



UNIVERSITY OF  
NOTRE DAME

**Department of Aerospace &  
Mechanical Engineering  
Undergraduate Handbook**

2023-2024

Academic Year

(Revised on 2/6/2024)

# AME Department

## Contact Information

| <b>Title</b>   | <b>Name</b>       | <b>Contact Information</b>  |
|--|-------------------|---|
| Department Chair   | Glen Niebur       | <i>EMAIL: <a href="mailto:gniebur@nd.edu">gniebur@nd.edu</a><br/>PHONE: 574-631-3327<br/>OFFICE: 365A Fitzpatrick Hall</i>                              |
| Associate Department Chair                               | Tengfei Luo       | <i>EMAIL: <a href="mailto:tluo@nd.edu">tluo@nd.edu</a><br/>PHONE: 574-631-9683<br/>OFFICE: 365B Fitzpatrick Hall</i>                                    |
| Assistant Department Chair                               | Robert Landers    | <i>EMAIL: <a href="mailto:rlanders@nd.edu">rlanders@nd.edu</a><br/>OFFICE: 152 Multidisciplinary<br/>Research Building</i>                              |
| Director of Undergraduate<br>Studies (DUS)               | Michael Seelinger | <i>EMAIL: <a href="mailto:mseelin1@nd.edu">mseelin1@nd.edu</a><br/>PHONE: 574-631-7826<br/>OFFICE: 375 Fitzpatrick Hall</i>                             |
| Assistant Director of<br>Undergraduate Studies<br>(ADUS) | Maria Warren      | <i>EMAIL: <a href="mailto:mwarren7@nd.edu">mwarren7@nd.edu</a><br/>PHONE: 574-631-7073<br/>OFFICE: 361A Fitzpatrick Hall</i>                            |
| Director of Graduate Studies<br>(DGS)                    | Ryan McClarren    | <i>EMAIL: <a href="mailto:rmcclarr@nd.edu">rmcclarr@nd.edu</a><br/>PHONE: 574-631-5975<br/>OFFICE: 108A<br/>Multidisciplinary Research<br/>Building</i> |

Director of Diversity, Equity  
and Inclusion

Pinar Zorlutuna

*EMAIL: [pzorlutu@nd.edu](mailto:pzorlutu@nd.edu)*

*PHONE: 574-631-8543*

*OFFICE: 143 Multidisciplinary  
Research Building*

Academic Advisor

Aaron Burdin

*EMAIL: [aburdin@nd.edu](mailto:aburdin@nd.edu)*

*PHONE: 574-631-8234*

*OFFICE: 204H Cushing Hall*

Academic Advisor

Julia Qian

*EMAIL: [jqian3@nd.edu](mailto:jqian3@nd.edu)*

*PHONE: 574-631-7817*

*OFFICE: 204I Cushing Hall*

Undergraduate Academic  
Program Administrator

Donna Fecher

*EMAIL: [dfecher@nd.edu](mailto:dfecher@nd.edu)*

*PHONE: 574-631-5432*

*OFFICE: 365 Fitzpatrick Hall*

# CONTENTS

|        |   |    |
|--------|---|----|
| 1      | Advising Information.....   | 6  |
| 1.1    | The Undergraduate Academic Program Administrator.....                     | 6  |
| 1.2    | The Academic advisor.....   | 6  |
| 1.3    | The Directors of Undergraduate Studies.....                               | 6  |
| 1.4    | The Associate Dean for Advising and Academic Affairs.....                 | 7  |
| 1.5    | Faculty Advisors.....   | 7  |
| 1.6    | AME Web Page.....   | 7  |
| 1.7    | Other Resources.....  | 7  |
| 2      | AME Course Plans.....   | 9  |
| 2.1    | Information for Specific Graduation Years.....                            | 9  |
| 2.1.1  | All AE & ME students.....   | 9  |
| 2.1.2  | Aerospace Engineering Class of 2027 and Beyond.....                       | 9  |
| 2.1.3  | Aerospace Engineering Class of 2026.....                                  | 9  |
| 2.1.4  | Aerospace Engineering Class of 2025.....                                  | 10 |
| 2.1.5  | Aerospace Engineering Class of 2024.....                                  | 10 |
| 2.1.6  | Aerospace Engineering Class of 2023.....                                  | 10 |
| 2.1.7  | Mechanical Engineering Class of 2027 and Beyond.....                      | 10 |
| 2.1.8  | Mechanical Engineering Class of 2026.....                                 | 10 |
| 2.1.9  | Mechanical Engineering Class of 2025.....                                 | 10 |
| 2.1.10 | Mechanical Engineering Class of 2024.....                                 | 11 |
| 2.1.11 | Mechanical Engineering Class of 2023.....                                 | 11 |
| 2.2    | Information about Required AME Courses.....                               | 11 |
| 2.3    | Example Course Plan for AE Class of 2027+ (127 Credit Hrs).....           | 16 |
| 2.4    | Curriculum Map for AE Class of 2027+.....                                 | 17 |
| 2.5    | Example Course Plan for AE Class of 2026 (127 Credit Hrs).....            | 18 |
| 2.6    | Curriculum Map for AE Class of 2026.....                                  | 19 |
| 2.7    | Example Course Plan for AE Class of 2025 (133 Credit Hrs).....            | 20 |
| 2.8    | Curriculum Map for AE Class of 2025.....                                  | 21 |
| 2.9    | Example Course Plan for AE Class of 2024 (133 Credit Hrs).....            | 22 |
| 2.10   | Curriculum Map for AE Class of 2024.....                                  | 23 |
| 2.11   | Example Course Plan for AE Class of 2023 (133 Credit Hrs).....            | 24 |
| 2.12   | Curriculum Map for AE Class of 2023.....                                  | 25 |
| 2.13   | Example Course Plan for ME Class of 2027 and Beyond (126 Credit Hrs)..... | 26 |

|       |  |    |
|-------|--|----|
| 2.14  | Curriculum Map for ME Class of 2027 and Beyond .....             | 27 |
| 2.15  | Example Course Plan for ME Class of 2026 (126 Credit Hrs) .....  | 28 |
| 2.16  | Curriculum Map for ME Class of 2026.....                         | 29 |
| 2.17  | Example Course Plan for ME Class of 2025 (132 Credit Hrs) .....  | 30 |
| 2.18  | Curriculum Map for ME Class of 2025.....                         | 31 |
| 2.19  | Example Course Plan for ME Class of 2024 (133 Credit Hrs) .....  | 32 |
| 2.20  | Curriculum Map for ME Class of 2024.....                         | 33 |
| 2.21  | Example Course Plan for ME Class of 2023 (133 Credit Hrs) .....  | 34 |
| 2.22  | Curriculum Map for ME Class of 2023.....                         | 35 |
| 2.23  | The Notre Dame Core Curriculum.....                              | 36 |
| 3     | AME Electives.....   | 38 |
| 3.1   | Aerospace Engineering Technical Specialization Courses .....     | 38 |
| 3.2   | Aerospace Engineering Professional Development Courses.....      | 39 |
| 3.3   | Mechanical Engineering AME Technical Electives.....              | 39 |
| 3.4   | Mechanical Engineering General Technical Electives.....          | 40 |
| 3.5   | Medical School .....   | 41 |
| 3.5.1 | Example Course Plan for ME Pre Health Majors .....               | 43 |
| 3.6   | ROTC .....   | 44 |
| 4     | Study Abroad.....  | 45 |
| 4.1   | Fall Programs in Rome (for AE and ME students) .....             | 45 |
| 4.2   | Fall Programs in Other Locations (for AE and ME students).....   | 45 |
| 4.3   | Spring Programs in London (Only for ME students).....            | 46 |
| 4.4   | Spring Program in Other Locations (Only for ME students).....    | 46 |
| 4.5   | Academic Year Program Locations .....                            | 47 |
| 4.6   | Summer Programs.....   | 47 |
| 5     | Minors.....  | 48 |
| 5.1   | Bioengineering (MBIE) .....                                      | 48 |
| 5.2   | Computational Engineering (MCOM) .....                           | 50 |
| 5.3   | Energy Engineering (MENE).....                                   | 51 |
| 5.4   | Energy Studies (MENS).....                                       | 53 |
| 5.5   | Engineering Corporate Practice (MECP).....                       | 53 |
| 5.6   | Environmental Earth Sciences (MEES) .....                        | 53 |
| 5.7   | Resiliency and Sustainability of Engineering Systems (MRSE)..... | 53 |
| 6     | Concentrations .....   | 55 |
| 6.1   | Aerospace Concentration .....                                    | 55 |

|       |  |    |
|-------|--|----|
| 6.2   | Bioengineering Concentration.....  | 55 |
| 6.3   | Computational Engineering Concentration.....                                       | 57 |
| 6.4   | Control and Mechanical Systems Concentration .....                                 | 57 |
| 6.5   | Design and Manufacturing Concentration .....                                       | 58 |
| 6.6   | Energy Concentration.....  | 58 |
| 6.7   | Materials Concentration .....  | 59 |
| 6.8   | Solid Mechanics Concentration .....  | 59 |
| 6.9   | Thermal and Fluid Sciences Concentration.....                                      | 60 |
| 6.10  | da Vinci Concentration .....   | 60 |
| 7     | Undergrad Research/Thesis .....  | 62 |
| 7.1   | Undergraduate Research and Engineering Projects .....                              | 62 |
| 7.2   | Undergraduate Thesis.....  | 63 |
| 8     | Student Organizations and Activities.....  | 65 |
| 8.1   | Professional Societies.....  | 65 |
| 8.1.1 | The American Institute of Aeronautics and Astronautics (AIAA) Student Chapter..... | 65 |
| 8.1.2 | The American Society of Mechanical Engineers (ASME) Student Chapter .....          | 65 |
| 8.1.3 | Minority Engineering Program .....   | 65 |
| 8.1.4 | The National Society of Black Engineers (NSBE) .....                               | 65 |
| 8.1.5 | The Society of Asian Scientists and Engineers (SASE) .....                         | 65 |
| 8.1.6 | The Society of Hispanic Engineers (SHPE) .....                                     | 66 |
| 8.1.7 | Women in Engineering & the Society of Women Engineers (SWE).....                   | 66 |
| 8.2   | Honor Societies .....  | 66 |
| 8.2.1 | TAU BETA PI .....  | 66 |
| 8.2.2 | PI TAU SIGMA.....  | 66 |
| 8.2.3 | SIGMA GAMMA TAU.....   | 66 |
| 8.3   | Clubs .....  | 67 |
| 8.3.1 | Design, Build, Fly.....  | 67 |
| 8.3.2 | Domer Rover .....  | 67 |
| 8.3.3 | E-NABLE .....  | 67 |
| 8.3.4 | Fighting Irish Racing (Formula SAE).....   | 67 |
| 8.3.5 | IrishSat.....  | 68 |
| 8.3.6 | Notre Dame Baja SAE.....   | 68 |
| 8.3.7 | Notre Dame Formula SAE Hybrid Racing Team .....                                    | 68 |
| 8.3.8 | The Notre Dame Robotic Football Club .....   | 68 |
| 8.3.9 | The Notre Dame Rocketry Team.....  | 68 |

# 1 Advising Information

## 1.1 The Undergraduate Academic Program Administrator

Mrs. [Donna Fecher](#) can help if you need:

- Directions on when and how to initiate eForms to:
  - Add or drop a class
  - Change majors, including adding a minor or concentration to existing major
- AME course registration overrides
- Clarification and confirmation of information on the AME Web Page
- GPS adjustments pertaining to AME major requirements

## 1.2 The Academic advisor

Mrs. [Julia Qian](#) and Mr. [Aaron Burdin](#) can help if you have question about:

- Course plan or Non-standard major planning
- Course plan for study abroad programs
- Consequences of dropping courses, particularly required courses
- Consequences of switching into/out of an AME major sophomore year or later
- Transfer students and students in 3-2 and/or 4-1 programs
- University, College, and Major degree requirements
- Minors and concentrations

## 1.3 The Directors of Undergraduate Studies

Prof. [Mike Seelinger](#) or Prof. [Maria Warren](#) are the best resource for specifics about the AE or ME major:

- Dual degree programs
- Planning for Study Abroad Programs
- Pre-professional students
- Course substitutions, particularly for students switching into an AME major
- Advice on transfer credit for courses taken at another institution
- Advice on Graduate Schools
- Graduate fellowship opportunities
- What, if anything, can be double-counted for various types of requirements
- CPT/OPT issues

## 1.4 The Associate Dean for Advising and Academic Affairs

Associate Dean [Mike Ryan](#) can help if you have:

- Issues related to academic probation or dismissal
- Course withdrawal after drop date
- Leaves of absence from the University
- Course overload approval (19+ credit hours/semester)
- S/U grading approval

## 1.5 Faculty Advisors

They are the best resource for general, “big picture” discussions:

- Student and department expectations for the college experience
- Advice for preparing for professional future
- Advice for preparing for graduate school
- Choosing electives
- Choosing minors and concentrations
- Research opportunities in AME

Students are expected to meet with their assigned Faculty Advisor at least one time each semester. You can find your advisor's name from Graduation Progress System (GPS). Students who establish a good working relationship with the Faculty Advisor find their Notre Dame experience to be more fulfilling and feel better prepared for the next stage of their life after graduation.

## 1.6 [AME Web Page](#)

The [Undergraduate webpage](#) and in particular the [AME Undergraduate Handbook](#) is the best resource for:

- Standard major planning: degree requirements for AE and ME programs
- Course prerequisites
- Courses satisfying minor and concentration requirements
- Planning for Study Abroad Programs
- Information that may predict (somewhat) years in which certain electives may be offered

## 1.7 Other Resources

The Course Catalog on [InsideND](#) is the best resource for:

- Course descriptions
- Course attributes, which indicate what requirements a course satisfies, e.g., AME Technical Elective, writing requirement, etc.

[University Health Services](#) and especially [Mental Health and Wellness](#)

[The Career Center](#) is the best resource for:

- Opportunities available at specific companies
- Scheduling interviews
- Resume preparation
- Mock interviews

[University Student Affairs](#)

[Office of Community Standards](#)

## 2 AME Course Plans

All Aerospace Engineering (AE) and Mechanical Engineering (ME) students should prepare their own course plans to ensure graduation by the desired date. The Academic Advisors and DUS/ADUS are available to help students with course planning. The Course Maps provided in this section are ONLY example plans for graduation. Many courses are offered both in the Fall and Spring semesters. The experiential learning classes such as AME Lab I & II as well as Design Tools 1 & 2 are limited in the number of seats that can be offered each semester. Sometimes these courses fill up. When this happens, students must adapt their course plans to take the course in question in a future semester.

Students who are considering a [study abroad](#) program should take special care to register for the correct courses during their sophomore year. For instance, some study abroad programs require taking a course that counts for a specific university core requirement. If a student has already fulfilled this university core requirement, he/she must take the required study abroad course even though it will not fulfill a graduation requirement.

This section of the AME Undergraduate Handbook provides

- Information for each graduating class (changes are often enacted between classes)
- [Information about required AME courses](#) with
  - Their prerequisites and/or corequisites
  - The semester they tend to be offered in
  - The last semester the course can be taken while enabling the student to graduate on time
- Example Course Plans
- Curriculum Maps to demonstrate prerequisite dependencies

### 2.1 Information for Specific Graduation Years

#### 2.1.1 All AE & ME students

All AE and ME students are required to take the [Notre Dame Core Curriculum](#) to fulfill the University Core Requirements. For ROTC student see ([link](#)) for multi-counting courses for the Core Curriculum.

#### 2.1.2 Aerospace Engineering Class of 2027 and Beyond

AE students in the Class of 2026 and beyond must complete 127 credit hours. They are required to take one [AE Technical Specialization](#) course (3 credits) and one [AE Professional Development](#) course (3 credits) to fulfill the degree elective requirements.

[Example Course Plan for AE Class of 2027 and Beyond](#)

[Course Map for AE Class of 2027 and Beyond](#)

#### 2.1.3 Aerospace Engineering Class of 2026

AE students in the Class of 2026 and beyond must complete 127 credit hours. They are required to take one [AE Technical Specialization](#) course (3 credits) and one [AE Professional Development](#) course (3 credits) to fulfill the degree elective requirements.

[Example Course Plan for AE Class of 2026](#)

[Course Map for AE Class of 2026](#)

### **2.1.4 Aerospace Engineering Class of 2025**

AE students in the Class of 2025 must complete 133 credit hours. They are required to take two [AE Technical Specialization](#) courses (6 credits) and one [AE Professional Development](#) course (3 credits) to fulfill the degree elective requirements.

[Example Course Plan for AE Class of 2025](#)

[Curriculum Map for AE Class of 2025](#)

### **2.1.5 Aerospace Engineering Class of 2024**

AE students in the Class of 2024 must complete 133 credit hours. They are required to take two [AE Technical Specialization](#) courses (6 credits) and one [AE Professional Development](#) course (3 credits) to fulfill the degree elective requirements. They are NOT required to take AME 20210 Intro to Design Thinking in Engineering.

[Example Course Plan for AE Class of 2024](#)

[Curriculum Map for AE Class of 2024](#)

### **2.1.6 Aerospace Engineering Class of 2023**

AE students in the Class of 2023 must complete 133 credit hours. They are required to take two [AE Technical Specialization](#) courses (6 credits) and one [AE Professional Development](#) course (3 credits) to fulfill the degree elective requirements. They are NOT required to take AME 20210 Intro to Design Thinking in Engineering.

[Example Course Plan for AE Class of 2023](#)

[Curriculum Map for AE Class of 2023](#)

### **2.1.7 Mechanical Engineering Class of 2027 and Beyond**

ME students in the class of 2027 and beyond must complete 126 credit hours. They are required to take two [AME Technical Elective](#) courses (6 credits) and two [General Technical Elective](#) courses (6 credits) to fulfill the degree elective requirements. The detailed information about these electives is provided under the [AME Electives](#) chapter.

[Example Course Plan for ME Class of 2027 and Beyond](#)

[Curriculum Map for ME Class of 2027 and Beyond](#)

### **2.1.8 Mechanical Engineering Class of 2026**

ME students in the class of 2026 and beyond must complete 126 credit hours. They are required to take two [AME Technical Elective](#) courses (6 credits) and two [General Technical Elective](#) courses (6 credits) to fulfill the degree elective requirements. The detailed information about these electives is provided under the [AME Electives](#) chapter.

[Example Course Plan for ME Class of 2026](#)

[Curriculum Map for ME Class of 2026](#)

### **2.1.9 Mechanical Engineering Class of 2025**

ME students in the class of 2025 must complete 132 credit hours. They are required to take four [AME Technical Elective](#) courses (12 credits) and two [General Technical Elective](#) courses (6 credits) to fulfill the degree elective requirements. The detailed information about these electives is provided under the [AME Electives](#) chapter.

[Example Course Plan for ME Class of 2025](#)

[Curriculum Map for ME Class of 2025](#)

### 2.1.10 Mechanical Engineering Class of 2024

ME students in the class of 2024 must complete 133 credit hours. They are required to take four [AME Technical Elective](#) courses (12 credits) and two [General Technical Elective](#) courses (6 credits) to fulfill the degree elective requirements. The detailed information about these electives is provided under the [AME Electives](#) chapter.

[Example Course Plan for ME Class of 2024](#)

[Curriculum Map for ME Class of 2024](#)

### 2.1.11 Mechanical Engineering Class of 2023

ME students in the class of 2023 must complete 133 credit hours. They are required to take four [AME Technical Elective](#) courses (12 credits) and two [General Technical Elective](#) courses (6 credits) to fulfill the degree elective requirements. The detailed information about these electives is provided under the [AME Electives](#) chapter.

