AERONAUTICS AND ASTRONAUTICS

The principal purpose of the undergraduate interdisciplinary major in Aeronautics and Astronautics is to prepare students who are strongly interested in aerospace for subsequent graduate study in the field. In particular, it is expected that students completing this undergraduate curriculum can then satisfy the requirements for the degree of Master of Science in Aeronautics and Astronautics at Stanford University in one additional academic year or, alternatively, complete the B.S. in General Engineering and the M.S. in Aeronautics and Astronautics as a co-terminal program in five years.

Another objective of the program is, of course, to provide an opportunity for interested undergraduates to become acquainted with the challenges of the aerospace field, with aeronautical and astronautical principles, and with the faculty who teach and do research in aeronautics and astronautics.

Students interested in aerospace are also encouraged to consider the undergraduate minor in Aeronautics and Astronautics, which is described in the "Minors and Honors" section of this Handbook.

The departmental requirements of this major include a core set of courses required of every Aeronautics and Astronautics major; a set of depth areas from which two areas (four courses) must be chosen; and an engineering elective. Students are expected to consult closely with an advisor about how best to satisfy these and all other requirements of the major, to submit a program planning sheet when declaring the major, and to have a final plan (program sheet) approved by the advisor and department at least one quarter prior to graduation.

REQUIREMENTS

Mathematics: 24 units (Fr, So, Jr)

Mathematics through ordinary differential equations is a prerequisite to depth courses. Some statistics is desirable. For a list of acceptable courses, see the Mathematics Requirement section of this handbook. Required: Ordinary Differential Equations, satisfied by MATH 53 or CME 102 (same as ENGR 155A).

Science: 18 units (Fr, So)

For a list of courses approved by the School, see the Science Requirement section of this handbook. Aero/Astro depth courses rely on a strong foundation in classical physics, particularly mechanics. Chemistry is needed for students without high school chemistry and is recommended for others. Required: Physics 41 and 43, plus one more advanced physics course.

Technology in Society: One course

See Figure 3-3 for a list of courses that fulfill the Technology in Society requirement.

ENGINEERING FUNDAMENTALS: THREE COURSES MINIMUM, AT LEAST ONE OF WHICH MUST BE UNSPECIFIED BY THE DEPARTMENT

Course	Title	Units
ENGR 14	Applied Mechanics: Statics (req'd)	3
ENGR 30	Engineering Thermodynamics (req'd)	3
ENGR 70A *or* 70X (CS106A *or* X)	Programming Methodology (recommended)	3-5

DEPARTMENTAL REQUIREMENTS: 39 UNITS

Course	Title	Units
AA 100	Introduction to Aeronautics & Astronautics	3
ME 70	Introductory Fluids Engineering	4
ME 131A	Heat Transfer	3-4
ENGR 15	Dynamics	3
ME 161 *or*	Dynamic Systems	4
PHYS 110	Intermediate Mechanics	4
CEE 101A *or*	Mechanics of Materials	4
ME 80	Strength of Materials	3
AA 190	* Directed Research & Writing in Aero/Astro	3
Depth Area I	two courses from a department Depth Area (see Depth Area lists below)	6
Depth Area II	two courses from a second Depth Area	6
One engineering elective		3

* Students should discuss their AA190 (WIM) topic with their advisor & the Student Services Manager during their junior year.

Depth Areas

Students should select four courses from the list on the next page, two from each of two areas. One additional engineering elective (at least 3 units) should also be selected: this may be an additional course from any of the depth areas below, another course in Aeronautics and Astronautics, or an appropriate elective from another Engineering department. In any case, the choice of depth areas and engineering elective should be determined in consultation with the Aeronautics and Astronautics major advisor.

