

**Undergraduate Requirements**  
**Total Units for Options and Minors**  
**2019-20 Catalog**

The Core Institute Requirements for all options total 219 units. Requirements for the options range from 142-279 units. This leaves the average student with an approximate range of 0-125 “free” electives. That is, units not specified through the Core requirements or options requirements.

Please find listed below the total number units for each option and minor. The details can be found on the following pages. However, while the total number of units was captured, the nuisances and substitution possibilities for each option are not specifically indicated. Enrollment figures for each option are presented on page 10.

**Options Requirements by Division with Total Number of Units**

<b>Division</b>	<b>Option</b>	<b>Number of Units</b>
Biology	Bioengineering	250
	Biology	233
	Computational and Neural Systems	250-253
Chemistry & Chemical Engineering	Chemical Engineering	279
	Chemistry	167-192
Engineering & Applied Sciences	Applied/Computational Math	273
	Applied Physics	198-216
	Computer Science	243
	Electrical Engineering	244-271
	Engineering & Applied Science	219-222
	Information and Data Sciences	252-255
	Materials Science	222-228
	Mechanical Engineering	233-242
Geological & Planetary Science	Geology	210
	Geobiology	216
	Geochemistry	225-237
	Geophysics	177
	Planetary Science	210
Humanities & Social Sciences	Business, Economics & Management	177
	Economics	168
	English	153
	History	156
	History & Philosophy of Science	142
	Philosophy	153
	Political Science	162
Physics, Math & Astronomy	Astrophysics	248
	Mathematics	183
	Physics	240-252

**Minor Requirements by Division with Total Number of Units**

<b>Division</b>	<b>Minor</b>	<b>Number of Units</b>
Biology and Biological Engineering	Biology	73
Chemistry & Chemical Engineering	Chemistry	72
Engineering & Applied Sciences	Aerospace	54
	Computer Science	84
	Control & Dynamical Systems	57
	Information and Data Sciences	108-111
	Structural Mechanics	54
Geological & Planetary Science	Environmental Science & Engineering	54
	Geological & Planetary Science (Geobiology, Geochemistry, Geology, Geophysics, Planetary Science)	54
Humanities & Social Sciences	English	72
	History	72
	History & Philosophy of Science	72
	Philosophy	72

## Undergraduate Option and Minor Requirements Details – 2018-19 Catalog

<b>Applied and Computational Math</b>	
<b>Requirements</b>	<b>Total Units</b>
Math Fundamentals	90
Programming Fundamentals	15
Communications Fundamentals	6
Core Courses	90-96
ACM Electives	27
Sequence	27
Scientific Fundamentals	18
	<b>273-279 units</b>
<b>Applied Physics</b>	
<b>Requirements</b>	<b>Total Units</b>
SEC 10, SEC 11/12/13, Lab Requirement	21-30
Specified APh and Ph courses	90
Ma 2, Ma 3, ACM 95ab	42
APH 78abc or APh 77	18-27
APh numbered over 100	27
	<b>198-216 units</b>
<b>Astrophysics</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Ay, Ma and Ph courses	134
Specified Ph course	24
Ay of Ph electives	63
Science and Engineering electives	27
	<b>249 units</b>
<b>Bioengineering</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified BE & ChE courses	43
Experimental Methods	30
Bi, Ch and Ph courses	75
Mathematical & Computational Methods	60
BE Electives	36
Bi/BE 24	6
	<b>250 units</b>
<b>Biology</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Bi and Ch courses	73
Ma 2, Ma 3 and 2 terms of Ph 2abc	36
Advanced lab or 3 terms of thesis	9-27
Additional Bi courses	18-24
Bi 24	6
Bi electives	67-91
	<b>233 units</b>
<b>Business, Economics, and Management</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Ec & Ma courses	36
Specified BEM courses	45
Writing/Oral Presentation Course	6
Specified BEM menu courses	45