[Example Course Plan for ME Class of 2023](#)

[Curriculum Map for ME Class of 2023](#)

## 2.2 Information about Required AME Courses

AME 20210 – Introduction to Design Thinking in Engineering

**Credits:** 3

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** None

**Corequisites:** EG 10118, MATH 10550

**Last Semester for Ontime Graduation:** AE: Fall of Junior Year, ME: Fall of Junior Year

AME 20216 – AME Lab I (Lecture Section) & AME 21267 – AME Lab I (Lab Section)

**Credits:** 2

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** MATH 10560

**Last Semester for Ontime Graduation:** AE: Fall of Junior Year, ME: Spring of Junior Year

**NOTE:** Student must register the lecture section AME 20216 and for a lab section AME 21216

AME 20217 – AME Lab II (Lecture Section) & AME 21217 – AME Lab II (Lab Section)

**Credits:** 2

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** AME 20216

**Last Semester for Ontime Graduation:** AE: Spring of Junior Year, ME: Fall of Senior Year

**NOTE:** Student must also register for a lab section of AME 21217

AME 20221 – Mechanics I

**Credits:** 3

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** MATH 10560, PHYS 10310

**Last Semester for Ontime Graduation:** AE: Fall of Sophomore Year, ME: Fall of Sophomore Year

AME 20222 – Mechanics II

**Credits:** 3

**Required for:** AE & ME

**Semester Usually Offered:** Spring

**Prerequisites:** AME 20221, MATH 20550

**Last Semester for Ontime Graduation:** AE: Spring of Sophomore Year, ME: Spring of Sophomore Year

AME 20231 – Thermodynamics

**Credits:** 3

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** MATH 20550

**Last Semester for Ontime Graduation:** AE: Spring of Sophomore Year, ME: Spring of Junior Year

AME 20241 – Solid Mechanics

**Credits:** 3

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** MATH 20550, AME 20221

**Last Semester for Ontime Graduation:** AE: Spring of Junior Year, ME: Spring of Junior Year

AME 20251 – Computing, Numerical Methods and Data Science in Engineering (AME Computing)

**Credits:** 3

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** MATH 10560, EG 10118

**Last Semester for Ontime Graduation:** AE: Spring of Senior Year, ME: Spring of Senior Year

AME 21267 – Design Tools 1

**Credits:** 2

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** MATH 10560, AME 20210

**Last Semester for Ontime Graduation:** AE: Spring of Junior Year, ME: Spring of Junior Year

AME 21268 – Design Tools 2

**Credits:** 2

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** AME 21267

**Last Semester for Ontime Graduation:** AE: Fall of Senior Year, ME: Fall of Senior Year

AME 30314 – Differential Equations, Vibrations, and Controls I

**Credits:** 3

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** MATH 20580

**Last Semester for Ontime Graduation:** AE Fall of Junior Year, ME: Spring of Junior Year

AME 30315 – Differential Equations, Vibrations, and Controls II

**Credits:** 3

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** AME 30314

**Last Semester for Ontime Graduation:** AE: Spring of Junior Year, ME: Fall of Senior Year

AME 30251 – Computing, Numerical Methods and Data Science in Engineering (AME Computing)

Note prior to Fall 2024, this course was listed as AME 20251.

**Credits:** 3

**Required for:** AE & ME

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** MATH 20580, EG 10118

**Last Semester for Ontime Graduation:** AE: Spring of Senior Year, ME: Spring of Senior Year

AME 30331 – Fluid Mechanics

**Credits:** 3

**Required for:** AE & ME

**Semester Usually Offered:** Fall (and Spring starting Spring 2024)

**Prerequisites:** AME 20222, AME 20231, MATH 20580

**Last Semester for Ontime Graduation:** AE: Fall of Junior Year, ME: Fall of Senior Year

AME 30332 – Compressible Aerodynamics

**Credits:** 3

**Required for:** AE

**Semester Usually Offered:** Spring

**Prerequisites:** AME 30331

**Last Semester for Ontime Graduation:** AE: Spring of Junior Year

AME 30333 – Theoretical and Experimental Aerodynamics

**Credits:** 3

**Required for:** AE

**Semester Usually Offered:** Spring

**Prerequisites:** AME 30331

**Corequisites:** AME 20217

**Last Semester for Ontime Graduation:** AE: Spring of Junior Year

AME 30334 – Heat Transfer

**Credits:** 3

**Required for:** AE & ME

**Semester Usually Offered:** Spring (and Fall starting Fall 2024)

**Prerequisites:** AME 30331

**Last Semester for Ontime Graduation:** AE: Spring of Senior Year, ME: Spring of Senior Year

AME 30341 – Aerospace Structures

**Credits:** 3

**Required for:** AE

**Semester Usually Offered:** Fall

**Prerequisites:** AME 20241

**Last Semester for Ontime Graduation:** AE: Fall of Senior Year

AME 30363 – Design of Machine Elements

**Credits:** 3

**Required for:** ME

**Semester Usually Offered:** Fall

**Prerequisites:** AME 20241

**Last Semester for Ontime Graduation:** ME: Fall of Senior Year

AME 30381 – Orbital and Space Dynamics

**Credits:** 3

**Required for:** AE

**Semester Usually Offered:** Fall and Spring

**Prerequisites:** AME 20222, AME 30314

**Last Semester for Ontime Graduation:** AE: Spring of Senior Year

AME 40423 – Mechanisms and Machines

**Credits:** 3

**Required for:** ME

**Semester Usually Offered:** Fall

**Prerequisites:** AME 20222, MATH 20580

**Last Semester for Ontime Graduation:** ME: Fall of Senior Year

AME 40431 – Gas Turbines and Propulsion

**Credits:** 3

**Required for:** AE

**Semester Usually Offered:** Fall

**Prerequisites:** AME 30331, AME 30332

**Last Semester for Ontime Graduation:** AE: Fall of Senior Year

AME 40451 – Aerospace Dynamics

**Credits:** 3

**Required for:** AE

**Semester Usually Offered:** Fall

**Prerequisites:** AME 20222, AME 30315, AME 30333

**Last Semester for Ontime Graduation:** AE: Fall of Senior Year

AME 40461 – Aerospace Design I – (formerly Flight Mechanics and Introduction to Design)

**Credits:** 3

**Required for:** AE

**Semester Usually Offered:** Fall

**Prerequisites:** AME 20211, AME 21267, AME 30333

**Corequisites:** AME 30341, AME 40431, AME 40451

**Last Semester for Ontime Graduation:** AE Fall of Senior Year

AME 40462 – Aerospace Design II

**Credits:** 3

**Required for:** AE

**Semester Usually Offered:** Spring

**Prerequisites:** AME 21268, AME 40461

**Last Semester for Ontime Graduation:** AE: Spring of Senior Year

AME 40463 – Senior Design

**Credits:** 4

**Required for:** ME

**Semester Usually Offered:** Fall and Spring

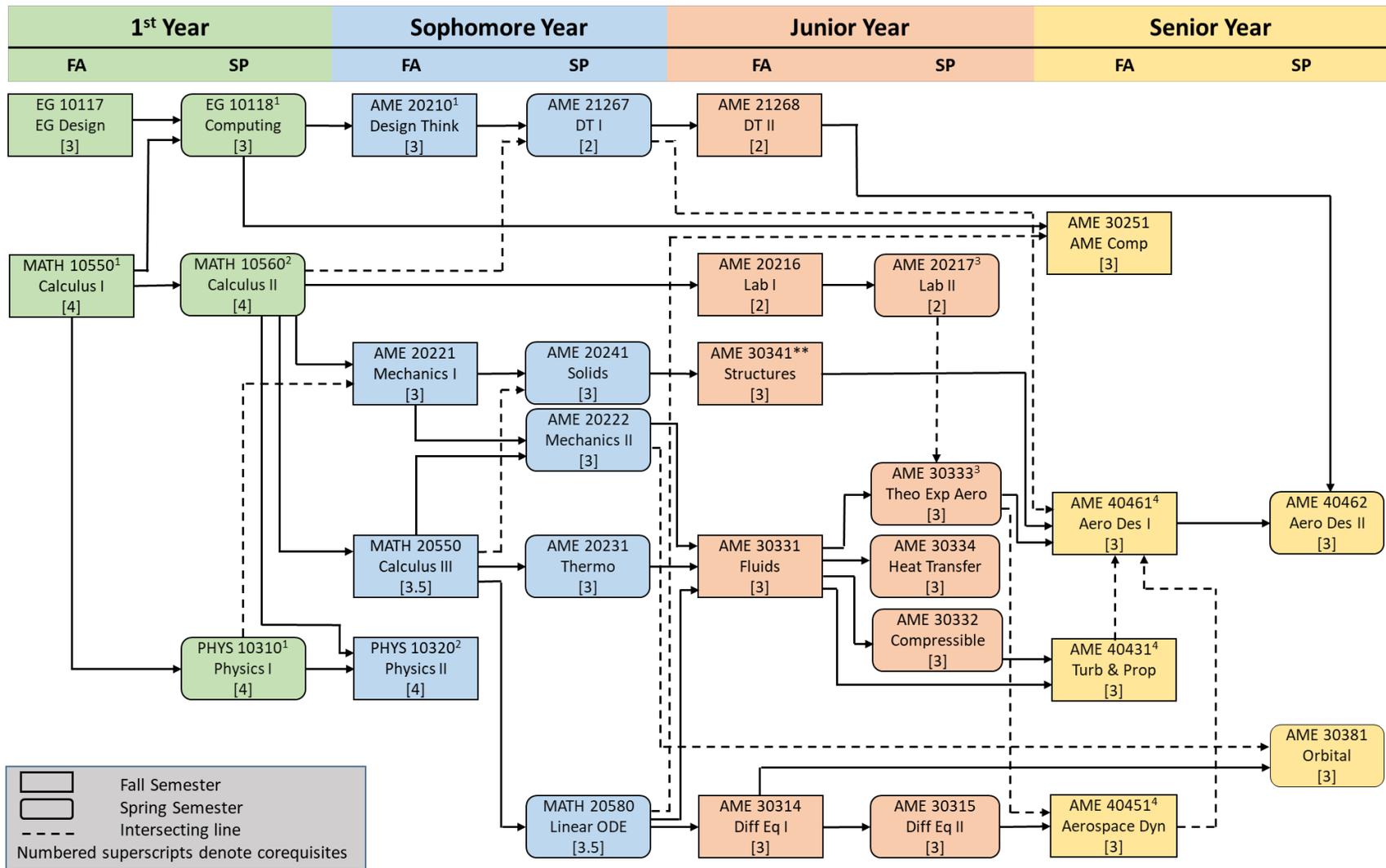
**Prerequisites:** AME 20210, AME 20217, EE 20222, AME 21268, AME 30315, AME 30334 (AME 30334 is a prerequisite for the Fall version of AME 40463, AME 30334 may be taken concurrently with the Spring version of AME 40463), AME 30363, AME 40423

**Last Semester for Ontime Graduation:** ME: Spring of Senior Year

### 2.3 Example Course Plan for AE Class of 2027+ (127 Credit Hrs)

| First Year                        |   |     |                                     |   |     |
|-----------------------------------|---|-----|-------------------------------------|---|-----|
| Fall Semester (Credit Hours:15)   |   |     | Spring Semester (Credit Hours:18)   |   |     |
| MATH 10550                        | Calculus I  | 4   | MATH 10560                          | Calculus II   | 4   |
| CHEM 10171                        | Intro to Chemical Principles                      | 4   | PHYS 10310                          | Engineering Physics I                                 | 4   |
| EG 10117                          | Engineering Design                                | 3   | EG 10118                            | Engineering Computing                                 | 3   |
| USEM or WR 13100                  | University Seminar or Writing & Rhetoric          | 3   | USEM or WR 13100                    | University Seminar or Writing & Rhetoric              | 3   |
| FYS 10101                         | Moreau First Year Experience                      | 1   | FYS 10102                           | Moreau First Year Experience                          | 1   |
|                                   |   |     |                                     | AE Professional Development or Core Curriculum Course | 3   |
| Sophomore Year                    |   |     |                                     |   |     |
| Fall Semester (Credit Hours:15.5) |   |     | Spring Semester (Credit Hours:15.5) |   |     |
| MATH 20550                        | Calculus III                                      | 3.5 | MATH 20580                          | Intro to Linear Algebra and Differential Equations    | 3.5 |
| PHYS 10320                        | Engineering Physics II                            | 4   | AME 20231                           | Thermodynamics  | 3   |
| AME 20221                         | Mechanics I                                       | 3   | AME 20222                           | Mechanics II  | 3   |
| AME 20210                         | Introduction to Design Thinking in Engineering    | 3   | AME 20241                           | Solid Mechanics                                       | 3   |
| AME 20216                         | Lab I   | 2   |                                     | Core Curriculum Class                                 | 3   |
|                                   |   |     |                                     |   |     |
| Junior Year                       |   |     |                                     |   |     |
| Fall Semester (Credit Hours:16)   |   |     | Spring Semester (Credit Hours:17)   |   |     |
| AME 30314                         | Differential Equations, Vibrations and Controls I | 3   | AME 30315                           | Differential Equations, Vibrations and Controls II    | 3   |
| AME 21267                         | Design Tools I                                    | 2   | AME 21268                           | Design Tools II                                       | 2   |
| AME 20217                         | Lab II  | 2   | AME 30333                           | Theoretical and Experimental Aerodynamics             | 3   |
| AME 30331                         | Fluid Mechanics                                   | 3   | AME 30332                           | Compressible Aerodynamics                             | 3   |
| AME 30341                         | Aerospace Structures                              | 3   | AME 30334                           | Heat Transfer   | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     | Core Curriculum Course                                | 3   |
| Senior Year                       |   |     |                                     |   |     |
| Fall Semester (Credit Hours:15)   |   |     | Spring Semester (Credit Hours:15)   |   |     |
| AME 40431                         | Gas Turbines and Propulsion                       | 3   | AME 30381                           | Orbital and Space Dynamics                            | 3   |
| AME 40451                         | Aerospace Dynamics                                | 3   | AME 40462                           | Aerospace Design                                      | 3   |
| AME 40461                         | Flight Mechanics and Introduction to Design       | 3   |                                     | AE Professional Development or Core Curriculum Course | 3   |
| AME 30251                         | Comp. Methods in AME                              | 3   |                                     | AE Technical Specialization                           | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     | Core Curriculum Course                                | 3   |

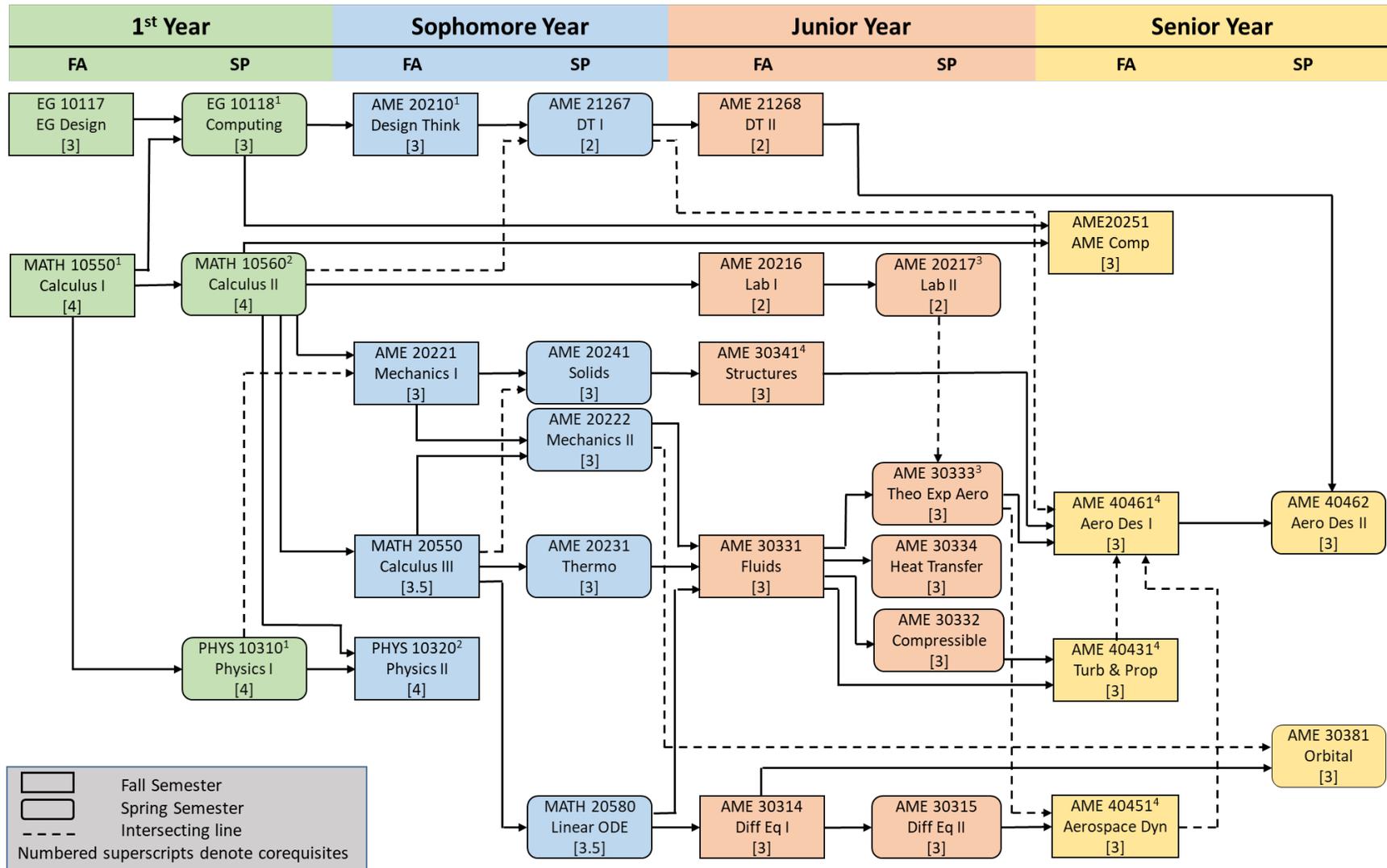
## 2.4 Curriculum Map for AE Class of 2027+



## 2.5 Example Course Plan for AE Class of 2026 (127 Credit Hrs)

| First Year                        |   |     |                                     |   |     |
|-----------------------------------|---|-----|-------------------------------------|---|-----|
| Fall Semester (Credit Hours:15)   |   |     | Spring Semester (Credit Hours:18)   |   |     |
| MATH 10550                        | Calculus I  | 4   | MATH 10560                          | Calculus II   | 4   |
| CHEM 10171                        | Intro to Chemical Principles                      | 4   | PHYS 10310                          | Engineering Physics I                                 | 4   |
| EG 10117                          | Engineering Design                                | 3   | EG 10118                            | Engineering Computing                                 | 3   |
| USEM or WR 13100                  | University Seminar or Writing & Rhetoric          | 3   | USEM or WR 13100                    | University Seminar or Writing & Rhetoric              | 3   |
| FYS 10101                         | Moreau First Year Experience                      | 1   | FYS 10102                           | Moreau First Year Experience                          | 1   |
|                                   |   |     |                                     | AE Professional Development or Core Curriculum Course | 3   |
| Sophomore Year                    |   |     |                                     |   |     |
| Fall Semester (Credit Hours:15.5) |   |     | Spring Semester (Credit Hours:15.5) |   |     |
| MATH 20550                        | Calculus III                                      | 3.5 | MATH 20580                          | Intro to Linear Algebra and Differential Equations    | 3.5 |
| PHYS 10320                        | Engineering Physics II                            | 4   | AME 20231                           | Thermodynamics  | 3   |
| AME 20221                         | Mechanics I                                       | 3   | AME 20222                           | Mechanics II  | 3   |
| AME 20210                         | Introduction to Design Thinking in Engineering    | 3   | AME 20241                           | Solid Mechanics                                       | 3   |
| AME 20216                         | Lab I   | 2   | AME 20251                           | Computing Methods in AME                              | 3   |
|                                   |   |     |                                     |   |     |
| Junior Year                       |   |     |                                     |   |     |
| Fall Semester (Credit Hours:16)   |   |     | Spring Semester (Credit Hours:17)   |   |     |
| AME 30314                         | Differential Equations, Vibrations and Controls I | 3   | AME 30315                           | Differential Equations, Vibrations and Controls II    | 3   |
| AME 21267                         | Design Tools I                                    | 2   | AME 21268                           | Design Tools II                                       | 2   |
| AME 20217                         | Lab II  | 2   | AME 30333                           | Theoretical and Experimental Aerodynamics             | 3   |
| AME 30331                         | Fluid Mechanics                                   | 3   | AME 30332                           | Compressible Aerodynamics                             | 3   |
| AME 30341                         | Aerospace Structures                              | 3   | AME 30334                           | Heat Transfer   | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     | Core Curriculum Course                                | 3   |
| Senior Year                       |   |     |                                     |   |     |
| Fall Semester (Credit Hours:15)   |   |     | Spring Semester (Credit Hours:15)   |   |     |
| AME 40431                         | Gas Turbines and Propulsion                       | 3   | AME 30381                           | Orbital and Space Dynamics                            | 3   |
| AME 40451                         | Aerospace Dynamics                                | 3   | AME 40462                           | Aerospace Design                                      | 3   |
| AME 40461                         | Flight Mechanics and Introduction to Design       | 3   |                                     | AE Professional Development or Core Curriculum Course | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     | AE Technical Specialization                           | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     | Core Curriculum Course                                | 3   |

