

# Aerospace Engineering B.S.

## Program Requirements

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## Minimum Requirements for Aerospace Engineering B.S.: 131 credits

### Concentrations: Aeronautics (p. 1), Space Systems - Astronautics (p. 1), Unmanned Aircraft Systems (p. 2), General (p. 2)

Students must earn a C- grade or better in each course.

Code	Title	Credits
<b>General University Requirements</b>		
Complete the general university requirements. ( <a href="https://catalog.uaf.edu/bachelors/#gurbachelorsdegreestext">https://catalog.uaf.edu/bachelors/#gurbachelorsdegreestext</a> )		
<b>General Education Requirements</b>		
Complete the general education requirements. ( <a href="https://catalog.uaf.edu/bachelors/#generaleducationrequirementstext">https://catalog.uaf.edu/bachelors/#generaleducationrequirementstext</a> )		36-40
As part of the general education requirements, complete the following:		
MATH F251X	Calculus I	
CHEM F105X and CHEM F105L	General Chemistry I and Chemistry F105X Lab	
ES F100X and ES F100L	Engineering Alaska - An Introduction to Engineering and Makerspace Alaska - A Laboratory Introduction to Engineering	

### B.S. Degree Requirements

Complete the B.S. degree requirements. (<https://catalog.uaf.edu/bachelors/#bachelorofsciencetext>) 16

As part of the B.S. requirements, complete the following:

MATH F252X	Calculus II	
PHYS F211X and PHYS F211L	General Physics I and PHYS F211X Laboratory	
PHYS F212X and PHYS F212L	General Physics II and PHYS F212X Laboratory	

### Aerospace Engineering Program Requirements

Complete the following:

AERO/ME F451	Aerodynamics	3
AERO/ME F452	Introduction to Astrodynamics	3
EE F102	Introduction to Electrical and Computer Engineering	3
EE F203	Electric Circuits	4
EE F243	Digital Systems Design	4
EE F253	Circuit Theory	3
EE F354	Engineering Signal Analysis	3
EE F461	Communication Systems and Networks	4

EE F471 or ME F409	Automatic Control Controls	3
EE F481 or ME F486	Electrical and Computer Engineering Design I Senior Design	1
EE F482 or ME F487	Electrical and Computer Engineering Design II Design Project	3
ES F201	Computer Techniques	3
ES F209	Statics	3
ES F210	Dynamics	3
ES F301 or EE F301	Engineering Analysis Analytical Methods for Electrical and Computer Engineers	3
ES F331	Mechanics of Materials	3
ES F341	Fluid Mechanics	4
ES F346	Introduction to Thermodynamics	3
MATH F253X	Calculus III	4
MATH F302	Differential Equations	3
ME F408	Mechanical Vibrations	3

### Fundamentals of Engineering (FE) Examination

Complete the Fundamentals of Engineering (FE) examination administered by the State of Alaska.

### Concentration

Complete one of the following:	12-13
Aeronautical Engineering	
Space Systems - Astronautics	
Unmanned Aircraft Systems	
General	

**Total Credits** 131-135

## Concentrations

### Aeronautical Engineering

Code	Title	Credits
<b>Aeronautical Engineering Concentration Requirements</b>		
Complete the following:		
AERO/ME F450	Theory of Flight	3
AERO/ME F453	Propulsion Systems	3
ME F313	Mechanical Engineering Thermodynamics	3

### Technical Electives

Complete 3-4 credits from the technical electives list 3-4

**Total Credits** 12-13

### Space Systems - Astronautics

Code	Title	Credits
<b>Space Systems - Astronautics Concentration Requirements</b>		
Complete the following:		
EE F303	Electric Power Systems and Machines	4
EE F333	Electronic Devices	4
EE F444	Embedded Systems Design	4