DEPTH AREA: FOUR COURSES, TWO FROM EACH OF TWO AREAS

Course	Title	Units
Dynamics and Controls		
ENGR 105	Feedback Control Design	3
ENGR 205	Intro to Control Design Techniques	3
AA 242A	Classical Dynamics	3
AA 271A	Dynamics and Control of Spacecraft and Aircraft	3
AA 279	Spacecraft Mechanics	3
Systems Design		
AA 236A,B	Spacecraft Design, Spacecraft Design Laboratory	3-5, 3
AA 241A,B	Introduction to Aircraft Design, Synthesis, and Analysis	3, 3
Fluids and CFD		
AA 200A	Applied Aerodynamics	3
AA 210A	Fundamentals of Compressible Flow	3
AA 214A	Numerical Methods in Fluid Mechanics	3
AA 283	Aircraft & Rocket Propulsion	3
ME 131B	Fluid Mechanics: Compressible Flow and Turbomachinery	4
Structures		
AA 240A	Analysis of Structures I	3
AA 240B	Analysis of Structures II	3
AA 256	Mechanics of Composites	3

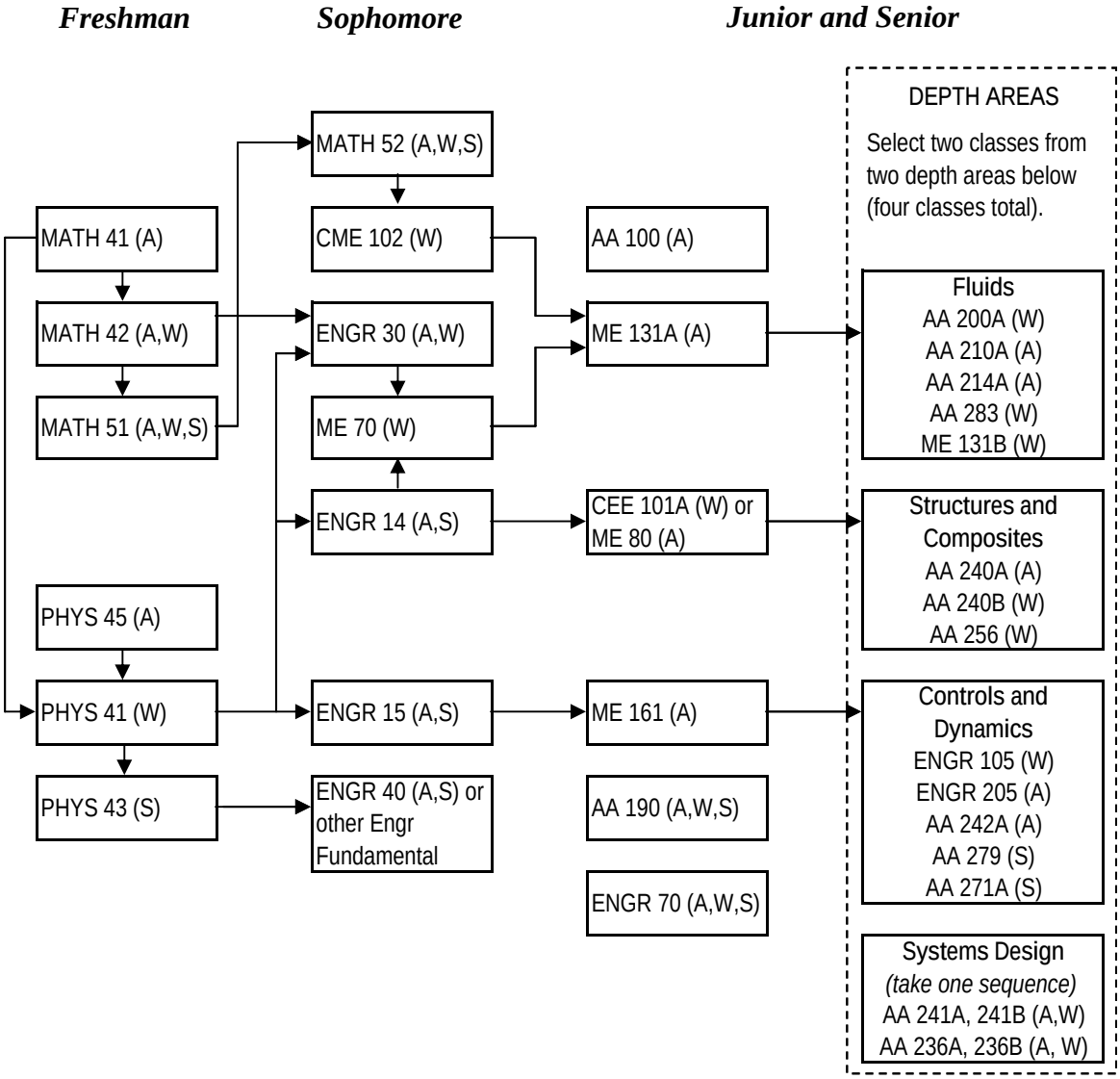
*It is recommended that students review prerequisites for all courses.