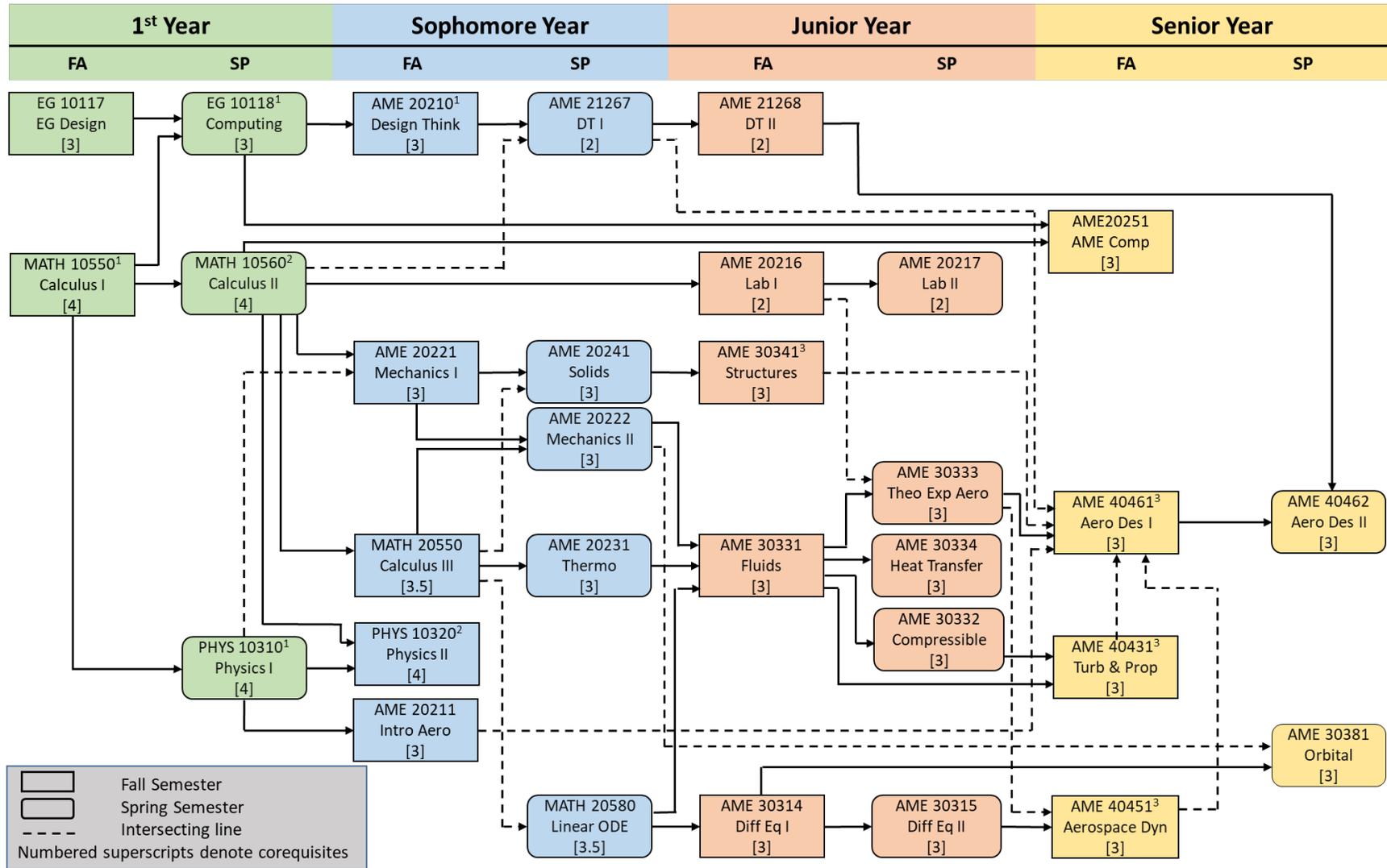
## 2.6 Curriculum Map for AE Class of 2026



## 2.7 Example Course Plan for AE Class of 2025 (133 Credit Hrs)

| First Year                        |   |     |                                     |   |     |
|-----------------------------------|---|-----|-------------------------------------|---|-----|
| Fall Semester (Credit Hours:18)   |   |     | Spring Semester (Credit Hours:18)   |   |     |
| MATH 10550                        | Calculus I  | 4   | MATH 10560                          | Calculus II   | 4   |
| CHEM 10171                        | Intro to Chemical Principles                      | 4   | PHYS 10310                          | Engineering Physics I                                 | 4   |
| EG 10117                          | Engineering Design                                | 3   | EG 10118                            | Engineering Computing                                 | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     | AE Professional Development or Core Curriculum Course | 3   |
| USEM or WR 13100                  | University Seminar or Writing & Rhetoric          | 3   | USEM or WR 13100                    | University Seminar or Writing & Rhetoric              | 3   |
| FYS 10101                         | Moreau First Year Experience                      | 1   | FYS 10102                           | Moreau First Year Experience                          | 1   |
| Sophomore Year                    |   |     |                                     |   |     |
| Fall Semester (Credit Hours:16.5) |   |     | Spring Semester (Credit Hours:17.5) |   |     |
| MATH 20550                        | Calculus III                                      | 3.5 | MATH 20580                          | Intro to Linear Algebra and Differential Equations    | 3.5 |
| PHYS 10320                        | Engineering Physics II                            | 4   | AME 20231                           | Thermodynamics  | 3   |
| AME 20221                         | Mechanics I                                       | 3   | AME 20222                           | Mechanics II  | 3   |
| AME 20210                         | Introduction to Design Thinking in Engineering    | 3   | AME 20216 or AME 21267              | Lab I or Design Tools I                               | 2   |
| AME 20211                         | Intro to Aeronautics                              | 3   | AME 20241                           | Solid Mechanics                                       | 3   |
|                                   |   |     |                                     | Core Curriculum Course                                | 3   |
| Junior Year                       |   |     |                                     |   |     |
| Fall Semester (Credit Hours:16)   |   |     | Spring Semester (Credit Hours:17)   |   |     |
| AME 30314                         | Differential Equations, Vibrations and Controls I | 3   | AME 30315                           | Differential Equations, Vibrations and Controls II    | 3   |
| AME 20216 or AME 21267            | Lab I or Design Tools I                           | 2   | AME 20217 or AME 21268              | Lab II or Design Tools II                             | 2   |
| AME 20217 or AME 21268            | Lab II or Design Tools II                         | 2   | AME 30333                           | Theoretical and Experimental Aerodynamics             | 3   |
| AME 30331                         | Fluid Mechanics                                   | 3   | AME 30332                           | Compressible Aerodynamics                             | 3   |
| AME 30341                         | Aerospace Structures                              | 3   | AME 30334                           | Heat Transfer   | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     | Core Curriculum Course                                | 3   |
| Senior Year                       |   |     |                                     |   |     |
| Fall Semester (Credit Hours:15)   |   |     | Spring Semester (Credit Hours:15)   |   |     |
| AME 40431                         | Gas Turbines and Propulsion                       | 3   | AME 30381                           | Orbital and Space Dynamics                            | 3   |
| AME 40451                         | Aerospace Dynamics                                | 3   | AME 40462                           | Aerospace Design                                      | 3   |
| AME 40461                         | Flight Mechanics and Introduction to Design       | 3   |                                     | AE Professional Development or Core Curriculum Course | 3   |
|                                   | AE Technical Specialization                       | 3   |                                     | AE Technical Specialization                           | 3   |
| AME 20251                         | Comp. Methods in AME                              | 3   |                                     | Core Curriculum Course                                | 3   |

## 2.8 Curriculum Map for AE Class of 2025

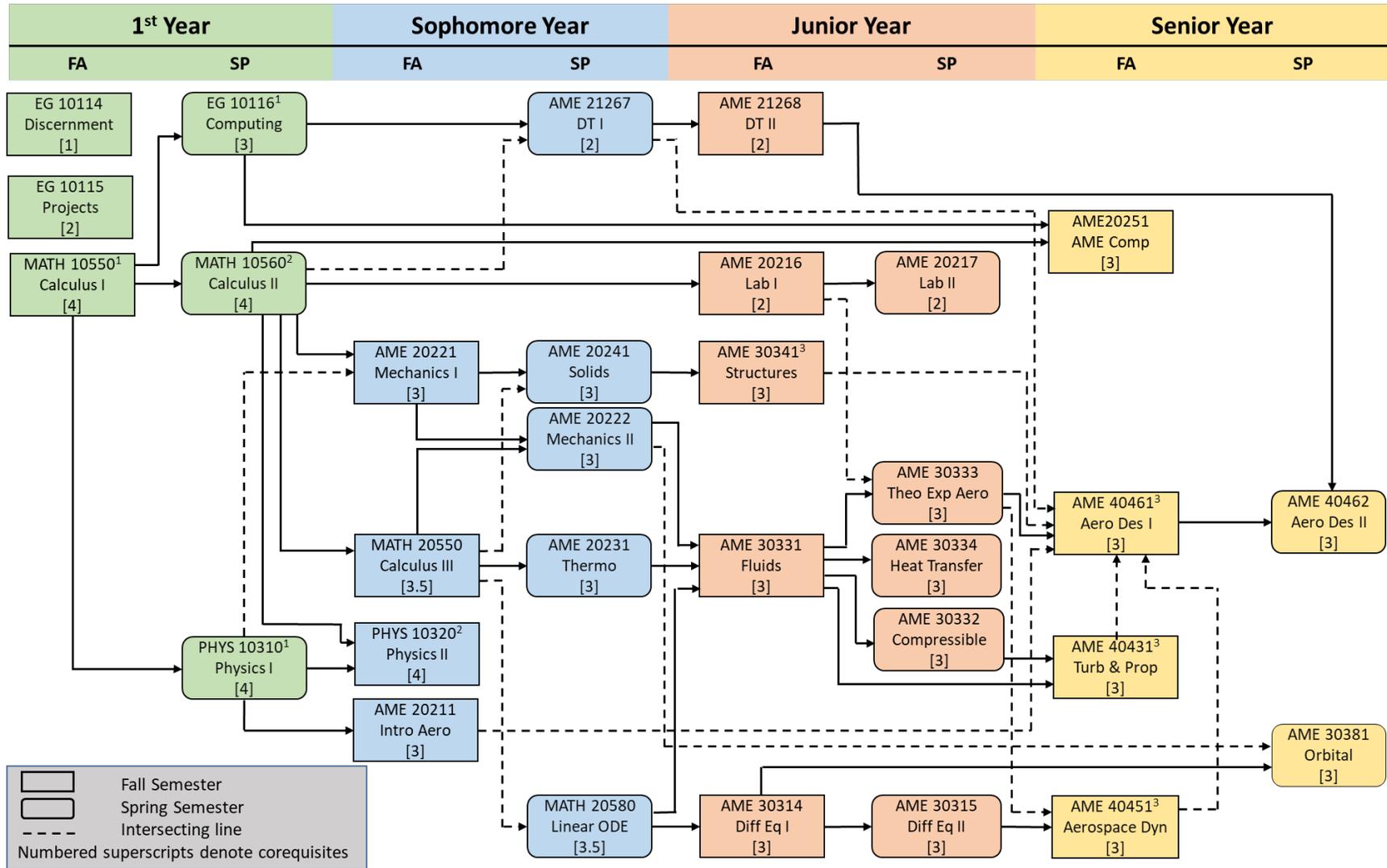


## 2.9 Example Course Plan for AE Class of 2024 (133 Credit Hrs)

| First Year                        |   |     |                                     |  |     |
|-----------------------------------|---|-----|-------------------------------------|--|-----|
| Fall Semester (Credit Hours:18)   |   |     | Spring Semester (Credit Hours:18)   |  |     |
| MATH 10550                        | Calculus I  | 4   | MATH 10560                          | Calculus II  | 4   |
| CHEM 10171                        | Intro to Chemical Principles                      | 4   | CHEM 10122                          | General Chemistry                                  | 3   |
| EG 10114                          | Engineering Discernment                           | 1   | EG 10116                            | Engineering Programming                            | 3   |
| EG 10115                          | Engineering Projects <sup>1</sup>                 | 2   | PHYS 10310                          | Engineering Physics I                              | 4   |
| USEM or WR 13100                  | University Seminar or Writing & Rhetoric          | 3   | USEM or WR 13100                    | University Seminar or Writing & Rhetoric           | 3   |
| FYS 10101                         | Moreau First Year Experience                      | 1   | FYS 10102                           | Moreau First Year Experience                       | 1   |
|                                   | Core Curriculum Course                            | 3   |                                     |  |     |
| Sophomore Year                    |   |     |                                     |  |     |
| Fall Semester (Credit Hours:16.5) |   |     | Spring Semester (Credit Hours:17.5) |  |     |
| MATH 20550                        | Calculus III                                      | 3.5 |                                     | Core Curriculum Course                             | 3   |
| PHYS 10320                        | Engineering Physics II                            | 4   | AME 20231                           | Thermodynamics                                     | 3   |
| AME 20221                         | Mechanics I                                       | 3   | AME 20222                           | Mechanics II                                       | 3   |
| AME 20216<br>Or AME 21267         | Lab I or Design Tools I                           | 2   | AME 20216 or<br>AME 21267           | Lab I or Design Tools I                            | 2   |
| AME 20211                         | Intro to Aeronautics                              | 3   | AME 20241                           | Solid Mechanics                                    | 3   |
| AME 20214                         | Intro to Engineering Computing                    | 1   | MATH 20580                          | Intro to Linear Algebra and Differential Equations | 3.5 |
| Junior Year                       |   |     |                                     |  |     |
| Fall Semester (Credit Hours:16)   |   |     | Spring Semester (Credit Hours:16)   |  |     |
| AME 21267                         | Design Tools II                                   | 2   | AME 30332                           | Compressible Aerodynamics                          | 3   |
| AME 20217                         | Lab II  | 2   | AME 30333                           | Theoretical and Experimental Aerodynamics          | 4   |
| AME 30314                         | Differential Equations, Vibrations and Controls I | 3   | AME 30315                           | Differential Equations, Vibrations and Controls II | 3   |
| AME 30331                         | Fluid Mechanics                                   | 3   | AME 30334                           | Heat Transfer                                      | 3   |
| AME 30341                         | Aerospace Structures                              | 3   |                                     | Core Curriculum Course                             | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     |  |     |
| Senior Year                       |   |     |                                     |  |     |
| Fall Semester (Credit Hours:15)   |   |     | Spring Semester (Credit Hours:16)   |  |     |
| AME 40431                         | Gas Turbines and Propulsion                       | 3   | AME 30381                           | Orbital and Space Dynamics                         | 3   |
| AME 40451                         | Aerospace Dynamics                                | 3   | AME 40462                           | Aerospace Design                                   | 4   |
| AME 40461                         | Flight Mechanics and Introduction to Design       | 3   |                                     | AE Technical Specialization                        | 3   |
|                                   | AE Technical Specialization                       | 3   |                                     | AE Professional Development                        | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     | Core Curriculum Course                             | 3   |

<sup>1</sup> Any department projects course could substitute for this course.

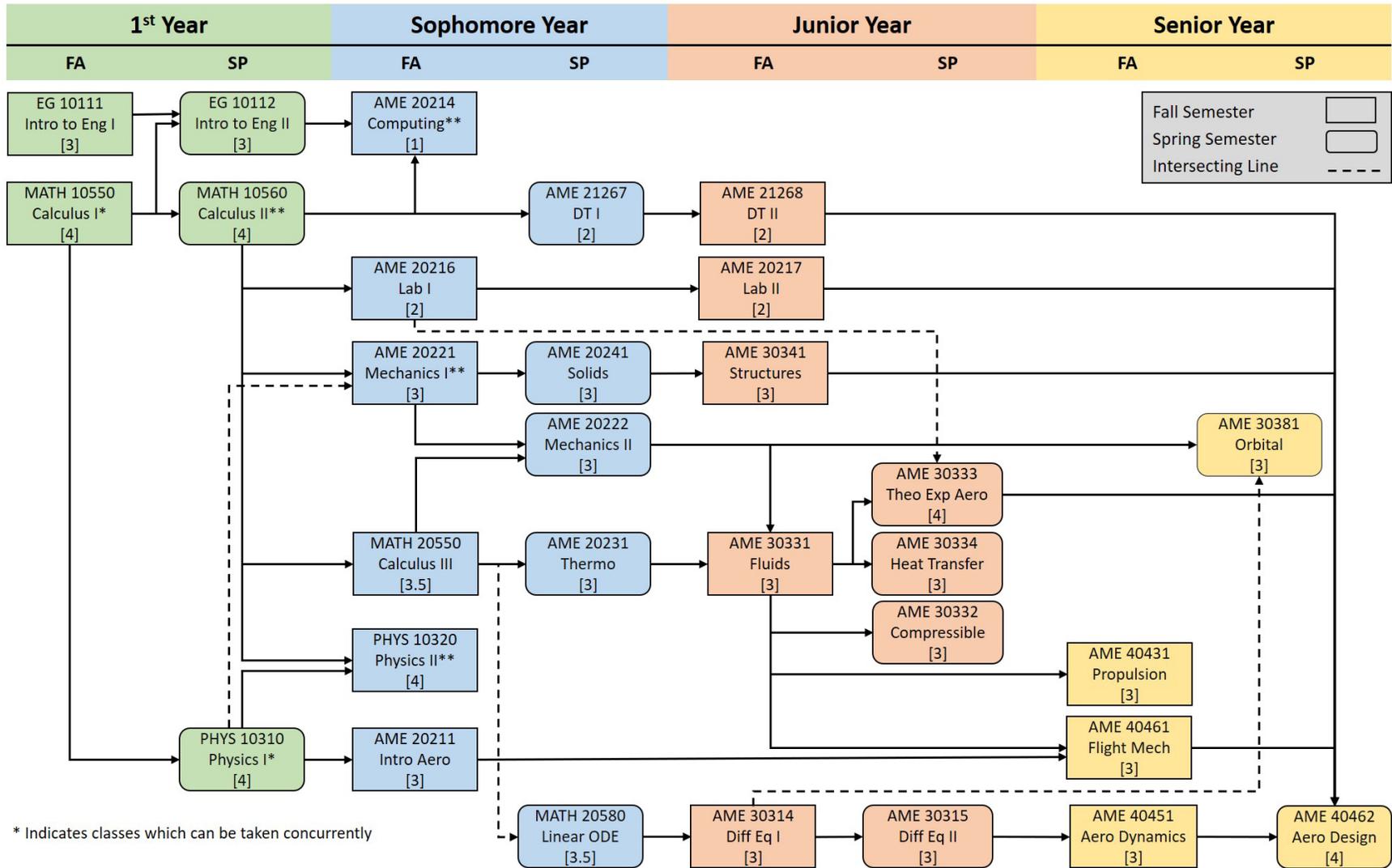
## 2.10 Curriculum Map for AE Class of 2024



## 2.11 Example Course Plan for AE Class of 2023 (133 Credit Hrs)

| First Year                        |   |     |                                     |  |     |
|-----------------------------------|---|-----|-------------------------------------|--|-----|
| Fall Semester (Credit Hours:18)   |   |     | Spring Semester (Credit Hours:18)   |  |     |
| MATH 10550                        | Calculus I  | 4   | MATH 10560                          | Calculus II  | 4   |
| CHEM 10171                        | Intro to Chemical Principles                      | 4   | CHEM 10122                          | General Chemistry                                  | 3   |
| EG 10111                          | Intro to Engineering Systems I                    | 3   | EG 10112                            | Intro to Engineering Systems II                    | 3   |
|                                   | Core Curriculum Course                            | 3   | PHYS 10310                          | Engineering Physics I                              | 4   |
| USEM or WR 13100                  | University Seminar or Writing & Rhetoric          | 3   | USEM or WR 13100                    | University Seminar or Writing & Rhetoric           | 3   |
| FYS 10101                         | Moreau 1st Year Experience                        | 1   | FYS 10102                           | Moreau First Year Experience                       | 1   |
| Sophomore Year                    |   |     |                                     |  |     |
| Fall Semester (Credit Hours:16.5) |   |     | Spring Semester (Credit Hours:17.5) |  |     |
| MATH 20550                        | Calculus III                                      | 3.5 |                                     | Core Curriculum Course                             | 3   |
| PHYS 10320                        | Engineering Physics II                            | 4   | AME 20231                           | Thermodynamics                                     | 3   |
| AME 20221                         | Mechanics I                                       | 3   | AME 20222                           | Mechanics II                                       | 3   |
| AME 20216 or AME 21267            | Lab I or Design Tools I                           | 2   | AME 20216 or AME 21267              | Lab I or Design Tools I                            | 2   |
| AME 20211                         | Intro to Aeronautics                              | 3   | AME 20241                           | Solid Mechanics                                    | 3   |
| AME 20214                         | Intro to Engineering Computing                    | 1   | MATH 20580                          | Intro to Linear Algebra and Differential Equations | 3.5 |
| Junior Year                       |   |     |                                     |  |     |
| Fall Semester (Credit Hours:16)   |   |     | Spring Semester (Credit Hours:16)   |  |     |
| AME 21267                         | Design Tools II                                   | 2   | AME 30332                           | Compressible Aerodynamics                          | 3   |
| AME 20217                         | Lab II  | 2   | AME 30333                           | Theoretical and Experimental Aerodynamics          | 4   |
| AME 30314                         | Differential Equations, Vibrations and Controls I | 3   | AME 30315                           | Differential Equations, Vibrations and Controls II | 3   |
| AME 30331                         | Fluid Mechanics                                   | 3   | AME 30334                           | Heat Transfer                                      | 3   |
| AME 30341                         | Aerospace Structures                              | 3   |                                     | Core Curriculum Course                             | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     |  |     |
| Senior Year                       |   |     |                                     |  |     |
| Fall Semester (Credit Hours:15)   |   |     | Spring Semester (Credit Hours:16)   |  |     |
| AME 40431                         | Gas Turbines and Propulsion                       | 3   | AME 30381                           | Orbital and Space Dynamics                         | 3   |
| AME 40451                         | Aerospace Dynamics                                | 3   | AME 40462                           | Aerospace Design                                   | 4   |
| AME 40461                         | Flight Mechanics and Introduction to Design       | 3   |                                     | AE Technical Specialization                        | 3   |
|                                   | AE Technical Specialization                       | 3   |                                     | AE Professional Development                        | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     | Core Curriculum Course                             | 3   |