**Total Credits** 12

## Unmanned Aircraft Systems (UAS)

Code	Title	Credits
<b>Unmanned Aircraft Systems Concentration Requirements</b>		
Complete the following:		
AERO F654	UAS Systems Design	3
AERO F656	Aerospace Systems Engineering	3
AERO F658	Unmanned Aircraft Systems (UAS) Operations	3
<b>Technical Electives</b>		
Complete 3-4 credits from the technical electives list		3-4
<b>Total Credits</b>		<b>12-13</b>

## General

Code	Title	Credits
<b>Technical Electives</b>		
Complete 12 credits from the technical electives list		12
<b>Total Credits</b>		<b>12</b>

## Electives

### Technical Electives

Code	Title	Credits
The following courses satisfy technical electives for the aerospace engineering major:		
AERO/ME F450	Theory of Flight	
AERO/ME F453	Propulsion Systems	
AERO F654	UAS Systems Design	
AERO F656	Aerospace Systems Engineering	
AERO F658	Unmanned Aircraft Systems (UAS) Operations	
CS F453	Robotics & 3D Printing	
CS F463	Cryptography and Data Security	
CS F465	Computer and Network Security	
EE F303	Electric Power Systems and Machines	
EE F333	Electronic Devices	
EE F404	Electric Power Systems Analysis	
EE F443	Computer Engineering Analysis and Design	
EE F444	Embedded Systems Design	
EE F451	Digital Signal Processing	
EE F607	Electric Motor Drives	
ESM F422	Engineering Decisions	
GEOS F416	Applied Geophysics	
GEOS F422	Geoscience Applications of Remote Sensing	
ME F313	Mechanical Engineering Thermodynamics	
ME F405	Computer Aided Design	
ME F406	Computer Aided Manufacturing	
ME F441	Heat Transfer	
STAT F300	Statistics	

## Roadmaps

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Roadmaps are recommended semester-by-semester plans of study for programs and assume full-time enrollment unless otherwise noted.

- This roadmap should be used in conjunction with regular academic advising appointments. All students are encouraged to meet with their advisor or mentor each semester.
- Some courses and milestones must be completed in the semester listed to ensure timely graduation.
- Transfer credit may change the roadmap.
- Requirements, course availability and sequencing are subject to change.
- Courses with (\*) are recommended.

## Aeronautical Engineering Concentration

### First Year

Fall	Credits Spring	Credits
CHEM F105X <sup>7</sup>	4 EE F102 <sup>20</sup>	3
COM F121X, F131X, or F141X <sup>1</sup>	3 MATH F252X <sup>16</sup>	4
ES F100X and ES F100L <sup>7</sup>	4 PHYS F211X <sup>17</sup>	4
ES F201 <sup>20</sup>	3 WRTG F111X <sup>1</sup>	3
MATH F251X <sup>6</sup>	4 General Education Requirement - Social Sciences	3
<b>18</b>		<b>17</b>

### Second Year

Fall	Credits Spring	Credits
EE F203 <sup>20</sup>	4 EE F253 <sup>20</sup>	3
EE F243 <sup>20</sup>	4 ES F210 <sup>20</sup>	3
ES F209 <sup>20</sup>	3 ES F346 <sup>20,25</sup>	3
MATH F253X <sup>20</sup>	4 LS F101X <sup>15</sup>	1
Complete one of the following: <sup>1</sup>	3 MATH F302 <sup>20,25</sup>	3
WRTG F211X	PHYS F212X <sup>17</sup>	4
WRTG F212X(*)		
WRTG F213X(*)		
WRTG F214X(*)		
<b>18</b>		<b>17</b>

### Third Year

Fall	Credits Spring	Credits
AERO/ME F452 <sup>20,25</sup>	3 AERO/ME F451 <sup>20,25</sup>	3
ES F331 <sup>20,25</sup>	3 EE F471 or ME F409 <sup>20,25</sup>	3
ES F341 <sup>20,25</sup>	4 ME F313 <sup>22,25</sup>	3
General Education Requirement - Arts	3 General Education Requirement - Humanities	3
Complete one of the following: <sup>20,25</sup>	3 General Education Requirement - Social Sciences	3
ES F301(*)		