Additional science, math, and engineering	45
	<b>177 units</b>
<b>Chemical Engineering</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Ch, ACM, ChE, CDS, and Ec/BEM	207
Completion of a track	72
	<b>279 units</b>
<b>Chemistry</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Ch courses, Ma 2, Ph 2a	81
Ch lab courses	41-51
Advanced Ch 100 level or above	45-60
	<b>167-192 units</b>
<b>Computational and Neural Systems</b>	
<b>Requirements</b>	<b>Total Units</b>
Extended Core	36
Computer Competency	27
Laboratory courses	21
ACM 95ab (or Ma 108abc or Ma 109abc, SEC 10, SEC 11/12/13	30-33
Specific Bi & CNS courses	46
Electives	45
Additional Sci & Eng electives	45
	<b>250-253 units</b>
<b>Computer Science</b>	
<b>Requirements</b>	<b>Total Units</b>
CS fundamentals	57
CS 114 and above incl CS Sequence, Lab Project or Thesis	72
Mathematic fundamentals	27
Communication fundamentals	6
Scientific fundamentals	18
Breadth (electives)	63
	<b>243 units</b>
<b>Economics</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Ec courses, Ma 3, Writing/Oral Presentation	78
Advanced Ec or SS courses	45
Electives in science, math or E&AS	45
	<b>168 units</b>
<b>Electrical Engineering</b>	
<b>Requirements</b>	<b>Total Units</b>
Ma 2, Ma 3 and Ph 2abc	45
APh109 or APh/EE 23 & 24	9-18
Specified EE courses, SEC 10, SEC 11/12/13	94
ACM 95ab	24
EE 113 or CDS 110a	9
EE 91	9
EE 80abc or sequence	9-27
Electives in EE over 100	45

	<b>244-271 units</b>
<b>Engineering &amp; Applied Science</b>	
<b>Requirements</b>	<b>Total Units</b>
Core requirements, CS 1, SEC 10, SEC 11/12/13	60
E&AS course from specific prefixes	27 (included in track)
Advanced E&AS or science courses	27 (included in track)
E&AS labs	18
Specified ACM or Ma courses	24-27
Completion of a track	117
	<b>219-222 units</b>
<b>Materials Science</b>	
<b>Requirements</b>	<b>Total Units</b>
Extended Core	45
Computer Programming	9
Lab Courses	18
ACM 104 & 95ab or Ma 108abc or Ma 109abc	27-33
E 10, E 11	6
APh 17ab or CHE 63ab or APh 105ab	18
MS 115, MS/ME/MedE 116, MS 90	27
Electives	45
Senior Thesis	27
	<b>222-228 units</b>
<b>English</b>	
<b>Requirements</b>	<b>Total Units</b>
En 99ab & En courses numbered 98 and above	99
Electives in science, math, engineering	54
	<b>153 units</b>
<b>Geology Option</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Ge/Ay courses	33
Ma and Ph courses	36
ACM 95ab (or specified Ch courses)	24-27
Specified Ge courses	78-84
Electives in Ge	33-39
	<b>210 units</b>
<b>Geobiology Option</b>	
<b>Requirements</b>	<b>Total Units</b>
Ge 11abc, Bi 8, Bi 9	45
Ma and Ph courses	36
Ch 41abc and Bi/Ch 110	39
Specified Ge and Bi courses	69
Electives in Ge, Bi, Ch or ESE	27
	<b>216 units</b>
<b>Geochemistry Option</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Ge/Ay courses	33
Ma and Ph courses	36
ACM 95ab (or Ch 21/41abc & Ge/ESE 118)	24-36
Specified Ge and Ch courses	27
Additional electives	105

	<b>225-237 units</b>
<b>Geophysics Option</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Ge courses	45
Ma and Ph courses	36
ACM 95ab	24
Ph & ME electives	36
Ge Electives	36
	<b>177 units</b>
<b>History Option</b>	
<b>Requirements</b>	<b>Total Units</b>
History Research Tutorial	27
H electives	72
Additional science, math and engineering	54
Oral Communication	3
	<b>156 units</b>
<b>History &amp; Philosophy of Science Option</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Hum/H/HPS courses	43
HPS/H and HPS/PI advanced electives	18
HPS electives	36
Additional science, math, and engineering	45
	<b>142 units</b>
<b>Information and Data Sciences Option</b>	
<b>Requirements</b>	<b>Total Units</b>
CS Fundamentals	27
Ma Fundamentals	63
Scientific Fundamentals	18
SEC 10, SEC 11/12/13	6
IDS Core	66-69
Applications Electives	18
Advanced Electives	54
	<b>252-255 units</b>
<b>Mathematics Option</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Ma courses	120
Ph courses	18
Additional Ma or ACM electives numbered 90+	45
	<b>183 units</b>
<b>Mechanical Engineering</b>	
<b>Requirements</b>	<b>Total Units</b>
SEC 10, SEC 11/12/13	6
Ma courses	42
Ph courses	18
Computing course	9
Core courses	95
Capstone design	18-27
ME electives	45
	<b>233-242 units</b>