Free Electives

To bring total units to the 180 required for graduation.

Aeronautics and Astronautics

Typical Sequence of Courses



* Plus one engineering elective and additional free electives to bring the total to 180 units.

Aeronautical and Astronautical Engineering

*Sample Program with Math 40 Series**

	Fall				*Winter*				*Spring*			
	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other	Class	Math/ Sci.	Engr.	Other
Freshman	IHUM			5	IHUM			5	IHUM			5
	Writing	-	-	3	Writing	-	-	3	MATH 51	5	-	-
	MATH 41	5	-	-	MATH 42	5	-	-	PHYSICS 43	4	-	-
	PHYSICS 45	4	-	-	PHYSICS 41	4	-	-	ENGR 14	-	3	-
	Subtotals	*9*	*0*	*8*	*Subtotals*	*9*	*0*	*8*	*Subtotals*	*9*	*3*	*5*
	Total			17	Total			17	Total			17
Sophomore	AA100	-	3	-	ME70	-	4	-	ENGR 15	-	3	-
	ME80	-	3	-	CME 102	5	-	-	Sci. Elective	3	-	-
	ENGR 40	-	5	-	ENGR 30	-	3	-	Elective	-	-	5
	MATH 52	5	-	-	Elective	-	-	3	GER	-	-	4
	Subtotals	*5*	*11*	*0*	*Subtotals*	*5*	*7*	*3*	*Subtotals*	*3*	*3*	*9*
	Total			16	Total			15	Total			15
Junior	ME 131A	-	4	-	ENGR 70A	-	5	-	Elective	-	-	3
	ME 161	-	4	-	Language	-	-	5	Language	-	-	5
	Language	-	-	5	GER	-	-	4	GER	-	-	4
	Sci. Elective	3	-	-	Depth course	-	3	-	Depth Course	-	3	-
	Subtotals	*3*	*8*	*5*	*Subtotals*	*0*	*8*	*9*	*Subtotals*	*0*	*3*	*12*
	Total			16	Total			17	Total			15
Senior	Elective	-	3	-	AA190	-	3	-	Elective	-	-	3
	Depth Course	-	3	-	Depth Course	-	3	-	Elective	-	-	3
	TIS course	-	-	5	GER	-	-	5	Elective	-	-	3
	GER	-	-	5	GER	-	-	4	GER	-	-	5
	Subtotals	*0*	*6*	*10*	*Subtotals*	*0*	*6*	*9*	*Subtotals*	*0*	*0*	*14*
	Total			16	Total			15	Total			14

Total Math & Science Units:	43
Total Engineering Units:	55
Total Other Units:	92
Total Units:	190

Notes:

*AP Math may be used for Math 41 & 42; see *Stanford Bulletin* for placement

AA190 fulfills the Writing in the Major requirement.

Students who test out of the language requirement should replace language units with technical electives.

CME 100, 102, 104 are also listed as ENGR 154, 155A, and 155B.

INSTRUCTIONS FOR DECLARING MAJOR IN ENGINEERING: AERONAUTICS & ASTRONAUTICS

1. Print your Stanford unofficial transcript from Axess.
2. Download the AA Program Sheet from the School of Engineering web site. Complete the Program Sheet indicating how you plan to fulfill the major requirements – or do this when you meet with your advisor. Your program proposal may change as you progress in the program: submit revisions in consultation with your advisor. Submit a final Program Sheet at least two quarters before you graduate.
3. Complete the form below and take it, along with your transcript and Program Sheet, to the Aero/Astro Student Services Manager (Durand Building, room 250) for an academic advisor assignment.
4. Make an appointment with your advisor to discuss your program. Have your advisor sign the Program Sheet and the declaration form.
5. Return the signed forms to the Aero/Astro Student Services Manager.
6. Declare the Aero/Astro major on Axess!