EE F301		
	<b>16</b>	<b>15</b>
<b>Fourth Year</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
AERO/ME F450 <sup>22,25</sup>	3 AERO/ME F453 <sup>22,25</sup>	3
EE F354 <sup>20,25</sup>	3 EE F461 <sup>20,25</sup>	4
ME F408 <sup>20,25</sup>	3 EE F482 or ME F487 <sup>20,25</sup>	3
Degree Requirement - Ethics	3 General Education Requirement - Additional Arts, Humanities or Social Sciences	3
Concentration Course - Upper Division	3 General Elective	1
Complete one of the following: <sup>20,25</sup>	1 Fundamentals of Engineering (FE) examination	
EE F481		
ME F486(*)		
	<b>16</b>	<b>14</b>

**Total Credits 131****Footnote Definitions**

General Education Requirements	Degree Requirements	Program & Other Requirements
1—Communication	8—Alaska Native-themed	20—Program Requirement
2—Arts	9—Communication	21—Capstone Requirement
3—Humanities	10—Computation	22—Concentration Course
4—Social Sciences	11—Ethics	23—General Elective
5—Additional Arts, Humanities or Social Sciences	12—Humanities	24—Minor Course
6—Mathematics	13—Human Relations	25—Upper Division
7—Natural Sciences	14—Humanities or Social Sciences	26—Program Elective
	15—Library & Information Research	
	16—Mathematics	
	17—Natural Sciences	
	18—Other	
	19—Social Sciences	

**Space Systems - Astronautics Concentration****First Year**

Fall	Credits Spring	Credits
CHEM F105X <sup>7</sup>	4 EE F102 <sup>20</sup>	3
COM F121X, F131X, or F141X <sup>1</sup>	3 MATH F252X <sup>16</sup>	4
ES F100X and ES F100L <sup>7</sup>	4 PHYS F211X <sup>17</sup>	4

ES F201 <sup>20</sup>	3 WRTG F111X <sup>1</sup>	3
MATH F251X <sup>6</sup>	4 General Education Requirement - Social Sciences	3
	<b>18</b>	<b>17</b>

**Second Year**

Fall	Credits Spring	Credits
EE F203 <sup>20</sup>	4 EE F253 <sup>20</sup>	3
EE F243 <sup>20</sup>	4 ES F210 <sup>20</sup>	3
ES F209 <sup>20</sup>	3 ES F346 <sup>20,25</sup>	3
MATH F253X <sup>20</sup>	4 LS F101X <sup>15</sup>	1
Complete one of the following: <sup>1</sup>	3 MATH F302 <sup>20,25</sup>	3
WRTG F211X	PHYS F212X <sup>17</sup>	4
WRTG F212X(*)		
WRTG F213X(*)		
WRTG F214X(*)		
	<b>18</b>	<b>17</b>

**Third Year**

Fall	Credits Spring	Credits
AERO/ME F452 <sup>20,25</sup>	3 AERO/ME F451 <sup>20,25</sup>	3
EE F333 <sup>22,25</sup>	4 EE F444 <sup>22,25</sup>	4
ES F331 <sup>20,25</sup>	3 EE F471 or ME F409 <sup>20,25</sup>	3
ES F341 <sup>20,25</sup>	4 General Education Requirement - Humanities	3
Complete one of the following: <sup>20,25</sup>	3 General Education Requirement - Social Sciences	3
EE F301		
ES F301(*)		
	<b>17</b>	<b>16</b>

**Fourth Year**

Fall	Credits Spring	Credits
EE F303 <sup>22,25</sup>	4 EE F461 <sup>20,25</sup>	4
EE F354 <sup>20,25</sup>	3 EE F482 or ME F487 <sup>20,25</sup>	3
ME F408 <sup>20,25</sup>	3 General Education Requirement - Arts	3
Degree Requirement - Ethics	3 General Education Requirement - Additional Arts, Humanities or Social Sciences	3
Complete one of the following: <sup>20,25</sup>	1 General Elective	1
EE F481	Fundamentals of Engineering (FE) examination	