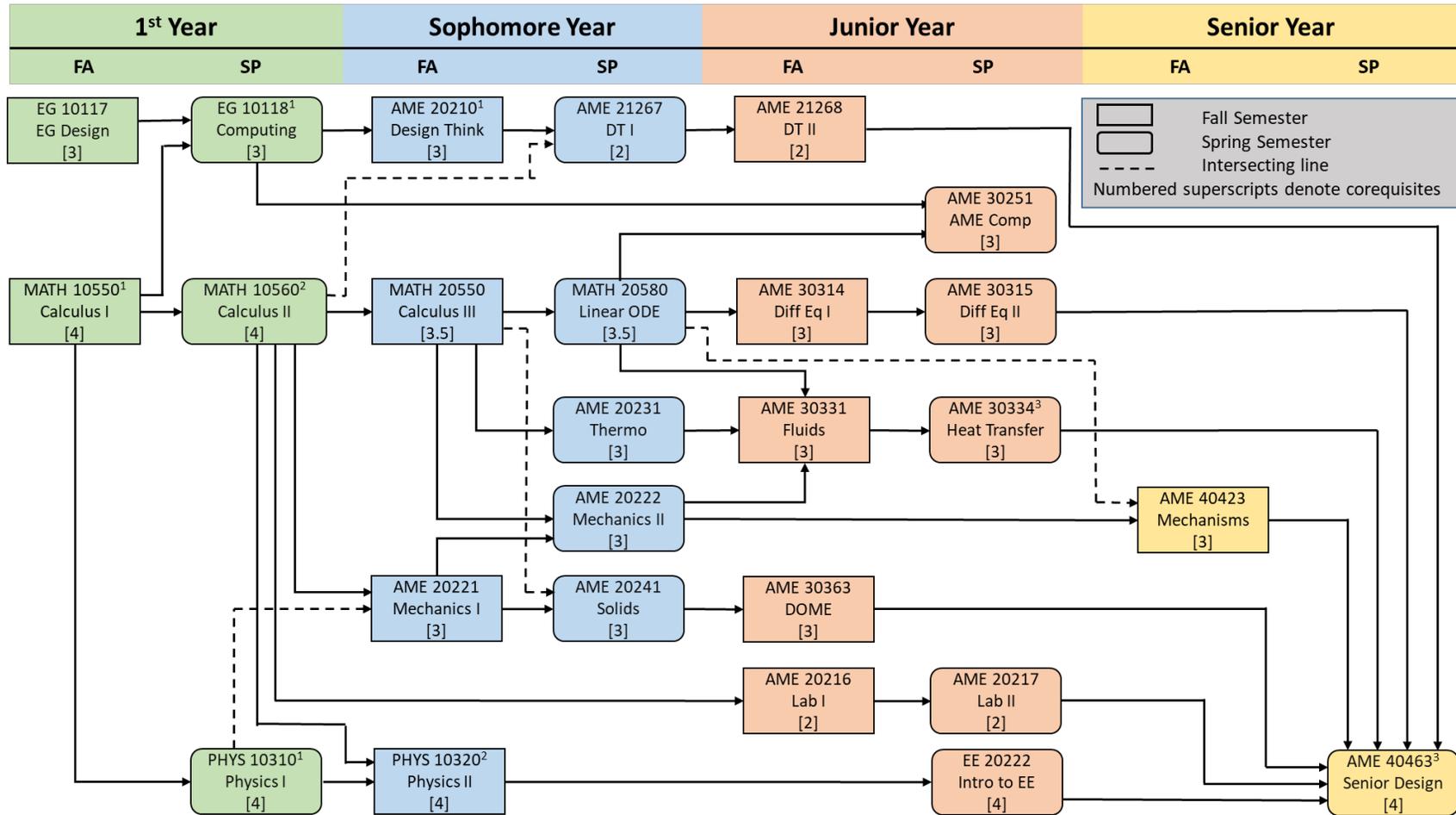
## 2.12 Curriculum Map for AE Class of 2023



## 2.13 Example Course Plan for ME Class of 2027 and Beyond (126 Credit Hrs)

| First Year                        |  |     |                                     |   |     |
|-----------------------------------|--|-----|-------------------------------------|---|-----|
| Fall Semester (Credit Hours:15)   |  |     | Spring Semester (Credit Hours:18)   |   |     |
| MATH 10550                        | Calculus I   | 4   | MATH 10560                          | Calculus II   | 4   |
| EG 10117                          | Engineering Design                                   | 3   | EG 10118                            | Engineering Computing                                   | 3   |
| CHEM 10171                        | Intro to Chemical Principles                         | 4   | PHYS 10310                          | Engineering Physics I                                   | 4   |
| USEM or WR 13100                  | University Seminar or Writing & Rhetoric             | 3   | USEM or WR 13100                    | University Seminar or Writing & Rhetoric                | 3   |
| FYS 10101                         | Moreau First Year Experience                         | 1   | FYS 10102                           | Moreau First Year Experience                            | 1   |
|                                   |  |     |                                     | ME General Technical Elective or Core Curriculum Course | 3   |
| Sophomore Year                    |  |     |                                     |   |     |
| Fall Semester (Credit Hours:16.5) |  |     | Spring Semester (Credit Hours:14.5) |   |     |
| MATH 20550                        | Calculus III   | 3.5 | AME 20231                           | Thermodynamics  | 3   |
| PHYS 10320                        | Engineering Physics II                               | 4   | AME 20241                           | Solid Mechanics   | 3   |
| AME 20221                         | Mechanics I  | 3   | AME 20222                           | Mechanics II  | 3   |
| AME 20210                         | Intro to Design Thinking in Engineering              | 3   | MATH 20580                          | Intro to Linear Algebra and Differential Equations      | 3.5 |
| CBE 20261                         | Engineering Materials                                | 3   | AME 20216 or AME 21267              | Lab I or Design Tools I                                 | 2   |
| Junior Year                       |  |     |                                     |   |     |
| Fall Semester (Credit Hours:16)   |  |     | Spring Semester (Credit Hours:15)   |   |     |
| AME 30314                         | Differential Equations, Vibrations and Controls I    | 3   | AME 30315                           | Differential Equations, Vibrations and Controls II      | 3   |
| AME 30331                         | Fluid Mechanics                                      | 3   | AME 30334                           | Heat Transfer   | 3   |
| AME 20216 or AME 21267            | Lab I or Design Tools I                              | 2   | AME 20217 or AME 21268              | Lab II or Design Tools II                               | 2   |
| AME 20217 or AME 21268            | Lab II or Design Tools II                            | 2   | EE 20222                            | Intro to Electrical Engineering                         | 4   |
| AME 30363                         | Design of Machine Elements                           | 3   |                                     | Core Curriculum Course                                  | 3   |
|                                   | Core Curriculum Course                               | 3   |                                     |   |     |
| Senior Year                       |  |     |                                     |   |     |
| Fall Semester (Credit Hours:15)   |  |     | Spring Semester (Credit Hours:16)   |   |     |
| AME 40423                         | Mechanisms and Machines                              | 3   | AME 40463                           | Senior Design Project                                   | 4   |
| AME 30251                         | Comp. Methods in AME                                 | 3   |                                     | General Technical Elective                              | 3   |
|                                   | AME Technical Elective                               | 3   |                                     | AME Technical Elective                                  | 3   |
|                                   | Core Curriculum Course                               | 3   |                                     | Core Curriculum Course                                  | 3   |
|                                   | General Technical Elective or Core Curriculum Course | 3   |                                     | Core Curriculum Course                                  | 3   |

## 2.14 Curriculum Map for ME Class of 2027 and Beyond

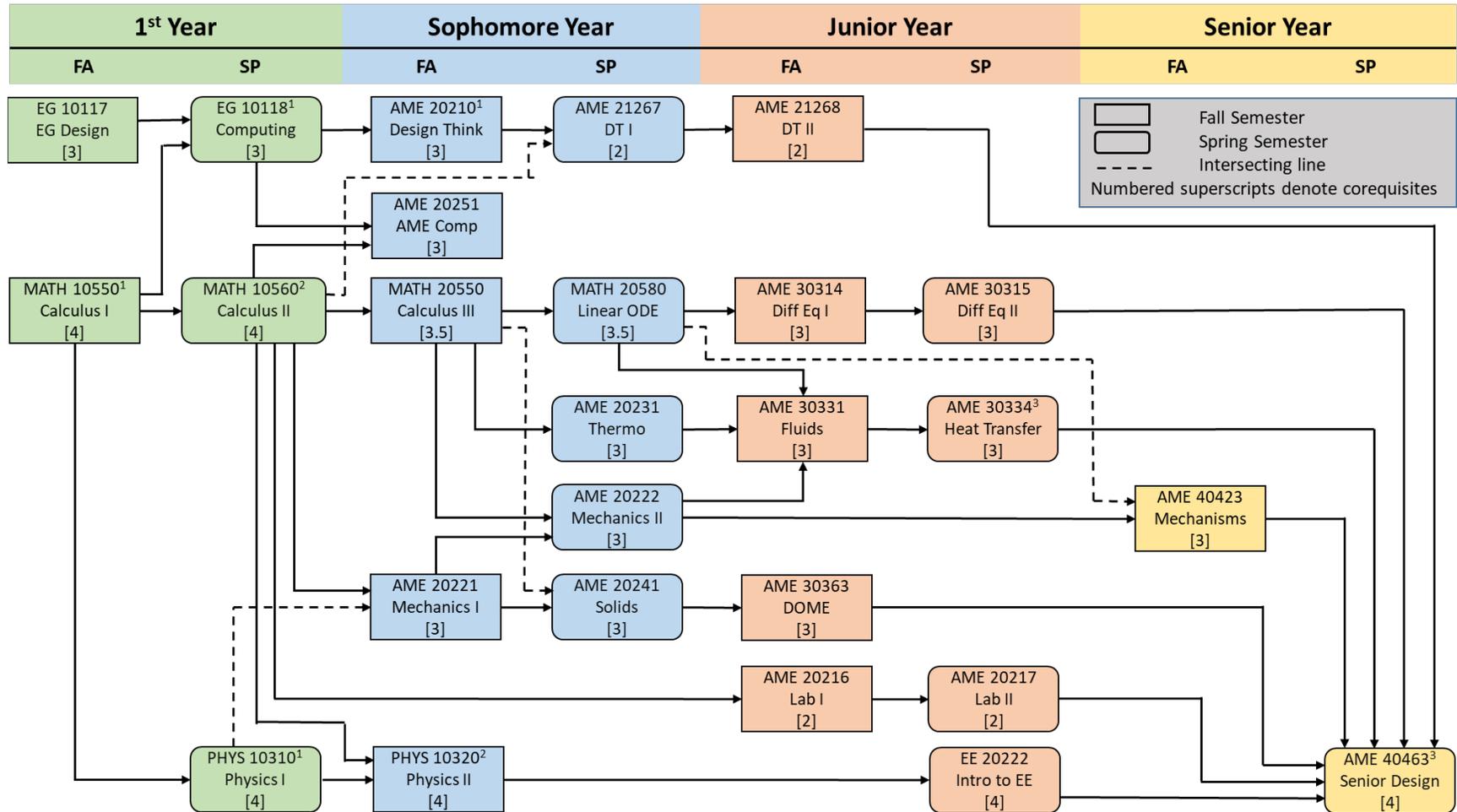


<sup>3</sup> AME 30334 may be taken concurrently with AME 40463 in the Spring Semester only

## 2.15 Example Course Plan for ME Class of 2026 (126 Credit Hrs)

| First Year                        |  |     |                                     |   |     |
|-----------------------------------|--|-----|-------------------------------------|---|-----|
| Fall Semester (Credit Hours:15)   |  |     | Spring Semester (Credit Hours:18)   |   |     |
| MATH 10550                        | Calculus I   | 4   | MATH 10560                          | Calculus II   | 4   |
| EG 10117                          | Engineering Design                                   | 3   | EG 10118                            | Engineering Computing                                   | 3   |
| CHEM 10171                        | Intro to Chemical Principles                         | 4   | PHYS 10310                          | Engineering Physics I                                   | 4   |
| USEM or WR 13100                  | University Seminar or Writing & Rhetoric             | 3   | USEM or WR 13100                    | University Seminar or Writing & Rhetoric                | 3   |
| FYS 10101                         | Moreau First Year Experience                         | 1   | FYS 10102                           | Moreau First Year Experience                            | 1   |
|                                   |  |     |                                     | ME General Technical Elective or Core Curriculum Course | 3   |
| Sophomore Year                    |  |     |                                     |   |     |
| Fall Semester (Credit Hours:16.5) |  |     | Spring Semester (Credit Hours:14.5) |   |     |
| MATH 20550                        | Calculus III   | 3.5 | AME 20231                           | Thermodynamics  | 3   |
| PHYS 10320                        | Engineering Physics II                               | 4   | AME 20241                           | Solid Mechanics   | 3   |
| AME 20221                         | Mechanics I  | 3   | AME 20222                           | Mechanics II  | 3   |
| AME 20210                         | Intro to Design Thinking in Engineering              | 3   | MATH 20580                          | Intro to Linear Algebra and Differential Equations      | 3.5 |
| AME 20251 or CBE 20261            | Comp. Methods in AME or Engineering Materials        | 3   | AME 20216 or AME 21267              | Lab I or Design Tools I                                 | 2   |
| Junior Year                       |  |     |                                     |   |     |
| Fall Semester (Credit Hours:16)   |  |     | Spring Semester (Credit Hours:15)   |   |     |
| AME 30314                         | Differential Equations, Vibrations and Controls I    | 3   | AME 30315                           | Differential Equations, Vibrations and Controls II      | 3   |
| AME 30331                         | Fluid Mechanics                                      | 3   | AME 30334                           | Heat Transfer   | 3   |
| AME 20216 or AME 21267            | Lab I or Design Tools I                              | 2   | AME 20217 or AME 21268              | Lab II or Design Tools II                               | 2   |
| AME 20217 or AME 21268            | Lab II or Design Tools II                            | 2   | EE 20222                            | Intro to Electrical Engineering                         | 4   |
| AME 30363                         | Design of Machine Elements                           | 3   |                                     | Core Curriculum Course                                  | 3   |
|                                   | Core Curriculum Course                               | 3   |                                     |   |     |
| Senior Year                       |  |     |                                     |   |     |
| Fall Semester (Credit Hours:15)   |  |     | Spring Semester (Credit Hours:16)   |   |     |
| AME 40423                         | Mechanisms and Machines                              | 3   | AME 40463                           | Senior Design Project                                   | 4   |
| AME 20251 or CBE 20261            | Comp. Methods in AME or Engineering Materials        | 3   |                                     | General Technical Elective                              | 3   |
|                                   | AME Technical Elective                               | 3   |                                     | AME Technical Elective                                  | 3   |
|                                   | Core Curriculum Course                               | 3   |                                     | Core Curriculum Course                                  | 3   |
|                                   | General Technical Elective or Core Curriculum Course | 3   |                                     | Core Curriculum Course                                  | 3   |

## 2.16 Curriculum Map for ME Class of 2026

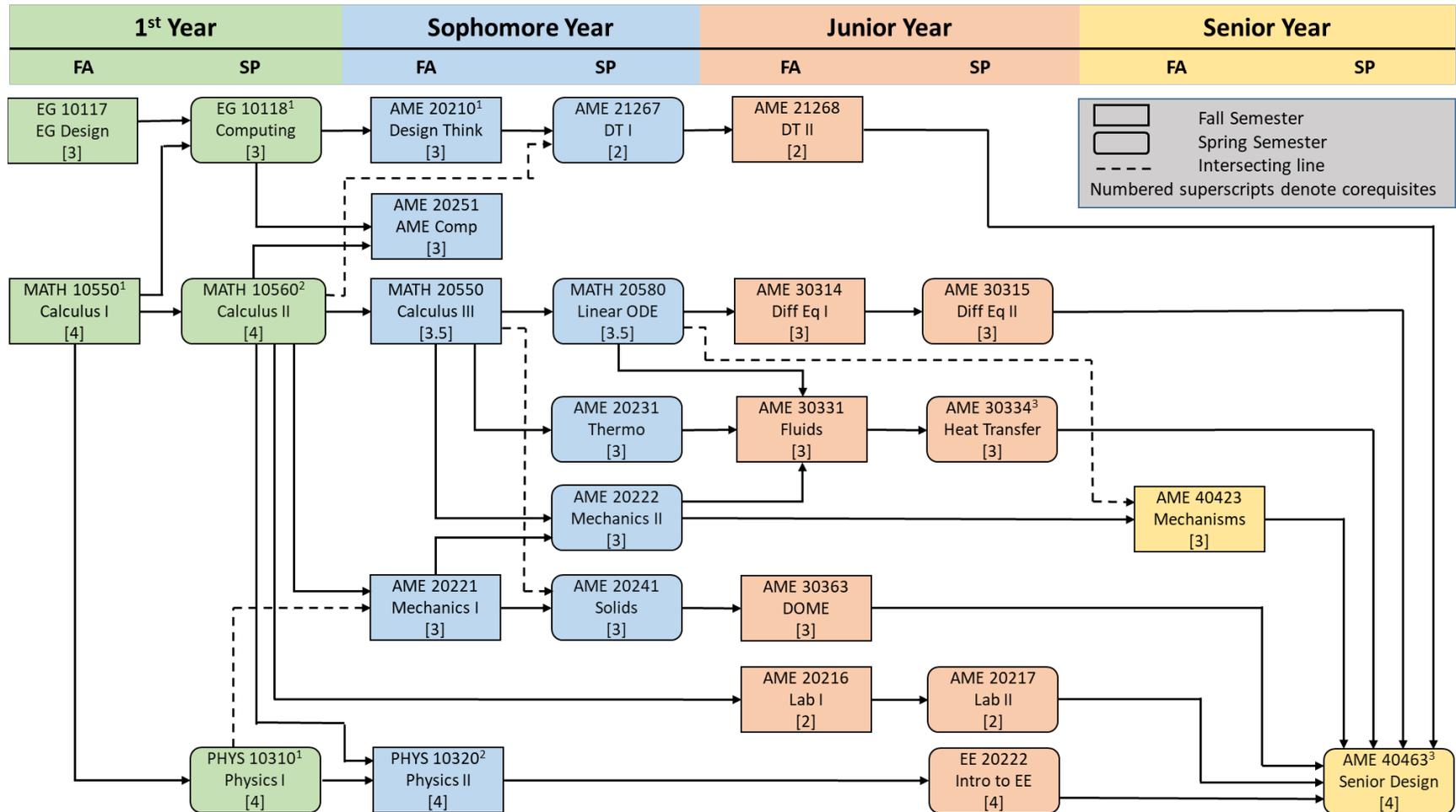


<sup>3</sup> AME 30334 may be taken concurrently with AME 40463 in the Spring Semester only

## 2.17 Example Course Plan for ME Class of 2025 (132 Credit Hrs)

| First Year                        |  |     |                                     |   |     |
|-----------------------------------|--|-----|-------------------------------------|---|-----|
| Fall Semester (Credit Hours:18)   |  |     | Spring Semester (Credit Hours:18)   |   |     |
| MATH 10550                        | Calculus I   | 4   | MATH 10560                          | Calculus II   | 4   |
| EG 10117                          | Engineering Design                                   | 3   | EG 10118                            | Engineering Computing                                   | 3   |
| CHEM 10171                        | Intro to Chemical Principles                         | 4   | PHYS 10310                          | Engineering Physics I                                   | 4   |
| USEM or WR 13100                  | University Seminar or Writing & Rhetoric             | 3   | USEM or WR 13100                    | University Seminar or Writing & Rhetoric                | 3   |
| FYS 10101                         | Moreau First Year Experience                         | 1   | FYS 10102                           | Moreau First Year Experience                            | 1   |
|                                   | Core Curriculum Course                               | 3   |                                     | ME General Technical Elective or Core Curriculum Course | 3   |
| Sophomore Year                    |  |     |                                     |   |     |
| Fall Semester (Credit Hours:16.5) |  |     | Spring Semester (Credit Hours:17.5) |   |     |
| MATH 20550                        | Calculus III   | 3.5 | AME 20231                           | Thermodynamics  | 3   |
| PHYS 10320                        | Engineering Physics II                               | 4   | AME 20241                           | Solid Mechanics   | 3   |
| AME 20221                         | Mechanics I  | 3   | AME 20222                           | Mechanics II  | 3   |
| AME 20210                         | Intro to Design Thinking in Engineering              | 3   | MATH 20580                          | Intro to Linear Algebra and Differential Equations      | 3.5 |
| AME 20251 or CBE 20261            | Comp. Methods in AME or Engineering Materials        | 3   | AME 20216 or AME 21267              | Lab I or Design Tools I                                 | 2   |
|                                   |  |     |                                     | Core Curriculum Course                                  | 3   |
| Junior Year                       |  |     |                                     |   |     |
| Fall Semester (Credit Hours:16)   |  |     | Spring Semester (Credit Hours:15)   |   |     |
| AME 30314                         | Differential Equations, Vibrations and Controls I    | 3   | AME 30315                           | Differential Equations, Vibrations and Controls II      | 3   |
| AME 30331                         | Fluid Mechanics                                      | 3   | AME 30334                           | Heat Transfer   | 3   |
| AME 20216 or AME 21267            | Lab I or Design Tools I                              | 2   | AME 20217 or AME 21268              | Lab II or Design Tools II                               | 2   |
| AME 20217 or AME 21268            | Lab II or Design Tools II                            | 2   | EE 20222                            | Intro to Electrical Engineering                         | 4   |
| AME 30363                         | Design of Machine Elements                           | 3   |                                     | Core Curriculum Course                                  | 3   |
|                                   | Core Curriculum Course                               | 3   |                                     |   |     |
| Senior Year                       |  |     |                                     |   |     |
| Fall Semester (Credit Hours:15)   |  |     | Spring Semester (Credit Hours:16)   |   |     |
| AME 40423                         | Mechanisms and Machines                              | 3   | AME 40463                           | Senior Design Project                                   | 4   |
| AME 20251 or CBE 20261            | Comp. Methods in AME or Engineering Materials        | 3   |                                     | General Technical Elective                              | 3   |
|                                   | AME Technical Elective                               | 3   |                                     | AME Technical Elective                                  | 3   |
|                                   | AME Technical Elective                               | 3   |                                     | AME Technical Elective                                  | 3   |
|                                   | General Technical Elective or Core Curriculum Course | 3   |                                     | Core Curriculum Course                                  | 3   |