<b>Philosophy Option</b>	
<b>Requirements</b>	<b>Total Units</b>
Pl 90ab	18
Advanced Pl	81
Additional science, math, and engineering	54
	<b>153 units</b>
<b>Physics Option</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Ph courses	123-135
Ma courses	18
Ph electives	90
Additional science or engineering outside Ph	9
	<b>240-252 units</b>
<b>Planetary Science Option</b>	
<b>Requirements</b>	<b>Total Units</b>
Ma and Ph courses	45
Specified Ge/Ay courses	33
ACM 95ab	24
Advanced science	45
Planetary science	63
	<b>210 units</b>
<b>Political Science Option</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified PS and Ec courses	27
PS Electives	36
PS 99ab	18
Ma 3	9
Social science electives	36
Additional science, math, or engineering	36
	<b>162 units</b>

<b>Minors:</b>	
<b>Aerospace</b>	
<b>Requirements</b>	<b>Total Units</b>
Ae 105abc	27
3-term 100-level Ae	27
	<b>54 units</b>
<b>Biology</b>	
<b>Requirements</b>	<b>Total Units</b>
Biology & Organic Chemistry Fundamentals	27
Intermediate Biology	28
Advanced Biology	18
	73
<b>Chemistry</b>	
<b>Requirements</b>	<b>Total Units</b>
Organic chemistry	18
Physical chemistry	18
Advanced Chemistry Electives	27
Lab	9
	<b>72 units</b>
<b>Computer Science</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified CS & Ma courses	75
CS 114 or above	9
	<b>84 units</b>
<b>Control &amp; Dynamical Systems</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified CDS courses	30
Three-term thesis	27
	<b>57 units</b>
<b>English</b>	
<b>Requirements</b>	<b>Total Units</b>
En courses 99+	72
	<b>72 units</b>
<b>Environmental Science and Engineering</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified ESE courses	27
ESE electives	27
	<b>54 units</b>
<b>History</b>	
<b>Requirements</b>	<b>Total Units</b>
H courses 99+	72
	<b>72 units</b>
<b>History &amp; Philosophy of Science</b>	
<b>Requirements</b>	<b>Total Units</b>
HPS courses 99+	72
	<b>72 units</b>
<b>Information and Data Sciences</b>	
<b>Requirements</b>	<b>Total Units</b>
CS & Ma Fundamentals	45



IDS Core	45-48
Electives	18
	<b>108-111 units</b>
<b>Geological and Planetary Sciences (Geobiology, Geochemistry, Geology, Geophysics, Planetary Science)</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified Ge courses	27
GPS courses 100+	27
	<b>54 units</b>
<b>Philosophy</b>	
<b>Requirements</b>	<b>Total Units</b>
Pl courses 99+	72
	<b>72 units</b>
<b>Structural Mechanics</b>	
<b>Requirements</b>	<b>Total Units</b>
Specified E&AS courses	<b>54 units</b>

**Undergraduate Enrollment Figures as of Fall 2018-19**

*Note: Fall 2019-20 figures will be posted after October 21, 2019*

Division	Option	Number of Students	
		1 <sup>st</sup> Option	2 <sup>nd</sup> Option
Biology	Bioengineering	29	
	Biology	32	
Chemistry & Chemical Engineering	Chemical Engineering	36	
	Chemistry	31	
Engineering & Applied Sciences	Applied/Computational Math	28	1
	Applied Physics	10	
	Computer Science	226	11
	Electrical Engineering	60	
	Engineering & Applied Science	7	
	Information and Data Sciences	2	
	Materials Science	6	
	Mechanical Engineering	72	
Geological & Planetary Science	Geology	4	
	Geobiology	5	
	Geochemistry	3	
	Geophysics	4	
	Planetary Science	5	
Humanities & Social Sciences	Business, Economics & Mgmt	2	14
	Economics		2
	English		2
	History		4
	History & Philosophy of Science		
	Philosophy		
Physics, Math & Astronomy	Astrophysics	15	
	Mathematics	42	6
	Physics	93	
Interdisciplinary Studies Program	Interdisciplinary Studies	1	

**Minor statistics:**

Division	Minor	Number of Students
Chemistry & Chemical Engineering	Chemistry	
Engineering & Applied Sciences	Aerospace	4
	Computer Science	22
	Control & Dynamical Systems	1
	Information and Data Sciences	7
	Structural Mechanics	
Geological & Planetary Science	Environmental Science & Engineering	3
	Geological & Planetary Science	3
Humanities & Social Sciences	English	3
	History	
	History & Philosophy of Science	
	Philosophy	2