ME F486 (*)	<b>14</b>	<b>14</b>
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**Total Credits 131**

**Footnote Definitions**

General Education Requirements	Degree Requirements	Program & Other Requirements
1—Communication	8—Alaska Native-themed	20—Program Requirement
2—Arts	9—Communication	21—Capstone Requirement
3—Humanities	10—Computation	22—Concentration Course
4—Social Sciences	11—Ethics	23—General Elective
5—Additional Arts, Humanities or Social Sciences	12—Humanities	24—Minor Course
6—Mathematics	13—Human Relations	25—Upper Division
7—Natural Sciences	14—Humanities or Social Sciences	26—Program Elective
	15—Library & Information Research	
	16—Mathematics	
	17—Natural Sciences	
	18—Other	
	19—Social Sciences	

**Unmanned Aircraft Systems (UAS) Concentration**

**First Year**

Fall	Credits Spring	Credits
CHEM F105X <sup>7</sup>	4 EE F102 <sup>20</sup>	3
COM F121X, F131X, or F141X <sup>1</sup>	3 MATH F252X <sup>16</sup>	4
ES F100X and ES F100L	4 PHYS F211X <sup>17</sup>	4
ES F201 <sup>20</sup>	3 WRTG F111X <sup>1</sup>	3
MATH F251X <sup>6</sup>	4 General Education Requirement - Social Sciences	3
	<b>18</b>	<b>17</b>

**Second Year**

Fall	Credits Spring	Credits
EE F203 <sup>20</sup>	4 EE F253 <sup>20</sup>	3
EE F243 <sup>20</sup>	4 ES F210 <sup>20</sup>	3
ES F209 <sup>20</sup>	3 ES F346 <sup>20,25</sup>	3
MATH F253X <sup>20</sup>	4 LS F101X <sup>15</sup>	1
Complete one of the following: <sup>1</sup>	3 MATH F302 <sup>20,25</sup>	3
WRTG F211X	PHYS F212X <sup>17</sup>	4
WRTG F212X (*)		
WRTG F213X (*)		
WRTG F214X (*)		
	<b>18</b>	<b>17</b>

**Third Year**

Fall	Credits Spring	Credits
AERO/ME F452 <sup>20,25</sup>	3 AERO/ME F451 <sup>20,25</sup>	3
AERO F654 <sup>22,25</sup>	3 EE F471 or ME F409 <sup>20,25</sup>	3
ES F331 <sup>20,25</sup>	3 General Education Requirement - Arts	3
ES F341 <sup>20,25</sup>	4 General Education Requirement - Humanities	3
Complete one of the following: <sup>20,25</sup>	3 General Education Requirement - Social Sciences	3
EE F301		
ES F301 (*)		
	<b>16</b>	<b>15</b>

**Fourth Year**

Fall	Credits Spring	Credits
AERO F656 <sup>22,25</sup>	3 AERO F658 <sup>22,25</sup>	3
EE F354 <sup>20,25</sup>	3 EE F461 <sup>20,25</sup>	4
ME F408 <sup>20,25</sup>	3 EE F482 or ME F487 <sup>20,25</sup>	3
Degree Requirement - Ethics	3 General Education Requirement - Additional Arts, Humanities or Social Sciences	3
Concentration Course - Upper Division	3 General Elective	1
Complete one of the following: <sup>20,25</sup>	1 Fundamentals of Engineering (FE) examination	
EE F481		
ME F486 (*)		
	<b>16</b>	<b>14</b>

**Total Credits 131**

**Footnote Definitions**

General Education Requirements	Degree Requirements	Program & Other Requirements
1—Communication	8—Alaska Native-themed	20—Program Requirement
2—Arts	9—Communication	21—Capstone Requirement
3—Humanities	10—Computation	22—Concentration Course
4—Social Sciences	11—Ethics	23—General Elective
5—Additional Arts, Humanities or Social Sciences	12—Humanities	24—Minor Course
6—Mathematics	13—Human Relations	25—Upper Division
7—Natural Sciences	14—Humanities or Social Sciences	26—Program Elective