## 2.18 Curriculum Map for ME Class of 2025



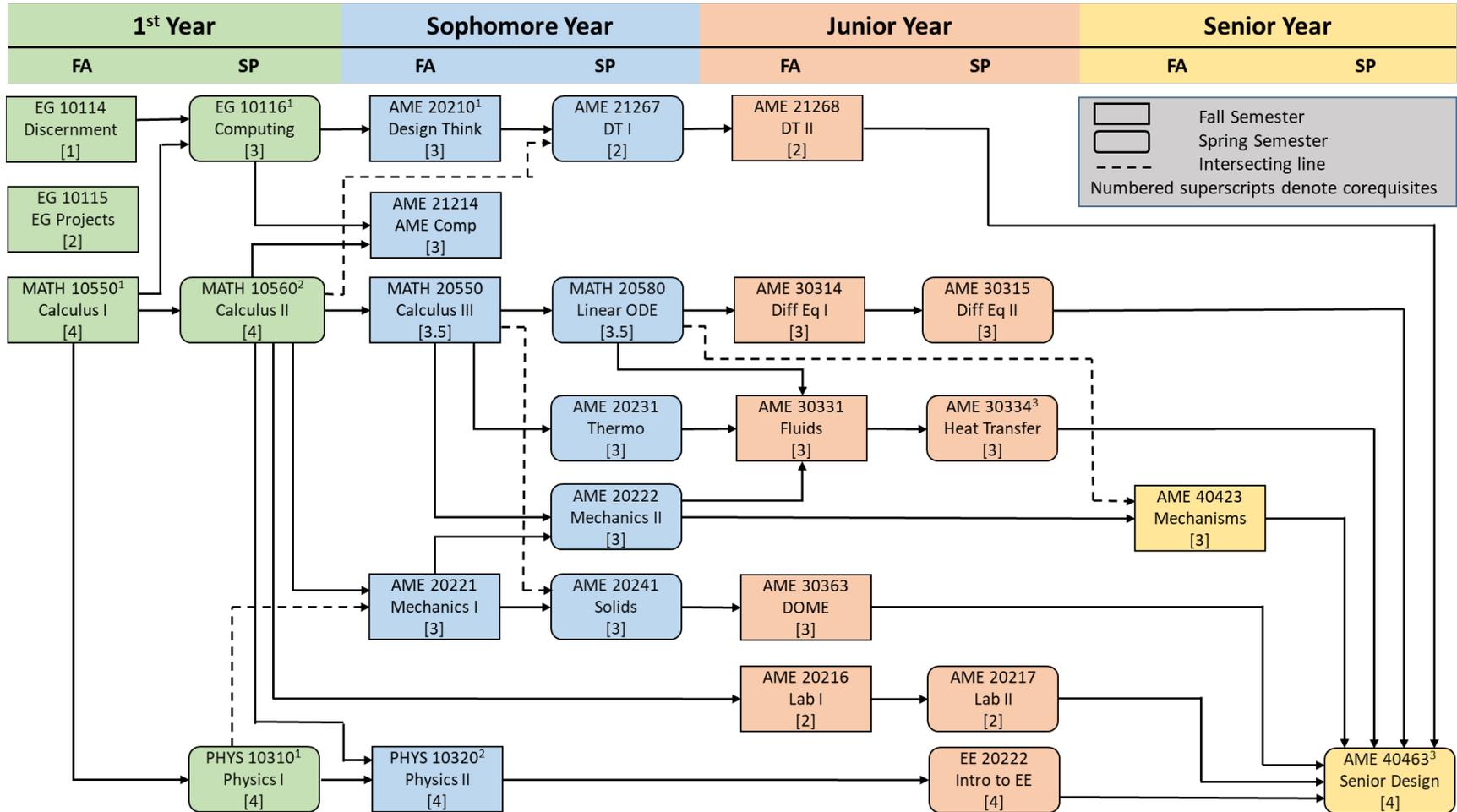
<sup>3</sup> AME 30334 may be taken concurrently with AME 40463 in the Spring Semester only

## 2.19 Example Course Plan for ME Class of 2024 (133 Credit Hrs)

| First Year                        |   |     |                                     |  |     |
|-----------------------------------|---|-----|-------------------------------------|--|-----|
| Fall Semester (Credit Hours:18)   |   |     | Spring Semester (Credit Hours:18)   |  |     |
| MATH 10550                        | Calculus I  | 4   | MATH 10560                          | Calculus II  | 4   |
| CHEM 10171                        | Intro to Chemical Principles                      | 4   | CHEM 10122                          | General Chemistry                                  | 3   |
| EG 10114                          | Engineering Discernment                           | 1   | EG 10116                            | Engineering Programming                            | 3   |
| EG 10115                          | Engineering Projects <sup>2</sup>                 | 2   | PHYS 10310                          | Engineering Physics I                              | 4   |
| USEM or WR 13100                  | University Seminar or Writing & Rhetoric          | 3   | USEM or WR 13100                    | University Seminar Writing & Rhetoric              | 3   |
| FYS 10101                         | Moreau First Year Experience                      | 1   | FYS 10102                           | Moreau First Year Experience                       | 1   |
|                                   | Core Curriculum Course                            | 3   |                                     |  |     |
| Sophomore Year                    |   |     |                                     |  |     |
| Fall Semester (Credit Hours:17.5) |   |     | Spring Semester (Credit Hours:17.5) |  |     |
| MATH 20550                        | Calculus III                                      | 3.5 | AME 20231                           | Thermodynamics                                     | 3   |
| PHYS 10320                        | Engineering Physics II                            | 4   | AME 20241                           | Solid Mechanics                                    | 3   |
| AME 20221                         | Mechanics I                                       | 3   | AME 20222                           | Mechanics II                                       | 3   |
| AME 20214                         | Intro to Engineering Computing                    | 1   |                                     | Core Curriculum Course                             | 3   |
| AME 20210                         | Intro to Design Thinking in Engineering           | 3   | AME 20216 or AME 21267              | Lab I or Design Tools I                            | 2   |
| CBE 20261                         | Science of Engineering Materials                  | 3   | MATH 20580                          | Intro to Linear Algebra and Differential Equations | 3.5 |
| Junior Year                       |   |     |                                     |  |     |
| Fall Semester (Credit Hours:16)   |   |     | Spring Semester (Credit Hours:15)   |  |     |
| AME 30314                         | Differential Equations, Vibrations and Controls I | 3   | AME 30315                           | Differential Equations, Vibrations and Controls II | 3   |
| AME 30331                         | Fluid Mechanics                                   | 3   | AME 30334                           | Heat Transfer                                      | 3   |
| AME 20216 or AME 21267            | Lab I or Design Tools I                           | 2   | AME 20217 or AME 21268              | Lab II or Design Tools II                          | 2   |
| AME 20217 or AME 21268            | Lab II or Design Tools II                         | 2   | EE 20222                            | Intro to Electrical Engineering                    | 4   |
| AME 30363                         | Design of Machine Elements                        | 3   |                                     | Core Curriculum Course                             | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     |  |     |
| Senior Year                       |   |     |                                     |  |     |
| Fall Semester (Credit Hours:15)   |   |     | Spring Semester (Credit Hours:16)   |  |     |
| AME 40423                         | Mechanisms and Machines                           | 3   | AME 40463                           | Senior Design Project                              | 4   |
|                                   | AME Technical Elective                            | 3   |                                     | AME Technical Elective                             | 3   |
|                                   | AME Technical Elective                            | 3   |                                     | AME Technical Elective                             | 3   |
|                                   | General Technical Elective                        | 3   |                                     | General Technical Elective                         | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     | Core Curriculum Course                             | 3   |

<sup>2</sup> Any department projects course could substitute for this course

## 2.20 Curriculum Map for ME Class of 2024

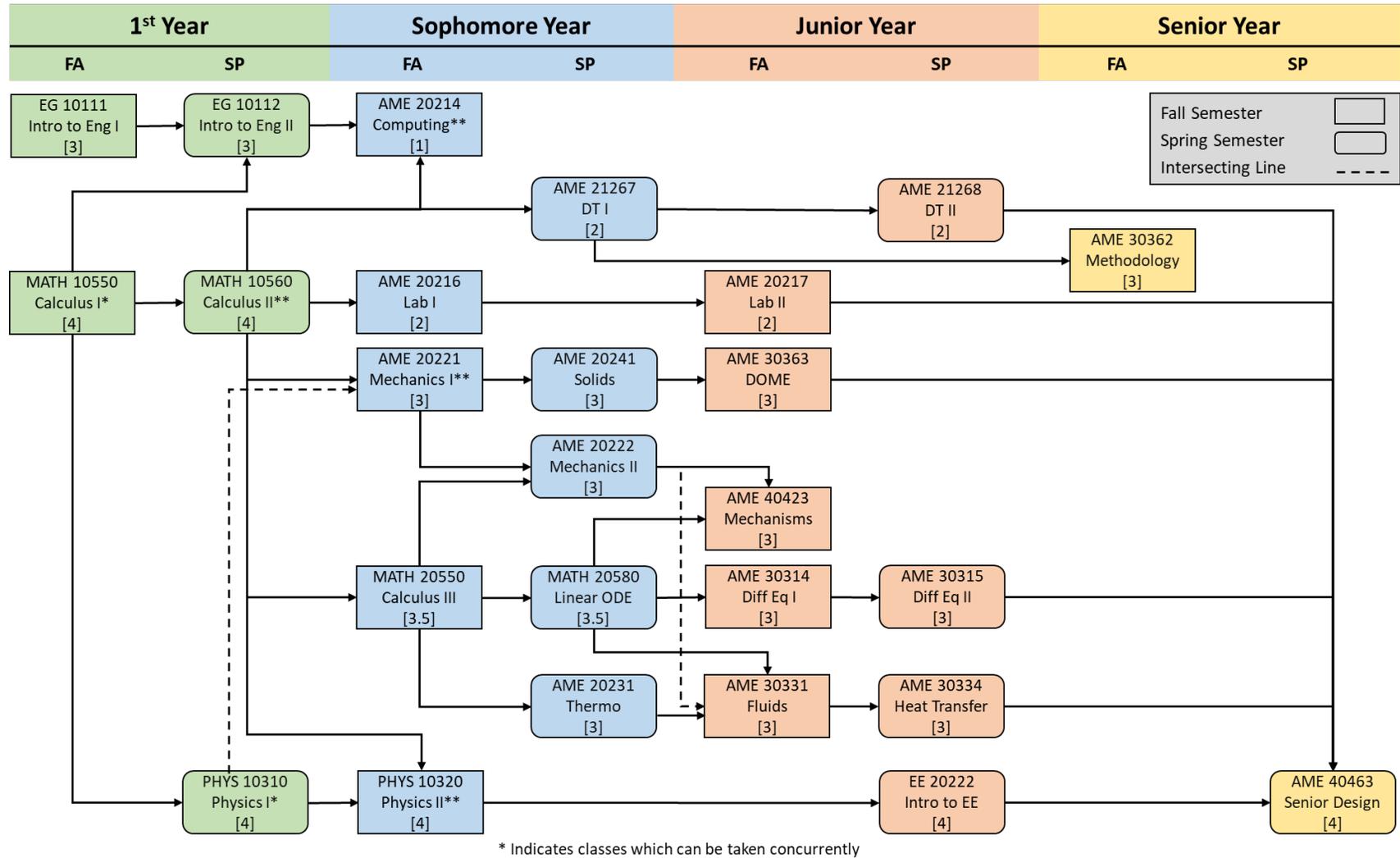


<sup>3</sup> AME 30334 may be taken concurrently with AME 40463 in the Spring Semester only

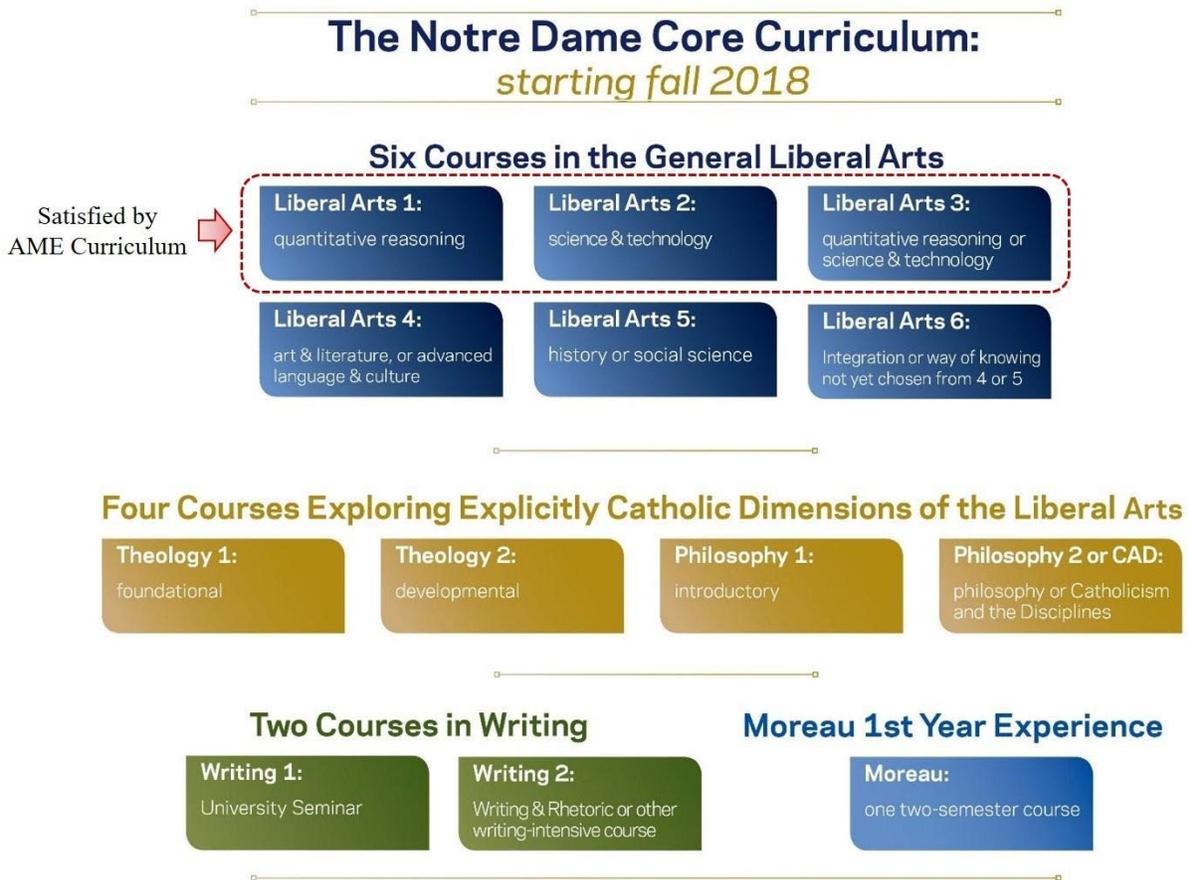
## 2.21 Example Course Plan for ME Class of 2023 (133 Credit Hrs)

| First Year                        |   |     |                                     |  |     |
|-----------------------------------|---|-----|-------------------------------------|--|-----|
| Fall Semester (Credit Hours:18)   |   |     | Spring Semester (Credit Hours:18)   |  |     |
| MATH 10550                        | Calculus I  | 4   | MATH 10560                          | Calculus II  | 4   |
| CHEM 10171                        | Intro to Chemical Principles                      | 4   | CHEM 10122                          | General Chemistry                                  | 3   |
| EG 10111                          | Intro to Engineering Systems I                    | 3   | EG 10112                            | Intro to Engineering Systems II                    | 3   |
|                                   | Core Curriculum Course                            | 3   | PHYS 10310                          | Engineering Physics I                              | 4   |
| USEM or WR 13100                  | University Seminar or Writing & Rhetoric          | 3   | USEM or WR 13100                    | University Seminar or Writing & Rhetoric           | 3   |
| FYS 10101                         | Moreau 1st Year Experience                        | 1   | FYS 10102                           | Moreau First Year Experience                       | 1   |
| Sophomore Year                    |   |     |                                     |  |     |
| Fall Semester (Credit Hours:16.5) |   |     | Spring Semester (Credit Hours:17.5) |  |     |
| MATH 20550                        | Calculus III                                      | 3.5 | AME 20241                           | Solid Mechanics                                    | 3   |
| PHYS 10320                        | Engineering Physics II                            | 4   | AME 20231                           | Thermodynamics                                     | 3   |
| AME 20221                         | Mechanics I                                       | 3   | AME 20222                           | Mechanics II                                       | 3   |
| AME 20216 or AME 21267            | Lab I Design Tools I                              | 2   | AME 20216 or AME 21267              | Lab I Design Tools I                               | 2   |
| CBE 20261                         | Science of Engineering Materials                  | 3   | MATH 20580                          | Intro to Linear Algebra and Differential Equations | 3.5 |
| AME 20214                         | Intro to Engineering Computing                    | 1   |                                     | Core Curriculum Course                             | 3   |
| Junior Year                       |   |     |                                     |  |     |
| Fall Semester (Credit Hours:17)   |   |     | Spring Semester (Credit Hours:15)   |  |     |
| AME 30314                         | Differential Equations, Vibrations and Controls I | 3   | AME 30315                           | Differential Equations, Vibrations and Controls II | 3   |
| AME 20217 or AME 21268            | Lab II or Design Tools II                         | 2   | AME 20217 or AME 21268              | Lab II or Design Tools II                          | 2   |
| AME 30331                         | Fluid Mechanics                                   | 3   | AME 30334                           | Heat Transfer                                      | 3   |
| AME 30363                         | Design of Machine Elements                        | 3   | EE 20222                            | Intro to Electrical Engineering                    | 4   |
| AME 40423                         | Mechanisms and Machines                           | 3   |                                     | Core Curriculum Course                             | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     |  |     |
| Senior Year                       |   |     |                                     |  |     |
| Fall Semester (Credit Hours:15)   |   |     | Spring Semester (Credit Hours:16)   |  |     |
| AME 30362                         | Design Methodology                                | 3   | AME 40463                           | Senior Design Project                              | 4   |
|                                   | AME Technical Elective                            | 3   |                                     | AME Technical Elective                             | 3   |
|                                   | AME Technical Elective                            | 3   |                                     | AME Technical Elective                             | 3   |
|                                   | General Technical Elective                        | 3   |                                     | General Technical Elective                         | 3   |
|                                   | Core Curriculum Course                            | 3   |                                     | Core Curriculum Course                             | 3   |

## 2.22 Curriculum Map for ME Class of 2023



## 2.23 The Notre Dame Core Curriculum



### Six Courses in the General Liberal Arts

- Liberal Arts 1: Quantitative Reasoning
- Liberal Arts 2: Science & Technology
- Liberal Arts 3: Quantitative Reasoning or Science & Technology
- Liberal Arts 4: Art & Literature, or Advanced Language & Culture
- Liberal Arts 5: History or Social Science
- Liberal Arts 6: Integration or Way of Knowing not yet chosen from 4 or 5

### Four Courses Exploring Explicitly Catholic Dimensions of the Liberal Arts

- Theology 1: Foundational
- Theology 2: Developmental
- Philosophy 1: Introductory
- Philosophy 2 or CAD: Philosophy elective or Catholicism and the Disciplines

## Two Courses in Writing

- Writing 1: University Seminar<sup>3</sup>
- Writing 2: Writing & Rhetoric or other Writing-Intensive Course<sup>4</sup>; EG 10117 Engineering Design counts as the 2<sup>nd</sup> Writing intensive (WRIT) course

## Moreau First Year Experience

- Moreau: One two-semester course

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<sup>3</sup> Regardless of which core curriculum you fall under, a University Seminar(USEM) course may be double-counted to fulfill both the USEM requirement and one of the other university requirements.