MAJOR DECLARATION
BS ENGINEERING: AERONAUTICS AND ASTRONAUTICS

Student Information (please print)

Date _____

Name (last) _____(first)_____

Student ID _____

Email _____@stanford.edu

For Office Use

Advisor Professor _____

Office _____

Advisor's Signature _____ Date _____

Student Services _____ Date _____

Stanford University ♦ School of Engineering

Aeronautics and Astronautics

2006-2007 Sample Program Sheet

Final version of completed and signed program sheet due to the department no later than one month prior to the last quarter of senior year.

Name: _____ SU ID: _____

Local Address: _____ Local Phone: _____

_____ Email: _____

_____ Date B.S. expected: _____

Mathematics and Science Requirement

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
Mathematics (24 units minimum: must include differential equations, eg CME 102 or Math 53)							
CME 102 *or* MATH 53		Ordinary Differential Eq for Engineers *or* Ordinary Differential Eq w/ Linear Algebra (req'd)	5				
				(24 units minimum)			
Science (18 units minimum)							
PHYS	41	Mechanics (req'd)	4				
PHYS	43	Electricity and Magnetism (req'd)	4				
				(18 units minimum)			
				(42 units minimum)			

Technology in Society Requirement (1 course required; see Note 1)

NOTES

* This form is available as an Excel file at http://ughb.stanford.edu/. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
* All courses listed on this form must be taken for a letter grade if offered by the instructor.
* Minimum Combined Grade Point Average for all courses in Engineering Topics (Engineering Fundamentals and Depth courses) is 2.0.
* Transfer and AP credits in Math, Science, Fundamentals, & TIS must be approved by the SoE Dean's Office. Transfer credits in Engineering Depth must be approved by the Advisor. Transfer credit information and petitions are available at http://ughb.stanford.edu/transfer.html.
* All courses listed on this form must only be included under one category. Delete courses not taken.

(1) For a list of approved TIS courses, see Figure 3-3 in the UGHB.

Aeronautics and Astronautics Program Sheet (continued)

Engineering Topics

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
Engineering Fundamentals (3 courses required)							
ENGR	14	Applied Mechanics: Statics (req'd)	3				
ENGR	30	Engineering Thermodynamics (req'd)	3				
ENGR 70A or 70X		Programming Methodology	5				
Engineering Depth (Be advised, no course may be listed twice on this sheet. No double-counting .)							
AA	100	Intro to Aeronautics & Astronautics (req'd)	3				
AA	190	Dir Rsch & Writing in AeroAstro (req'd) (see note 2)	3				
ME	70	Introductory Fluids Engineering (req'd)	4				
ME	131A	Heat Transfer (req'd)	4				
ENGR	15	Dynamics (req'd)	3				
ME 161 *or*		Dynamic Systems or					
PHYS 110		Intermediate Mechanics (one req'd)	4				
CEE 101A *or*		Mechanics of Materials or					
ME 80		Strength of Materials (one req'd)	3				
		Engineering Elective	3				
		Engineering Elective	3				
Depth Area I [ ]Fluid [ ]Struc [ ]Dyn/Ctrl [ ] Dsgn *(check 1)*							
		depth course	3				
		depth course	3				
Depth Area II [ ]Fluid [ ]Struc [ ]Dyn/Ctrl [ ] Dsgn *(check 1)*							
		depth course	3				
		depth course	3				
		Engineering Depth Unit Totals		*(39 units minimum)*			

Program Totals

Mathematics and Science		*(42 units minimum)*
Engineering Depth		*(39 units minimum)*

Program Approvals

Advisor
Printed Name: _____ Date: _____
Signature: _____

Departmental
Printed Name: _____ Date: _____
Signature: _____

School of Engineering
Printed Name: _____ Date: _____
Signature: _____

NOTES (continued from page 1)

(2) Fulfills the "Writing in the Major" requirement.