15—Library & Information Research
16—Mathematics
17—Natural Sciences
18—Other
19—Social Sciences

## General Concentration

### First Year

Fall	Credits Spring	Credits
CHEM F105X <sup>7</sup>	4 EE F102 <sup>20</sup>	3
COM F121X, F131X, or F141X <sup>1</sup>	3 MATH F252X <sup>16</sup>	4
ES F100X and ES F100L	4 PHYS F211X <sup>17</sup>	4
ES F201 <sup>20</sup>	3 WRTG F111X <sup>1</sup>	3
MATH F251X <sup>6</sup>	4 General Education Requirement - Social Sciences	3
	<b>18</b>	<b>17</b>

### Second Year

Fall	Credits Spring	Credits
EE F203 <sup>20</sup>	4 EE F253 <sup>20</sup>	3
EE F243 <sup>20</sup>	4 ES F346 <sup>20,25</sup>	3
ES F209 <sup>20</sup>	3 ES F210 <sup>20</sup>	3
MATH F253X <sup>20</sup>	4 LS F101X <sup>15</sup>	1
Complete one of the following: <sup>1</sup>	3 MATH F302 <sup>20,25</sup>	3
WRTG F211X	PHYS F212X <sup>17</sup>	4
WRTG F212X(*)		
WRTG F213X(*)		
WRTG F214X(*)		
	<b>18</b>	<b>17</b>

### Third Year

Fall	Credits Spring	Credits
AERO F452 or ME F452 <sup>20,25</sup>	3 AERO/ME F451 <sup>20,25</sup>	3
ES F331 <sup>20,25</sup>	3 EE F444(*) <sup>22,25</sup>	4
ES F341 <sup>20,25</sup>	4 EE F471 or ME F409 <sup>20,25</sup>	3
General Education Requirement - Arts	3 General Education Requirement - Humanities	3
Complete one of the following: <sup>20,25</sup>	3 General Education Requirement - Social Sciences	3
EE F301		
ES F301(*)		
	<b>16</b>	<b>16</b>

### Fourth Year

Fall	Credits Spring	Credits
EE F354 <sup>20,25</sup>	3 EE F461 <sup>20,25</sup>	4
ME F408 <sup>20,25</sup>	3 EE F482 or ME F487 <sup>22,25</sup>	3

ME F441(*) <sup>22,25</sup>	3 General Education Requirement - Additional Arts, Humanities or Social Sciences	3
Degree Requirement - Ethics	3 Concentration Course - Upper Division	3
Concentration Course - Upper Division	3 Fundamentals of Engineering (FE) examination	
Complete one of the following: <sup>20,25</sup>	1	
EE F481		
ME F486(*)		
	<b>16</b>	<b>13</b>

### Total Credits 131

### Footnote Definitions

General Education Requirements	Degree Requirements	Program & Other Requirements
1—Communication	8—Alaska Native-themed	20—Program Requirement
2—Arts	9—Communication	21—Capstone Requirement
3—Humanities	10—Computation	22—Concentration Course
4—Social Sciences	11—Ethics	23—General Elective
5—Additional Arts, Humanities or Social Sciences	12—Humanities	24—Minor Course
6—Mathematics	13—Human Relations	25—Upper Division
7—Natural Sciences	14—Humanities or Social Sciences	26—Program Elective
	15—Library & Information Research	
	16—Mathematics	
	17—Natural Sciences	
	18—Other	
	19—Social Sciences	

## Learning Outcomes

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Learning Outcomes are measurable statements that describe knowledge or skills achieved by students upon completion of the program.

Students graduating from this program will be able to:

- Apply engineering knowledge and standards to solve problems, analyze and interpret data, and design experiments
- Communicate effectively, participate in multi-disciplinary teams, and design systems under realistic constraints
- Develop the skills necessary to compete in both the local and global engineering economy

- Have an understanding of professional and ethical responsibility and a knowledge of contemporary issues