<sup>4</sup> Students who have AP credit to test out of Writing and Rhetoric may have opportunities to double-count by choosing an approved writing-intensive course that also fulfills a university, college, or major requirement. Writing and Rhetoric does not count toward any other ways of knowing.

## 3 AME Electives

There are four different types of AME undergraduate electives, two for each program. Aerospace Engineering has the "[Technical Specialization](#)" elective and the "[Professional Development](#)" elective. Mechanical Engineering has "[AME Technical Electives](#)" and "[General Technical Electives](#)." The definition for each is different and students must take care to ensure that they satisfy the different elective requirements in their program.

Limitations on Non-classroom courses: Only a total of 6 credits of non-classroom courses, such as AME Undergraduate Research and AME Special Studies, may be counted toward degree requirements.

### 3.1 Aerospace Engineering Technical Specialization Courses

- AME 18491/28491/38491/48491 Undergraduate Research
- AME 47560 Independent UG Design Project
- AME 30358 & AME 31358 Mechatronics Lab
- AME 30363 Design of Machine Elements
- AME 40423 Mechanisms and Machines
- AME 40453 & AME 41453 Automation and Controls
- AME 40510 Introduction to Numerical Methods
- AME 40531 Intro to Hypersonic Systems
- AME 40532 Computational Fluid Dynamic
- AME 40541/60541 Finite Element Methods
- AME 40548/60548 Biofabrication
- AME 40551/60551 Introduction to Robotics
- AME 40571/60571 Structural Aspects of Biomaterials
- AME 40572/60572 Introduction to Biomechanics
- AME 40623/60623 Analytical Dynamics
- AME 40634/60634 Intermediate Heat Transfer
- AME 40643/60643 Additive Manufacturing
- AME 40652/60652 Intermediate Controls
- AME 40671/60671 Orthopaedic Biomechanics
- CBE 20261 Science of Engineering Materials
- CBE 30355 Transport Phenomena I
- CE 30200 Intro Structural Engineering
- CE 30210 Structural Analysis
- CE 30555 Living and Working on the Moon: Science or Science Fact?
- CE 40450 Hydraulics
- CSE 20232 C/C++ Programming

- CSE 20311 Fundamentals of Computing
- EE 20222 Introduction to Electrical Engineering and Embedded Systems
- EE 40455 Control Systems
- EG 34440 Probability and Statistics
- EG 35101 Engineering Projects
- EG 40421 Integrated Engineering and Business Fundamentals
- ACMS 30440 Probability and Statistics
- ACMS 34445 Probability and Statistics for Data Science
- MATH 30540 Mathematical Statistics
- All AME 50000 level and 60000 level courses

### **3.2 Aerospace Engineering Professional Development Courses**

All Aerospace Engineering Technical Specialization Courses count as Aerospace Engineering Professional Development Courses.

Most, but not all, 30000-level or higher courses offered by the Colleges of Engineering or Science that are not otherwise required by the Aerospace Engineering curriculum may satisfy the Professional Development requirement.

Specifically, any course with a prefix AME, ACMS, CBE, CE, ENVG, CSE, EE, EG, ESTS, BIOS, CHEM, MATH, PHYS or SC that is 30000-level or higher (including the courses listed above as Technical Specialization courses) may be used to satisfy the Professional Development requirement with the following exceptions and additions:

- EE 20222 Intro to Electrical Engineering may be used to satisfy a Professional Development requirement.
- MATH 30650: Differential Equations, PHYS 30210: Physics I and PHYS 30220: Physics II may NOT be used to satisfy a Professional Development requirement.
- Three credits from a completed ROTC program on campus may be used to satisfy a Professional Development course requirement.
- ARCH 53413: Sustainability & Energy Modeling of Traditional Architecture
- All levels of AME Undergraduate Research AME 18491/28491/38491/48491
- All levels of AME/EG 21243/31243/41243 Fabrication courses

### **3.3 Mechanical Engineering AME Technical Electives**

Any course that is 30000-level or higher with an AME prefix that is not otherwise required by the Mechanical Engineering curriculum may be used to satisfy an AME Technical Elective requirement in the Mechanical Engineering program. The following courses are exceptions to satisfy an AME Technical Elective requirement.

- All levels of AME Undergraduate Research AME 18491/28491/38491/48491
- All levels of AME/EG 21243/31243/41243 Fabrication courses
- EG 35101 Engineering Projects

### 3.4 Mechanical Engineering General Technical Electives

All AME Technical Electives automatically count as General Technical Electives.

Most, but not all, 30000-level or higher courses offered by the Colleges of Engineering or Science that are not otherwise required by the Mechanical Engineering curriculum may satisfy the General Technical Elective requirement. All AME Technical Electives also count for Mechanical Engineering General Technical Electives.

Specifically, any course with a prefix AME, ACMS, CBE, CE, ENVG, CSE, EE, EG, BIOS, CHEM, MATH, PHYS or SC that is 30000-level or higher may be used to satisfy the General Technical Elective requirement with the following exceptions and additions:

- ARCH 53413 Sustainability & Energy Modeling of Traditional Architecture
- BIOS 20201 General Biology A
- BIOS 20202 General Biology B
- CBE 20258 Numerical and Statistical Analysis
- CHEM 20273 Organic Reactions and Applications
- CSE 20232 C/C++ Programming
- CSE 20311 Fundamentals of Computing
- DESN 40201 ID: Collaborative Productive Development
- MATH 20810 Honors Algebra I
- MATH 20820 Honors Algebra II
- PHYS 20330 Elements of Modern Physics

The following courses may NOT be used to satisfy the General Technical Elective requirement:

- MATH 30650 Differential Equations
- PHYS 30210 Physics I
- PHYS 30220 Physics II

A student can apply up to 3 credit hours of a 40000-level military science class (AS, MSL, NSCI), taken while an active midshipman or cadet in good standing within a University ROTC program, toward satisfying the general technical elective requirements.

Additionally, at most one 20000 level course at 3 credits or fewer, not within the above list, taught within the College of Engineering may be used to satisfy a General Technical Elective requirement in the Mechanical Engineering program if it is taken during the first year or the sophomore year of studies.

#### Non-classroom courses

Non-classroom courses refer to experiential learning opportunities that do not take place in the typical classroom setting. These include:

- AME 18491/28491/38491/48491 – AME Undergraduate Research Courses
- AME 47560 - Independent Undergraduate Design Project
- AME Special Studies Courses
- EG 21243/31243/41243 - Fabrication Courses
- EG 35101 - Engineering Projects

- Undergraduate Research in non-AME Engineering Departments

Only a total of 6 credits of non-classroom courses may be counted toward degree requirements. To satisfy an elective, the student must take a total of 3 credit hours of the same type of non-classroom course.

Due to the complications of course offerings during the global pandemic, AE and ME Classes of 2022 - 2024 may combine credits from the Fab courses with other credits, such as undergraduate research, to 3 credits to satisfy an elective requirement. However, the Class of 2025 and beyond must take all 3 Fab courses to satisfy an elective requirement.

### 3.5 Medical School

The information below is intended for mechanical engineering majors interested in attending medical school. Given the large number of required courses for aerospace engineering majors, it is not feasible for them to adequately prepare for medical school and complete the requirements for the aerospace engineering degree in a four-year period.

It is highly recommended that Mechanical Engineering majors pursuing a pre-health path should connect with specialized advising early and often.

[The Center for Health Sciences Advising](#) can provide you with advice on choosing courses as an engineering student planning to attend medical school. It is recommended that you schedule an appointment as early as possible with pre health advisor Dr. Susan Gursky ([sgursky@nd.edu](mailto:sgursky@nd.edu)) and with the engineering pre health advisor, Dr. Tanyel Kiziltepe Bilgicer ([tkizilte@nd.edu](mailto:tkizilte@nd.edu)), who is a professor in the CBE department.

Most medical schools require applicants to have taken the MCAT (Medical College Admission Test), and to have completed:

- One year of Biology (Recommend BIOS 10171/11173: Biological Sciences I and lab, BIOS 10172/11174: Biological Sciences II and lab)
- Two years of Chemistry (10171, 10172, 20273, 20274 with labs)
- One year of Physics
- One year of English
- Biochemistry

Many schools recommend courses in:

- Writing intensive courses
- Psychology and Sociology/Anthropology

Note that some medical schools (e.g. Harvard) require the biology courses to be taken in college (not satisfied by AP credits). If you have AP credit, you must take higher level biology courses with lab components. There are similar restrictions on AP chemistry and physics. Other schools accept credits awarded through AP testing (at Notre Dame this usually requires a score of 5). If you are interested in a specific medical school you should verify their policy on AP credits early in the program.

Hence, in addition to the AME degree requirements, students must take additional courses. In addition to the courses, the Notre Dame preprofessional programs generally require a 1 credit lab component with each course. Students with an interest in preparing for medical school should consult with personnel in the Center for Health Sciences Advising for curricular planning advice, as they have prepared course plans for engineering students interested in medical school.

The course plan shown below is recommended for mechanical engineering pre health students. Please note the following guidelines:

- For students following the curriculum through their junior year demonstrating the seriousness of their intent to prepare for medical school, the Director of Undergraduate Students will approve suitable high-level technical classes in the COE and/or COS to satisfy the (2) AME Technical Elective requirements.
- To satisfy the Core Curriculum LA4, be sure to take a literature course (attribute WKLI) and NOT an art (WKAR), advanced language or culture course (WKLC).
- PSY 10000 can be replaced with a Core Curriculum course in the 1st Year Spring. If so, take PSY 20000 in the Core Curriculum slot for 3rd Year - Fall. This satisfies LA5, WKSS)

### 3.5.1 Example Course Plan for ME Pre Health Majors

|                                 |   |             |   | Total Credit Hours   | 143         |
|---------------------------------|---|-------------|---|--|-------------|
| <b>First Year</b>               |   |             |   |  |             |
| <b>1st Year - Fall Semester</b> |   | <b>19</b>   | <b>1st Year - Spring Semester</b>           |  | <b>19</b>   |
| MATH 10550                      | Calculus I  | 4           | MATH 10560                                  | Calculus II  | 4           |
| EG 10117                        | Engineering Design  | 3           | EG 10118                                    | Engineering Computing  | 3           |
| CHEM 10171                      | Intro to Chemical Principles  | 4           | PHYS 10310                                  | Engineering Physics I  | 4           |
| BIOS 10171                      | Biology I: Big Questions  | 3           | BIOS 10172                                  | Biology II: Molecules to Ecosystems  | 3           |
| BIOS 11173                      | Biological Investigations Laboratory                                      | 1           | BIOS 11174                                  | Research Experience in Biology   | 1           |
| USEM                            | University Seminar  | 3           | PSY 10000                                   | Introductory Psychology First Year<br>(Counts for Core LA5 - WKSS)           | 3           |
| FYS 10101                       | Moreau First Year Experience  | 1           | FYS 10102                                   | Moreau First Year Experience   | 1           |
| <b>Sophomore Year</b>           |   |             |   |  |             |
| <b>2nd Year - Fall Semester</b> |   | <b>17.5</b> | <b>2nd Year - Spring Semester</b>           |  | <b>18.5</b> |
| MATH 20550                      | Calculus III  | 3.5         | AME 20231                                   | Thermodynamics   | 3           |
| PHYS 10320                      | Engineering Physics II  | 4           | AME 20241                                   | Solid Mechanics  | 3           |
| AME 20221                       | Mechanics I   | 3           | AME 20222                                   | Mechanics II   | 3           |
| AME 20210                       | Intro to Design Thinking in Engineering                                   | 3           | MATH 20580                                  | Intro to Linear Algebra and Differential Equations                           | 3.5         |
| CHEM 10172                      | Organic Structure and Reactivity  | 3           | AME 20216 or<br>AME 21267                   | AME Lab I or Design Tools I  | 2           |
| CHEM 11172                      | Organic Structure and Reactivity Lab                                      | 1           | CHEM 20273                                  | Organic Reactions and Applications   | 3           |
|                                 |   |             | CHEM 21273                                  | Organic Reactions and Applications   | 1           |
| <b>Junior Year</b>              |   |             |   |  |             |
| <b>3rd Year - Fall Semester</b> |   | <b>19</b>   | <b>3rd Year - Spring Semester</b>           |  | <b>19</b>   |
| AME 30314                       | Differential Equations, Vibrations and Controls I                         | 3           | AME 30315                                   | Differential Equations, Vibrations and Controls II                           | 3           |
| AME 30331                       | Fluid Mechanics   | 3           | AME 30334                                   | Heat Transfer  | 3           |
| AME 20216 or<br>AME 21267       | Lab I or Design Tools I   | 2           | AME 20217 or<br>AME 21268                   | Lab II or Design Tools II  | 2           |
| AME 20217 or<br>AME 21268       | Lab II or Design Tools II   | 2           | EE 20222                                    | Intro to Electrical Engineering  | 4           |
| AME 30363                       | Design of Machine Elements  | 3           | BIOS 30341 or<br>AME 40573 or<br>BIOS 30344 | Cell Biology or Physiology for Engineers<br>or Vertebrate (Human) Physiology | 3           |
| CHEM 40420                      | Principles of Biochemistry  | 3           | CHEM 30333                                  | Analytical Chemistry I   | 3           |
|                                 | Core Curriculum Course  | 3           | CHEM 31333                                  | Analytical Chemistry I Lab   | 1           |
| <b>Senior Year</b>              |   |             |   |  |             |
| <b>4th Year - Fall Semester</b> |   | <b>15</b>   | <b>4th Year - Spring Semester</b>           |  | <b>16</b>   |
| AME 40423                       | Mechanisms and Machines   | 3           | AME 40463                                   | Senior Design Project  | 4           |
| AME 20251                       | Comp. Methods in AME  | 3           | CBE 40325                                   | Immunoengineering  | 3           |
| CBE 20261                       | Engineering Materials   | 3           |   | Core Curriculum Course   | 3           |
|                                 | Core Curriculum Course (For LA4 - take an English Course rather than Art) | 3           |   | Core Curriculum Course   | 3           |
|                                 | Core Curriculum Course  | 3           |   | Core Curriculum Course???  | 3           |

### **3.6 ROTC**

Both AE and ME Students in ROTC program can use 3 credits of a 40000-level ROTC course to satisfy the History (WKHI) or Social Science (WKSS) University Core Requirement.

Aerospace Engineering Students who complete a ROTC program may use 3 credits of a 40000-level ROTC course to satisfy the Professional Development elective requirement.

Mechanical Engineering Students who complete a ROTC program may use 3 credits of a 40000-level ROTC course to satisfy a General Technical Elective requirement.

## 4 Study Abroad

Students who study abroad in the academic year generally do so during the fifth or sixth semester; a few go for the entire junior year. Below are the requirements to participate in the programs. Any student in good standing who is not behind in the program is eligible to apply for a program.

Students who are considering a study abroad program should take special care to register for the correct courses during their sophomore year.

- In some cases, if a student has not registered for the correct courses prior to studying abroad, the student may be ineligible to take part in the program as there would be no path to graduate on time.
- Some study abroad programs require taking a course that counts for a specific university core requirement. If a student has already fulfilled this university core requirement, he/she must take the required study abroad course even though it will not fulfill a graduation requirement.
- For the abroad program, identify which courses are mandatory, which optional courses can be taken during the program, and how each course counts towards your graduation requirements.

### 4.1 Fall Programs in Rome (for AE and ME students)

#### Overview

The Rome Program Consists of:

- AME 34314 Differential Equations, Vibrations, and Controls I (required, unless student has already completed this course)
- AME 34331 Fluid Mechanics (required)
- An AME elective that is guaranteed to count as at least a Professional Development elective for AE or an AME Technical Elective for ME. (required)
- All Roads Lead to Rome (required) (Counts for WKAL or WKHI for Core and WRIT)
- A theology course will be offered, often Theology & Historical Reality, (required) (Counts for WKDT for Core)
- Experiencing Rome through CEL (required, 1 credit hour course))
- Students who have already taken AME 30314 must enroll in Beginning Italian I

#### ME Students

- Students must take AME 30363 DOME and AME 40423 Mechanisms & Machines in the fall semester of senior year. Consequently, they must take AME 40463 Senior Design in the spring semester of senior year.

#### AE Students

- Students must have completed AME 20216 Lab I by the spring semester of sophomore year, so they can take AME 30333 Theoretical and Experimental Aerodynamics in the spring semester of junior year.
- Students must take AME 30341 Aerospace Structures in the fall semester of senior year.

### 4.2 Fall Programs in Other Locations (for AE and ME students)

#### ME Students

- Students must take AME 30363 DOME and AME 40423 Mechanisms & Machines in the fall semester of senior year, or find equivalent courses for one or both of these at their international location. If they take DOME or Mechanisms & Machines in the fall of senior year, they must take Senior Design the spring semester of senior year.

- Students must take an approved Fluid Mechanics course at their international location or over the summer before junior year.
- Unless students take AME 30314 in their sophomore year, students must take a differential equations course prior to the spring semester of junior year and enroll in the spring semester of junior year in a zero-credit course for vibrations. This differential equations course may be at ND in the spring of sophomore year if they are one semester ahead in the math sequence. If they are not ahead in math, they must take it either at the international location or over the summer.
- Students should aim for three or more technical courses at their international location.

### **AE Students**

- Students must have completed AME 20216 Lab I by the spring semester of sophomore year, so they can take AME 30333 Theoretical and Experimental Aerodynamics in the spring semester of junior year.
- Students must take Aerospace Structures in the fall semester of senior year, or find an equivalent course at the international studies location.
- Students must take an approved Fluid Mechanics course at their international location or over the summer before junior year.
- Unless students take AME 30314 in their sophomore year, they must take a differential equations course prior to the spring semester of their junior year and enroll in the spring semester of junior year in a zero-credit course for vibrations.

## **4.3 Spring Programs in London (Only for ME students)**

### **Overview:**

The Spring London Program Consists of:

- AME 34334 Heat Transfer (required)
- AME 34315 Differential Equations, Vibrations and Control II (required)
- Whatever AME technical elective course is offered in London (required)
- London gateway offers courses fulfilling the Fine Arts, Literature, History, 2nd Philosophy, and Development Theology requirements, as well as a growing group of Writing Intensive and Catholicism and the Disciplines courses, and a small but consistent set of courses fulfilling the Social Science requirement.
- No courses will be offered fulfilling the Advanced Language and Culture, Quantitative Reasoning, Science and Technology or 1st Philo and Intro Theo requirements.

To take part in the program students must

- Complete AME 21267 DT I and AME 20216 Lab I in their sophomore year so they can take AME 21268 DT II and AME 20217 Lab II in the fall semester of junior year or fall semester of senior year.
- Must take EE 20222 Intro to Electrical Engineering in the spring semester of sophomore year.

## **4.4 Spring Program in Other Locations (Only for ME students)**

Students must have completed AME 21267 DT I and AME 20216 Lab I, so they can take AME 21268 DT II and AME 20217 Lab II in the fall semester of junior year or fall semester of senior year. Students must take EE 20222 Intro to Electrical Engineering in the spring semester of sophomore year.

- Students should take a course equivalent to AME 30334 Heat Transfer if it is offered in their international location. If there is not one offered, they may delay Heat Transfer to the spring semester of senior year, in which case they may not take Senior Design until the spring semester of senior year. You are going to need a waiver from AME department to do so.

- Student must either
  - Have completed AME 30315 in their sophomore year OR
  - Complete a controls course in their international location.
    - The controls course must either cover Laplace Transforms or the student must take a zero-credit course covering that material PRIOR to going abroad.
    - The student must take a zero-credit course upon their return covering solutions to systems of first order differential equations and multi-degree of freedom vibrations.

### **Zero-Credit Courses**

Sometimes it may not be possible to find a course at a given university abroad exactly equivalent to one offered on campus. In this case, and at the discretion of the Director of Undergraduate Studies, students may be required upon return to take zero-credit self-study courses to compensate for the topics not covered abroad.

## **4.5 Academic Year Program Locations**

If a student needs to take AME courses abroad, these locations may work for them:

- |                     |               |
|---------------------|---------------|
| ● Rome (Italy)      | AME           |
| ● London (UK)       | AME           |
| ● Dublin            | UCD, Trinity  |
| ● Hong Kong (China) | HKUST         |
| ● Oxford (UK)       | by invitation |
| ● Perth (Australia) | UWA           |
| ● Singapore         | NUS           |

If a student does not need to take a course in their major during their semester abroad, they are welcome to study on any program that interests them.

For additional information on a specific program, please speak with your adviser or the AME Department Director of Undergraduate Studies and visit the Notre Dame International Study Abroad website: <https://studyabroad.nd.edu/>.

## **4.6 Summer Programs**

The **College of Engineering** offers programs in:

- Alcoy (Spain),
- London (England),
- Shenzhen (China),
- Kitakyushu (Japan),
- Rome (Italy).

Other options are available each summer through Notre Dame International Study Abroad.

