tr>
<td>MATH 574</td>
<td>Bayesian Computational Stats</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours: 32

1 A course may not be chosen if it is already being applied to the ASR elective course requirement.

Master of Science in Autonomous Systems and Robotics (Thesis Option)

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Credits Required</td>
<td>32</td>
</tr>
<tr>
<td>Maximum 400-Level Credit</td>
<td>9</td>
</tr>
<tr>
<td>Maximum 700-Level Credit</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMAE 501</td>
<td>Engineering Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 541</td>
<td>Advanced Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 543</td>
<td>Modern Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>Autonomous Systems and Robotics (ASR Electives) (15-17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select 15-17 credit hours from the following:</td>
<td>15-17</td>
<td></td>
</tr>
<tr>
<td>MMAE 410</td>
<td>Aircraft Flight Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 411</td>
<td>Spacecraft Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 445</td>
<td>Computer-Aided Design</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 500</td>
<td>Data Driven Modeling</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 502</td>
<td>Engineering Analysis II</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours: 9

Required Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMAE 501</td>
<td>Engineering Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 541</td>
<td>Advanced Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 543</td>
<td>Modern Control Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

Autonomous Systems and Robotics (ASR Electives) (15-17)

Select 15-17 credit hours from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMAE 410</td>
<td>Aircraft Flight Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 411</td>
<td>Spacecraft Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 445</td>
<td>Computer-Aided Design</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 500</td>
<td>Data Driven Modeling</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 502</td>
<td>Engineering Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 539</td>
<td>Robotic Motion Planning</td>
<td>3</td>
</tr>
</tbody>
</table>
### Master of Science in Autonomous Systems and Robotics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMAE 540</td>
<td>Robotics</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 545</td>
<td>Advanced CAD/CAM</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 549</td>
<td>Optimal Control</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 550</td>
<td>Optimal State Estimation</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 552</td>
<td>Intro to the Space Environment</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 555</td>
<td>Intro to Navigation Systems</td>
<td>3</td>
</tr>
<tr>
<td>MMAE 557</td>
<td>Special Topics</td>
<td>1-3</td>
</tr>
<tr>
<td>CS 584</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>ECE 505</td>
<td>Applied Optimization Engrgs</td>
<td>3</td>
</tr>
<tr>
<td>CS 557</td>
<td>Cyber-Physical Sys Sec/Dsgn</td>
<td>3</td>
</tr>
<tr>
<td>ECE 565</td>
<td>Compt Vision Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>ECE 566</td>
<td>Machine and Deep Learning</td>
<td>3</td>
</tr>
<tr>
<td>ECE 567</td>
<td>Statistical Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>MATH 484</td>
<td>Regression</td>
<td>3</td>
</tr>
<tr>
<td>MATH 564</td>
<td>Applied Statistics</td>
<td>3</td>
</tr>
<tr>
<td>MATH 569</td>
<td>Statistical Learning</td>
<td>3</td>
</tr>
<tr>
<td>MATH 574</td>
<td>Bayesian Computational Stats</td>
<td>3</td>
</tr>
</tbody>
</table>

**Thesis Research**  
MMAE 591  
Research and Thesis M.S. 6-8

---

1. A course may not be chosen if it is already being applied to the ASAR elective course requirements.