## 5 Minors

The College of Engineering offers six minors, open to all University students who have taken the appropriate pre-requisite courses for upper-level engineering and science courses.

A student seeking an Engineering degree is allowed to count the same course to satisfy a university requirement, a college requirement, and a program requirement (major, supplementary major, minor). A multi-counted course can be used no more than once at each level (university, college, program). There is no limit to the number of multi counts a student may use in their degree. However, each program will require a specific number of credit hours to earn the degree - AP / IB / Credit by examination credits do count towards the total number of required credit hours.

Note: if a student multi counts a course (or courses) for their unique course of study (primary degree and secondary credential), they may be required to take additional courses in order to meet the minimum required courses needed to earn the degree. In such cases, the student should consult their advisor or Director of Undergraduate Studies to determine which additional courses are required.

The department who manages the minor should be consulted for the rules. Students in other colleges should consult their own program department for similar restrictions.

- [Bioengineering](#)
- [Computational Engineering](#)
- [Energy Engineering](#)
- [Energy Studies](#)
- [Engineering Corporate Practice](#)
- [Environmental Earth Sciences](#)
- [Resiliency and Sustainability of Engineering Systems](#)

### 5.1 Bioengineering (MBIE)

This minor, offered by the Department of Aerospace and Mechanical Engineering and the Department of Chemical and Biomolecular Engineering, comprises a five-course sequence that teaches students how to use the tools of engineering analysis with the fundamentals of the engineering and life sciences, to enliven the understanding of living organisms, medical treatments and biochemical pathways and to provide quantitative predictions and insight towards the design of medical and biological devices and processes. See the minor's dedicated webpage at:

<https://bioengineering.nd.edu/bioengineering-minor/>

#### ***Prerequisites to declaring the minor:***

Students interested in declaring the Bioengineering minor must

- have completed the requirements of Calculus I and Calculus II
- have completed the requirements of Physics I and Physics II

It is highly recommended that students

- have completed Calculus III and a course in differential equations
- interested in pursuing advanced courses in drug design or biomolecules complete a course in organic chemistry

#### ***Biology Requirement:***

Students must complete BIOS 10172 Molecules to Ecosystems

**Bioengineering Requirements:**

Students must complete at least one of the following:

- AME 40571/CBE 40571 – Biomaterials
- AME 40572 – Biomechanics
- AME 40573 – Physiology for Engineers
- AME 30386/CBE 30386 – Introduction to Bioengineering
- CBE 30357 – Biotransport
- EE 40331 – Biomedical Device Design

**Additional Elective Courses:**

Students must complete 3 additional courses in bioengineering from the following list (all such courses have the BIOE attribute in the course catalog).

- AME 30386/CBE 30386 – Introduction to Bioengineering
- AME 34386 – Biomedical Engineering Physiology
- AME 40548 – Biofabrication
- AME 40571 – Structural Aspects of Biomechanics
- AME 40572 – Introduction to Biomechanics
- AME 40573 – Physiology for Engineers
- AME 40671 – Orthopaedic Biomechanics
- AME 50571 – Structural Aspects of Biomaterials
- AME 50572 – Introduction to Biomechanics
- AME 60672 – Cell Mechanics
- AME 60673 – Kinematics of Human Motion
- AME 60677 – Biomimetic Tissue Engineering
- AME 60678 – Biomedical Imaging Modalities
- AME 60679 – Nanoparticles in Biomedicine
- AME 60770 – Stem Cell Engineering
- CBE 30357 – Biotransport
- CBE 30386 – Introduction to Bioengineering
- CBE 40325 – Immunoengineering
- CBE 40456 – Polymer Engineering
- CBE 40479 – Introduction to Cellular and Tissue Engineering
- CBE 40483 – Topics in Biomolecular Engineering
- CBE 40487 – Drug Development and Pharmacology
- CBE 40571 – Structural Aspects of Biomaterials
- CBE 40725 – Principles of Molecular Engineering
- CBE 40888 – Cellular and Physical Principles of Bioengineering
- CBE 41910 – Biomolecular Engineering Lab
- CE 40355 – Water, Disease, and Global Health
- EE 30073/40331 – Biomedical Device Engineering
- EE 30074/40332 – Introduction to Biophotonics and Biomedical Optics
- EE 40073/40432 – Introduction to Systems Biology
- EE 47040 – Biomedical Device Engineering

## 5.2 Computational Engineering (MCOM)

This minor, offered by the Department of Aerospace and Mechanical Engineering, recognizes the importance of computational tools in all disciplines of engineering and gives students exposure to the fundamentals of programming and numerical methods, experience and skills in computer usage, and knowledge of applications from a range of different areas. The Computational Engineering Minor will provide the students with a solid grounding in the application of computational methods to various engineering problems such as fluid mechanics, structural analysis, elasticity, optimization, etc. With a fundamental understanding of the problems being solved and the numerical methods used to determine solutions, students are prepared to properly interpret the results, recognize the limitations of the methods employed, etc.

The Minor requires completion of 15 credits of coursework, more fully described below.

One of the following courses must be taken to fulfill the requirements for the minor:

- AME 40532 Computational Fluid Dynamics
- AME 40541/60541 Finite Element Methods
- CE 60130 Finite Elements in Engineering

Any of the following courses may be taken in order to fulfill the requirements for the Computational Engineering Minor:

- ACMS 20210 Scientific Computing<sup>5</sup>
- ACMS 20220 Scientific Computing Python<sup>5</sup>
- ACMS 40212 Advanced Scientific Computing
- ACMS/MATH 40390 Numerical Analysis<sup>6</sup>
- ACMS 40395 Numerical Linear Algebra
- ACMS 40630 Nonlinear Dynamical Systems
- ACMS 40730 Mathematical/Computational Modeling
- ACMS 40760 Introduction to Stochastic Modeling
- ACMS 50550 Functional Analysis
- ACMS/PHYS 50051 Numerical PDE Techniques for Scientists and Engineers I
- ACMS 50052 Numerical PDE Techniques for Scientists and Engineers II
- ACMS 60395 Numerical Linear Algebra
- ACMS 60612 Advanced Scientific Computing
- ACMS 60690 Numerical Analysis I<sup>6</sup>
- ACMS 60790 Numerical Analysis II
- AME 20214 Introduction to Engineering Computing<sup>5</sup>
- AME 20251 Computing Methods in AME<sup>7</sup>

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<sup>5</sup> Only one of these courses will be counted

<sup>6</sup> Only one of these courses will be counted

- AME 40510 Introduction to Numerical Methods<sup>7</sup>
- AME 40532 Computational Fluid Dynamics
- AME 40541/60541 Finite Element Methods
- AME 50559 Statistical Computing Methods for Scientists and Engineers
- AME 60614 Numerical Methods
- AME 60620 Multiscale Modeling
- AME 60627 Computational Mechanism Design
- AME 60649 Molecular Level Modeling for Engineering Applications
- CBE 20258 Computational Methods in Chemical Engineering<sup>7</sup>
- CBE 40455 Process Operations
- CE/CSE 30125 Computational Methods
- CE 40140 Applied/Computational Probability for Engineers;  
Uncertainty Quantification and Propagation
- CE/CSE 60130 Finite Elements in Engineering [or ACMS 60590]
- CE 60263 Finite Element Methods in Structural Mechanics
- CSE 20189 Basic UNIX for Engineers
- CSE 20232 C/C++ Programming
- CSE 40113 Design/Analysis of Algorithms
- CSE 40166 Computer Graphics
- CSE 40171 Introduction to Artificial Intelligence
- CSE 40431 Programming Languages
- CSE 40755 Parallel Computing
- MATH 30720 Discrete Fourier and Wavelet Transforms
- MATH 50510 Computer Programming/ Problem Solving
- PHYS 30421 Scientific Programming

### 5.3 Energy Engineering (MENE)

This minor, offered by the Department of Aerospace and Mechanical Engineering, recognizes that Energy is an important subject of current interest that involves many engineering and non-engineering disciplines, and enables students to develop a stronger background in and to prepare better for professional jobs or higher studies in the area. This minor differs from the Energy Studies minor as described below in that it focuses on the technical aspects of energy and requires courses concentrated in engineering and science.

Energy is clearly of pressing national and international concern, the fact of which is evidenced by recognition by Notre Dame in the creation of the Center for Sustainable Energy. The factual details of the nature of the technological energy

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<sup>7</sup> Only one of these courses will be counted

needs facing society and the manner in which academia, and Notre Dame in particular, are addressing them were the focus of a recent article in the Signatures Magazine and include the following subjects:

- Blackouts, the stability of the power grid and other reliability issues in energy distribution;
- Energy efficiency and policy;
- The politics of power;
- Sources of energy and the related environmental concerns;
- Carbon dioxide capture and storage;
- Nuclear energy and the associated difficulties;
- Clean coal technology, and;
- Biofuels

The Energy Engineering Minor parallels the institutional commitment reflected in the creation of the Center for Sustainable Energy at the undergraduate level by providing undergraduates with the educational background necessary to confront this important technological issue of the current time.

The Energy Engineering Minor requires completion of five courses from this list:

- AME 20231                      Thermodynamics
- AME 40431                      Gas Turbines and Propulsion
- AME 40472                      Electrical and Hybrid Vehicles
- AME 40530                      Wind Turbine Performance, Control and Design
- AME 47431                      Special Studies: Designing Energy-Efficient Buildings
- AME 40532                      Computational Fluid Dynamics
- AME 40538                      Nanotechnology Solutions for Sustainability and Energy
- AME 40634/60634              Intermediate Heat Transfer
- AME 50535                      Energy Systems
- AME 60636                      Fundamentals of Combustion
- AME 60638                      Turbine Engine Components
- AME60733                      Solar Energy: Photovoltaic Systems
- CBE 20256                      Chemical Engineering Thermodynamics
- CBE 40425                      Energy, Economics, and Environment
- CBE 40435                      Electrochemical Energy and Storage
- CBE 40498                      Energy and Climate
- EE 30372                      Electric Machinery and Power Systems
- EE 47010                      Alternative Energy Devices and Materials
- EE 40472                      Electrical and Hybrid Vehicles
- EE 47015                      Electric Vehicles and the Power Grid
- PHYS 30461                      Thermal Physics

## 5.4 Energy Studies (MENS)

The **Energy Studies Minor** is open to undergraduate students in all majors and colleges at the University of Notre Dame. This minor prepares students to become successful leaders who understand the complexities of the world's energy challenges, joining an energy network that extends far beyond campus. Students may draw from both technical and non-technical resources to learn how to help move our country and the world toward a more sustainable energy future. For more information see <https://energy.nd.edu/minor/>.

## 5.5 Engineering Corporate Practice (MECP)

The College of Engineering collaborates with the Mendoza College of Business and the College of Arts and Letters to offer this unique experience that prepares you for your future career while exploring topics at the intersection of engineering and business. The Minor in Engineering Corporate Practice (MECP) is open to all engineering undergraduates. For information see the dedicated webpage with the current requirements:

<https://engineering.nd.edu/departments-programs/undergraduate-programs/minor-in-engineering-corporate-practice/>

## 5.6 Environmental Earth Sciences (MEES)

This minor will provide you with an introduction to the disciplines of Earth and Environmental sciences. It provides a foundation in the physical sciences, with emphasis on processes that occur near or at the surface of Earth and the impact of human activity on such processes.

You'll explore the geochemical, mineralogical and hydrological properties of Earth's crust and develop an understanding of the interplay of natural processes such as mineral-water-rock-bacteria interactions, with anthropogenic issues such as transport of toxic heavy metals and safe disposal of nuclear waste.

For current information on the minor view the minor's dedicated webpage at:

<https://engineering.nd.edu/departments-programs/undergraduate-programs/minor-in-environmental-earth-sciences/>

## 5.7 Resiliency and Sustainability of Engineering Systems (MRSE)

With approximately 9 billion people projected to inhabit the Earth by the middle of the century, we are at a defining moment in human history when we must find effective ways to reduce resource consumption to avoid dramatic degradations in our complex and inter/intra-dependent environmental, social, and economic systems.

The Resiliency and Sustainability of Engineering Systems minor prepares students from all disciplines to recognize the impact of their design decisions on built and natural engineering systems and be adept at working closely with planners, decision makers, and the general public towards a sustainable and resilient global development.

This minor is designed to help you:

- Recognize and assess the complex interactions and interdependencies within and between critical infrastructure, engineering networks, social systems, and our environment.
- Recognize the technical, social, economic, and ethical aspects of a commitment to sustainable and resilient development.
- Recognize and apply engineering principles, processes, and practices to engineered infrastructure and systems that result in sustainable and resilient development.
- Develop a functional knowledge of the historical and economic frameworks that guide engineering regulations and public policy.
- Develop skills to convey critical information about sustainability and resilience to the non-expert.

For current information on the minor view the minor's dedicated webpage at:

<https://engineering.nd.edu/departments-programs/undergraduate-programs/minor-in-resiliency-and-sustainability-of-engineering-systems/>

## 6 Concentrations

The AME Department offers several concentrations which are ways for students to focus their electives in a particular area of interest. Concentrations are completely optional. To complete a concentration a student must complete 9 credits of coursework from the list of courses corresponding to the concentration. A single course may not be used by a student to satisfy more than one concentration. If a student wants to complete two concentrations they must take 18 credits to satisfy the requirements. Students should make sure that they have the necessary prerequisites that may not be part of the concentration.

To include the concentration on the student's final transcript, in their last semester before graduation, they must complete a "Curriculum Change" eForm (<https://academic-eforms.nd.edu/>) which must be approved by the Director of Undergraduate Studies. If the necessary courses are completed successfully, the concentration will be included on the student's final transcript.

For questions on concentrations please contact the Director of Undergraduate Studies, [Prof. Mike Seelinger](#), or the Undergraduate Academic Program Administrator, [Mrs. Donna Fecher](#).

The following are the courses that count towards each concentration. NOTE: AEs cannot earn the Aerospace concentration. Courses that are required in a program (marked below with\* for AE and \*\* for ME) cannot be used as part of a concentration for that program.

### 6.1 Aerospace Concentration<sup>8</sup>

- AME 30332 Compressible Aerodynamics
- AME 30333 Theoretical and Experimental Aerodynamics
- AME 30341 Aerospace Structures
- AME 30381 Orbital and Space Dynamics
- AME 40431 Gas Turbines and Propulsion
- AME 40451 Aerospace Dynamics
- AME 40461 Flight Mechanics and Introduction to Design
- AME 40531 Intro to Hypersonic Systems
- AME 50581 Space Systems and Analysis
- AME 60630 Microparticle Dynamics
- AME 60631 Experimental Methods in Fluids
- AME 60632 Physical Gas Dynamics
- AME 60638 Turbine Engine Components
- AME 60639 Advanced Aerodynamics

### 6.2 Bioengineering Concentration

All courses with the BIOE attributes in College of Engineering. Examples are listed below:

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<sup>8</sup> Students in Aerospace Engineering cannot earn the Aerospace concentration.

- AME/CBE 30386 Introduction to Bioengineering
- AME 34318 Mechanics of the Summer Olympic Games
- AME 34319 Mechanics of Traditional Irish Sports
- AME 34370 Biomechanics of Human Motion
- AME 40548/60548 Biofabrication
- AME 40571/60571 Structural Aspects of Biomaterials [or CBE 40571]
- AME 40573 Physiology for Engineers
- AME 40671/60671 Orthopaedic Biomechanics
- AME 40572/60572 Introduction to Biomechanics
- AME 60676 Biofluid and Bioheat Transfer
- AME 60672 Cell Mechanics
- AME 60673 Kinematics of Human Motion
- AME 60677 Biomimetic Tissue Engineering:  
Challenges & Applications for Microfabricated Cell Biomaterial Constructs
- AME 60678 Biomedical Imaging Modalities
- AME 60679 Nanoparticles in Biomedicine
- AME 60770 Stem Cell Engineering
- CBE 30357 Biotransport
- CBE 40325 Immunoengineering
- CBE 40456 Polymer Engineering
- CBE 40479 Introduction to Cellular and Tissue Engineering
- CBE 40725 Principles of Molecular Engineering
- CBE 40481 Biomedical Engineering Transport Phenomena
- CBE 40483 Topics in Biomolecular Engineering
- CBE 40487 Drug Development and Pharmacology
- CBE 40888 Cellular and Physical Principals of Bioengineering
- CBE 41910 Biomolecular Engineering Lab
- EE 40331 Biomedical Device Engineering and Physics
- EE 40332 Introduction to Biophotonics and Biomedical Optics
- EE 40432 Introduction to Systems Biology
- PHYS 40432 Biological Physics

Any BIOS course 30,000-level or higher level. Examples are listed below:

- BIOS 30341 Cell Biology
- BIOS 31341 Cell Biology Laboratory

- BIOS 30344 Vertebrate (Human) Physiology
- BIOS 40340 Human Anatomy
- BIOS 40411 Biostatistics

### 6.3 Computational Engineering Concentration

- AME 40532 Computational Fluid Dynamics
- AME 40541/60541 Finite Element Methods
- AME 50559 Statistical Computing Methods for Scientists and Engineers
- AME 40510 Introduction to Numerical Methods
- AME 60614 Numerical Methods
- AME 60620 Multiscale Modeling
- AME60733 Solar Energy: Photovoltaic Systems
- ACMS/MATH 40390 Numerical Analysis
- CE/CSE 30125 Computational Methods\*
- CE/CSE 60130 Finite Elements in Engineering [or ACMS 60590]
- CSE 20232 C/C++ Programming
- CSE 40755 Parallel Computing
- MATH 20210 Computer Programming and Problem Solving
- MATH 30720 Discrete Fourier and Wavelet Transforms

### 6.4 Control and Mechanical Systems Concentration

- AME 30381 Orbital and Space Dynamics\*
- AME 40423 Mechanisms and Machines\*\*
- AME 40451 Aerospace Dynamics\*
- AME 40453 Automation and Controls
- AME 40551/60551 Introduction to Robotics
- AME 40623/60623 Analytical Dynamics
- AME 40652/60652 Intermediate Controls
- AME 50521 Intermediate Dynamics
- AME 50650 Applied Nonlinear Analysis and Control
- AME 60556 Soft Robotics
- AME 60627 Computational Mechanism Design
- AME 60651 Advanced Vehicle Dynamics
- AME 60654 Advanced Kinematics

- AME 60673 Kinematics of Human Motion
- EE 40455 Control Systems

## 6.5 Design and Manufacturing Concentration

- AME 30362 Design Methodology\*\*
- AME 30363 Design of Machine Elements\*\*
- AME 40643/60643 Additive Manufacturing
- AME 47431 Special Studies: Designing Energy-Efficient Buildings
- AME 50542 Engineering Analysis of Manufacturing Processes
- AME 40548/60548 Biofabrication
- AME 40551/60551 Introduction to Robotics
- AME 50561 Reliability Engineering
- AME 60642 Manufacturing Systems
- AME 60654 Advanced Kinematics
- AME 60661 Optimum Design of Mechanical Elements
- AME 60662 Topology Optimization
- AME 60742 Metal Forming
- AME 47560 Independent UG Design Project or  
EG 35101 Innovation Projects (3 credits in total)
- CE 35620 Community-Based Engineering Design Projects
- DESN 40201 Collaborative Product Development

## 6.6 Energy Concentration

- AME 40401 Energy, Technology and Policy
- AME 40431 Gas Turbines and Propulsion (ME only)
- AME 40472 Electrical and Hybrid Vehicles
- AME 40530 Wind Turbine Performance, Control and Design
- AME 40532 Computational Fluid Dynamics
- AME 40538 Nanotechnology Solutions for Sustainability and Energy
- AME 40634/60634 Intermediate Heat Transfer
- AME 47431 Special Studies: Designing Energy-Efficient Buildings
- AME 50535 Energy Systems
- AME 60636 Fundamentals of Combustion
- AME 60638 Turbine Engine Components
- AME60733 Solar Energy: Photovoltaic Systems

- CBE 40425 Energy, Economics, and Environment
- CBE 40435 Electrochemical Energy and Storage
- CBE 40498 Energy and Climate
- CBE 40911 Fuel Cells Science and Technology
- EE 30372 Electric Machinery and Power Systems
- EE 40472 Electrical and Hybrid Vehicles
- EE 47010 Alternative Energy Devices and Materials
- EE 47015 Electric Vehicles and the Power Grid
- EG 34021 Electromechanical Energy Conversion
- EG 53413 Energy Performance of Buildings
- PHYS 30461 Thermal Physics

## 6.7 Materials Concentration

- AME 40571/60571 Structural Aspects of Biomaterials
- AME 50542 Engineering Analysis of Manufacturing Processes
- AME 60645 Advanced Mechanical Behavior of Materials
- AME 60646 Failure of Materials
- CBE 20261 Science of Engineering Materials\*\*
- CBE 30362 Laboratory Techniques in Materials Science
- CBE 40461 Structure of Solids
- CBE 60556 Polymer Engineering
- CHEM 30324 Physical Chemistry for Engineers

## 6.8 Solid Mechanics Concentration

- AME 30341 Aerospace Structures\*
- AME 40541/60541 Finite Element Methods
- AME 40572/60572 Introduction to Biomechanics
- AME 60624 Continuum Mechanics
- AME 60625 Advanced Structural Dynamics
- AME 60641 Advanced Mechanics of Solids
- AME 60645 Advanced Mechanical Behavior of Materials
- AME 60646 Failure of Materials
- AME 60741 Computational Nonlinear Solid Mechanics
- AME 60742 Metal Forming

## 6.9 Thermal and Fluid Sciences Concentration

- AME 30332 Compressible Aerodynamics\*
- AME 30333 Theoretical and Experimental Aerodynamics\*
- AME 40431 Gas Turbines and Propulsion\*
- AME 40532 Computational Fluid Dynamics
- AME 60624 Continuum Mechanics
- AME 60631 Experimental Methods in Fluids
- AME 60632 Physical Gas Dynamics
- AME 60633 Introduction to Acoustics and Noise
- AME 40634/60634 Intermediate Heat Transfer
- AME 60635 Intermediate Fluid Mechanics
- AME 60636 Fundamentals of Combustion
- AME 60637 Ionization and Ion Transport
- AME 60638 Turbine Engine Components
- AME 60639 Advanced Aerodynamics
- AME 60676 Biofluid and Bioheat Transfer
- AME 60675 Cardiovascular Fluid Mechanics
- CE 60130 Finite Elements in Engineering

## 6.10 da Vinci Concentration

### Introduction

The “da Vinci Concentration (dVC)” is a unique “concentration” that functions as a means for Mechanical Engineering students to use their technical electives towards a focused study in an area of interest within the College of Arts and Letters. It gives MEs additional flexibility in their major. The da Vinci Concentration has not been formally approved by the College Council. Therefore, this is not a formal concentration and does not appear on a student’s transcript.

### Motivation

The da Vinci Concentration is inspired by Leonardo da Vinci, an exemplar of a Renaissance scholar, whose skill set included engineering. This concentration may appeal to those who seek distinction in their engineering education by allowing additional focus on the liberal arts. This can also be considered a means by which a student can be intentional, with foresight and planning, in structuring a sequence of three free electives in lieu of some technical electives.

### Requirements

- The concentration is available only to ME students.
- Students must apply for the concentration during their sophomore year (or third year in the case of five year students).
- Students admitted into the dVC will be allowed to count as technical electives three courses (at three credits/course) from the University of Notre Dame's College of Arts and Letters. Two of those courses will qualify as General Technical Electives, and one as an AME Technical Elective.

- Courses counted towards a dVC cannot be used to fulfill any other program options within the College of Engineering or University.
- Students cannot obtain the dVC for an area where they are pursuing a minor.
- In their final semester at Notre Dame dVC students must register in a zero credit course in AME. The requirement of this course will be for the student to give a thirty minute oral presentation to a committee. The committee is composed of two AME faculty members, and is organized by the dVC student. The committee assigns an S/U grade.
- It is essential that the three liberal arts courses have a coherent intellectual theme as well as depth. The intention of the program is to allow students to pursue topics that are likely not obviously related to their professional degree, but allow them to take advantage of the "universal" nature of knowledge nurtured at a "University." As such, themes that have no straightforward resonance with engineering, e.g. history, theology, literature, language, etc., are especially encouraged.

The application requires a short (one page) description of the theme of the concentration as well as identifying six courses, any three of which may be used to satisfy the concentration coursework requirements. It is important to have some upper level courses identified in the proposal. If you are interested in applying for the da Vinci Concentration contact the Director of Undergraduate Studies, [Prof. Mike Seelinger](#) for the application.

Before the proposal is accepted, the Assistant Dean for Undergraduate Studies in the College of Arts & Letters reviews the proposed coursework to evaluate the feasibility of the proposed plan of study. Approval will depend on course availability and consistency of the proposed program with the goals of the dVC. If a student drops out of the program at any time, that student will then be required to complete all of the ordinary technical elective requirements of the BSME. Final decisions for admission will be made within AME.

# 7 Undergrad Research/Thesis

## 7.1 Undergraduate Research and Engineering Projects

Most students benefit greatly from becoming involved in research projects and participating in the Department's research activities. AME students may do research for either course credit or as a paid research aide. Please note: students cannot receive credit and be paid for the same research position.

### Finding a Research Advisor

To find suitable supervisors and research topics, students should talk to their instructors and academic advisors to find out about on-going research in the Department.

Students can explore the departmental website and the faculty websites for more detailed information on their research. Individual faculty members should be contacted directly to see if they have openings for undergraduate research aides.

### Research as a Paid Position

The supervising faculty member will determine if the research can be done as a paid position. Once this decision is made, the student should come to the Department office and complete the necessary employment paperwork with [AME Undergraduate Academic Program Administrator](#).

### Research for Credit

Students carrying out undergraduate research for credit under the supervision of an AME professor will register for one of the variable credit hour courses: AME 18491/28491/38491/48491. Completing 3 hours of AME undergraduate research for credit counts as a Technical Specialization elective for AE majors or an AME Technical Elective for ME majors. AME students can use 6 credits of non-classroom courses to fulfill degree requirements in both the Aerospace and Mechanical degree programs.

Permission of the faculty supervising the research is required to register for AME 18491/28491/38491/48491. The research supervisor should email the [AME Undergraduate Academic Program Administrator](#).

Students carrying out undergraduate research from a non-AME engineering faculty member should sign up for the research course from their supervising professor's department. If 3 hours of this non-AME undergraduate research is completed it counts as a Professional Development elective for AE majors or a General Technical Elective for ME majors.

### Research Course Report Requirements

To successfully complete one of the AME undergraduate research courses (AME 18491/28491/38491/48491) each individual student should submit a written report of his or her research scholarship commensurate with the number of credit hours they are receiving for the course. This report must be approved by the student's research supervisor. Minimum length requirements are

- 1 credit: 5 pages, 12 point font, double spaced
- 2 credits: 10 pages, 12 point font, double spaced
- 3 credits: 15 pages, 12 point font, double spaced

These are minimum page requirements and longer reports are common. If your research resulted in a submitted scholarly publication, then that may be acceptable instead of a separate report. If you wish to go this route, then you must contact AME Director of Undergraduate Studies, [Prof. Mike Seelinger](#) at least a week prior to the report due date to give time to review it and decide.

While some undergraduate research projects may involve fellow students, each student intending to earn credit for undergraduate research must submit an individual report, using his/her own words, describing the research and the findings. The student must describe and acknowledge the work of others, but his/her unique contribution should be the focus of the paper and be clearly identified.

## 7.2 Undergraduate Thesis

### Eligibility

There are two undergraduate thesis programs in the Department.

*Undergraduate Thesis Program:* This requires written permission from the Director of Undergraduate Studies. Any undergraduate in the AE or ME program is eligible to write a thesis though it is recommended that only those having strong academic backgrounds should consider this program. Successful completion will be recognized by the words “Graduation with Senior Thesis” on the student's transcript and on the Commencement Exercises announcement.

### Procedure for thesis in both programs

A thesis and the work leading up to it must be supervised by an AME faculty member who will be the thesis advisor. The work may have been done over several semesters or years including summers. The thesis advisor will make sure that the quality of the work done and that of the written thesis are acceptable at the level of an undergraduate degree.

The steps to be taken during the semester in which the thesis is submitted and defended are listed below. Each step must be completed before the next. The last dates for each action during this semester are also indicated in parenthesis. The necessary forms for approvals and signatures are available from the AME Department Office and should be submitted to the Undergraduate Academic Program Administrator, [Mrs. Donna Fecher](#).

1. Approval of a request to participate must be obtained from the Director of Undergraduate Studies (by the end of the 2nd week of the semester). This request must be in writing, and must include the endorsement of the thesis advisor.
2. The student must complete a “Curriculum Change” eForm (<https://academic-eforms.nd.edu/>). This form allows the student to formally add the thesis to their degree program so that it is recognized by the Registrar's Office at the University Level.
3. An examining committee should be chosen by the student (by mid-semester break). The examining committee consists of three members: the thesis advisor and two other AME faculty of the student's choice. The student will acquire signatures on the committee selection form from all members of the committee indicating that they agree to read the thesis and participate in the defense examination.
4. The completed thesis should be handed to the advisor (at least 5 weeks before last day of class). The advisor will read the thesis and suggest any changes needed. The student will make these changes, if any, and get the advisor's approval to proceed to the next step.
5. The advisor-approved thesis should be handed to each member of the examining committee (at least 3 weeks before last day of class). The student will provide them with complete, printed copies. The committee members can discuss the thesis with the student before the defense examination if they wish to.
6. The thesis should be defended before the committee in an oral examination (at least 2 weeks before last day of class). The student will schedule a time for an examination that is convenient for all participants, and inform the Departmental Administrative Assistant so that a location can be reserved. One of the faculty, who is not the thesis advisor, will serve as the Chair for this examination. The defense examination will consist of a 30 min (approximate) public presentation followed by questions from the public, and will conclude with a closed-door question-and-answer session with the committee. The defense examination will be at least 90 mins long at the end of which the committee members will vote. A majority vote is needed to approve the thesis. Approval may be unconditional or conditional; the latter implies that suggested changes must be

incorporated in the final version of the thesis. Rejection means that the thesis is not accepted by the Department.

7. The final version of the thesis should be submitted to the Department (by the last day of class). The thesis advisor must make sure that any changes required by the examining committee during the defense examination have been made. The student will send a pdf version of the thesis to the Undergraduate Academic Program Administrator, [Mrs. Donna Fecher](#), and with this all requirements for a thesis will be satisfied.

### **Guidelines for Thesis**

The thesis should be the product of the student's individual and original work. The written document should be produced entirely on a computer and compiled as a single pdf document. [The format recommended by the Graduate School for M.S. and Ph.D. students](#) may be followed if desired. A title page (including title of thesis, name of student, and name of advisor), abstract, table of contents, and list of references should be included. The length of the document should be commensurate with its contents, and long computer programs should not be part of the document.

## 8 Student Organizations and Activities

There are many engineering related professional societies, honor societies, and clubs at Notre Dame. The list of the organizations presented here is not exhaustive. They focus on the societies and clubs that are most directly related to or run by the AME department.

### 8.1 Professional Societies

#### 8.1.1 The American Institute of Aeronautics and Astronautics (AIAA) Student Chapter

*Faculty advisor: Dr. Thomas Juliano*

Since 1963, members from a single professional society have achieved virtually every milestone in modern American flight. That society is the American Institute of Aeronautics and Astronautics. With more than 35,000 individual members and 100 corporate members, AIAA is the world's largest technical society dedicated to the global aerospace profession. Created in 1963 by the merger of the two great aerospace societies of the day, the American Rocket Society (founded in 1930 as the American Interplanetary Society), and the Institute of the Aerospace Sciences (established in 1933 as the Institute of the Aeronautical Sciences), AIAA carries forth a proud tradition of more than 80 years of aerospace leadership. Web page: <https://sites.nd.edu/aiaa-club/> email: [aiaa@nd.edu](mailto:aiaa@nd.edu)

#### 8.1.2 The American Society of Mechanical Engineers (ASME) Student Chapter

*Faculty advisor: Dr. Edward Kinzel*

Founded in 1880 as the American Society of Mechanical Engineers, today's ASME is a 120,000-member professional organization focused on technical, educational and research issues of the engineering and technology community. ASME conducts one of the world's largest technical publishing operations, holds numerous technical conferences worldwide, and offers hundreds of professional development courses each year. ASME sets internationally recognized industrial and manufacturing codes and standards that enhance public safety.

The work of the Society is performed by its member-elected Board of Governors and through its five Councils, 44 Boards and hundreds of Committees in 13 regions throughout the world. There are a combined 400 sections and student sections serving ASME's worldwide membership. email: [ndasme@nd.edu](mailto:ndasme@nd.edu)

#### 8.1.3 Minority Engineering Program

*Director: Leo McWilliams*

The Minority Engineering Program (MEP) works to establish an environment with programs that will help students of diverse backgrounds succeed and become integrated with the college.

#### 8.1.4 The National Society of Black Engineers (NSBE)

*Faculty Advisor:*

The National Society of Black Engineers (NSBE) is one of the largest student-governed organizations based in the United States. NSBE, founded in 1975, supports and promotes the aspirations of collegiate and pre-collegiate students and technical professionals in engineering and technology. email: [nsbe@nd.edu](mailto:nsbe@nd.edu)

#### 8.1.5 The Society of Asian Scientists and Engineers (SASE)

*Faculty Advisor:*

SASE is dedicated to the advancement of Asian heritage scientists and engineers in education and employment so that they can achieve their full career potential. Email: [sase@nd.edu](mailto:sase@nd.edu)

### **8.1.6 The Society of Hispanic Engineers (SHPE)**

*Faculty Advisor:*

The Society of Hispanic Professional Engineers' (SHPE) mission is to change lives by empowering the Hispanic community to realize its fullest potential and to impact the world through STEM awareness, access, support, and development.

SHPE's vision is a world where Hispanics are highly valued and influential as the leading innovators, scientists, mathematicians, and engineers. SHPE values Familia, Service, Education, and Resilience.

Webpage: <https://sites.nd.edu/shpe-club/> Email: [shpe@nd.edu](mailto:shpe@nd.edu)

### **8.1.7 Women in Engineering & the Society of Women Engineers (SWE)**

*Faculty advisors: Dr. Kerry Meyers & Dr. Victoria Goodrich*

Notre Dame Women in Engineering encourages women to pursue engineering as an exciting and fulfilling educational and career choice. We bring together women at all levels — undergraduate, graduate, faculty, and alumni — to create a community of support and opportunities for women to thrive.

The Society of Women Engineers (SWE) gives support, guidance and recognition to women engineers and engineering students. Today, SWE is a nationally recognized professional, educational, non-profit, service organization. Its student section membership includes graduate and undergraduate female and male engineers.

Webpage: <https://engineering.nd.edu/student-experience/women-in-engineering/> email: [swe@nd.edu](mailto:swe@nd.edu)

## **8.2 Honor Societies**

### **8.2.1 TAU BETA PI**

*Faculty advisor: Leo McWilliams*

In 1960, the Indiana Gamma Chapter of Tau Beta Pi was installed at Notre Dame to foster a spirit of liberal culture in the engineering college and to recognize those who have conferred honor upon Notre Dame by distinguished scholarship and exemplary character as undergraduates in engineering or by their attainment as alumni in the field of engineering. Seniors in the top fifth of their class and juniors in the top eighth of their class are eligible for election under rigid standards of scholarship, character, leadership, and service.

### **8.2.2 PI TAU SIGMA**

*Faculty advisor: Dr. Svetlana Neretina*

In 1963, the Sigma Beta Chapter of Pi Tau Sigma, the national honor society for mechanical engineers, was installed at Notre Dame. Juniors, seniors, and alumni are elected to membership on the basis of scholastic attainment, leadership, quality of character, and a demonstration of probable future success in engineering. Email: [pts@nd.edu](mailto:pts@nd.edu)

### **8.2.3 SIGMA GAMMA TAU**

*Faculty advisor: Dr. Meng Wang*

In 1981, the Notre Dame Chapter of Sigma Gamma Tau, the national honor society for aerospace engineers was installed. This organization recognizes and honors those individuals in the field of aeronautics and astronautics who

have distinguished themselves through scholarship, integrity, service, and outstanding achievement. Senior students who rank in the top third of their aerospace engineering class are eligible for admission.

## **8.3 Clubs**

### **8.3.1 Design, Build, Fly**

*Faculty advisor: Tom Juliano*

The Notre Dame Design/Build/Fly (DBF) team strengthens engineering, technical, and teamwork skills through participation in the annual AIAA Design/Build/Fly aerospace design competition.

The team aims to teach iterative design, creative problem solving, and the application of engineering principles. The team designs, builds, tests, and flies large, complex remote-controlled (RC) airplanes based on the competition's rules and requirement for four missions.

Website: <https://sites.nd.edu/aiaa-club/dbf/> Email: [aiaa@nd.edu](mailto:aiaa@nd.edu)

### **8.3.2 Domer Rover**

*Faculty advisor: Paul Rumbach*

Domer Rover is an engineering design team at the University of Notre Dame working to develop a Mars rover to compete in the University Rover Challenge.

Website: <https://www.linkedin.com/company/domer-rover>

### **8.3.3 E-NABLE**

*Faculty advisor: Pat Wensing*

Enable ND is focused on using the skills we learn in class to be a "force for good in the world." With a focus on bio design, Notre Dame Students are working to create prosthetic and assistive technologies for those in the area that need them. Website: <https://sites.google.com/a/nd.edu/enable-nd/home> email: [enablend@nd.edu](mailto:enablend@nd.edu)

### **8.3.4 Fighting Irish Racing (Formula SAE)**

*Faculty advisor: Mike Seelinger*

The Notre Dame Formula SAE team, Fighting Irish Racing, is committed to creating a unique learning opportunity for all students to enhance their technical skills, and also to nurturing a strong community of extremely talented, committed, and hardworking students.

Regardless of whether students are involved in the engineering or business side of the team, they will develop and apply their respective abilities to contribute to a project they can proudly call their own. Engineering members gain hands-on experience on how to design, plan, and build an actual motor vehicle, while business members apply many of the broad finance, marketing, and management skills in a real context. Having been charged with acquiring resources and building the car from the ground up, students will be able to fulfill their entrepreneurial spirit as well.

Being a member of the team allows students to engage deeply with peers who share their interests and passions as they work together to bring dreams and designs into reality. As an extension of the Notre Dame community, our team is committed to being a shining exemplar of that community which our school values so deeply and a conduit for the flourishing of our students.

Email: [fracing@nd.edu](mailto:fracing@nd.edu)

### **8.3.5 IrishSat**

*Faculty advisor: Scott Howard*

The mission of IrishSat is to undertake the process of launching CubeSats through NASA's CubeSat Launch Initiative (CSLI). Throughout this process, IrishSat seeks to educate, develop, and innovate at the University of Notre Dame. IrishSat seeks to educate the next generation of aeronautical engineers at Notre Dame through hands-on experience with fundamental concepts of design, construction, testing, and implementation as related to satellite operations. IrishSat consists of five projects, each incorporating communications, power, orientation, structural mechanics, and scientific testing that allow for the successful performance of a satellite in orbit. IrishSat seeks to conduct research in a low earth orbit environment capable of pushing the boundaries in a variety of fields including astrophysics, communications, and others.

Website: <https://sites.nd.edu/aiaa-club/notre-dame-irishsat/>

### **8.3.6 Notre Dame Baja SAE**

*Faculty Advisor: Craig Goehler*

The University of Notre Dame Baja Team is dedicated to competing at the highest level of the Baja SAE competition. The team members learn to apply their engineering education to a demanding project that requires strict time management, budgeting, team organization, precise design, and careful execution of the build. Through the process of taking a design from the concept stages to a tested and raced product, students learn what it takes to be successful in a competitive environment.

Website: <https://sites.nd.edu/bajasae/> email: [ndbaja@nd.edu](mailto:ndbaja@nd.edu)

### **8.3.7 Notre Dame Formula SAE Hybrid Racing Team**

*Faculty advisor: Jing Wang*

The Notre Dame Formula SAE Hybrid Racing Team is a university club with a goal of creating a hybrid vehicle that will compete in the national Formula Hybrid competition. We have been an official Notre Dame club since 2015.

Webpage: <http://sites.nd.edu/formulahybrid/> Email: [ndhybrid@nd.edu](mailto:ndhybrid@nd.edu)

### **8.3.8 The Notre Dame Robotic Football Club**

*Faculty Advisor: Craig Goehler*

Designing and building robot 'players' that compete in an intercollegiate football conference.

Website: <https://www3.nd.edu/~rfc/> Contact: [https://www3.nd.edu/~rfc/pages/contact\\_us/](https://www3.nd.edu/~rfc/pages/contact_us/)

### **8.3.9 The Notre Dame Rocketry Team**

*Faculty advisor: Taka Sakaue*

The team designs and builds a complex vehicle each year with a projected apogee between 3,500 and 5,500 ft. alongside a mission-oriented payload.

The team competes in the NASA Student Launch against other college teams across the nation which culminates in a final launch in Huntsville, Alabama.

The team not only allows for college students to share in their passion for aerospace, but also encourages them to instill that same passion in the community through educational outreach efforts.

Website: <https://ndrocketry.weebly.com/> Contact: <https://ndrocketry.weebly.com/contactus.html>

### **8.3.10 The Themed Entertainment Association – Notre Dame**

*Faculty advisor:*

Founded spring of 2018, the Themed Entertainment Association at Notre (TEA@ND) is a community of students interested in pursuing careers and gaining skills relevant to the Themed Entertainment industry. Along with weekly meetings, our club allows members to explore this exciting industry in a variety of ways:

- Competitions – Participating in a variety of competitions, students gain experience in doing industry-style work in design, business, and engineering.
- Networking Events – Building connections with alumni and industry professionals through conferences, guest speakers, and other social events throughout the year.
- Travel Opportunities – Throughout the school year, members organize tours and trips to theme parks, museums, and other themed entertainment related locations to learn more about the industry and have some fun!

Website: <https://sites.nd.edu/themed-entertainment-association-club/> Email: [tea@nd.edu](mailto:tea@nd.edu)