# 2021 - 2022 Major Map
## Computer Science, BS
### School/College: Ira A. Fulton Schools of Engineering
### Location: Tempe campus
ESCSEBS

### Term 1 0 - 15 Credit Hours
#### Critical course signified by ♦

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 110: Principles of Programming (CS)</td>
<td>3</td>
<td>C</td>
<td>- ASU 101 or college-specific equivalent First-Year Seminar required of all first-year students and should be taken in the first semester.</td>
</tr>
<tr>
<td>ASU 101-CSE: The ASU Experience</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: First-Year Composition</td>
<td>3</td>
<td>C</td>
<td>- If ENG 105 is taken, a 3 credit hour elective must also be taken prior to graduation.</td>
</tr>
<tr>
<td>FSE 100: Introduction to Engineering</td>
<td>2</td>
<td>C</td>
<td>- Prep for success using the First-Year Student Guide.</td>
</tr>
<tr>
<td>MAT 265: Calculus for Engineers I (MA)</td>
<td>3</td>
<td>C</td>
<td>- Join a Fulton community.</td>
</tr>
<tr>
<td>Social-Behavioral Sciences (SB) AND Global Awareness (G)</td>
<td>3</td>
<td></td>
<td>- Explore engineering and technical professions.</td>
</tr>
<tr>
<td>Complete Mathematics (MA) requirement.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum 2.00 GPA ASU Cumulative.</td>
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</tr>
</tbody>
</table>

Term hours subtotal: 15

### Term 2 15 - 31 Credit Hours
#### Critical course signified by ♦

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 205: Object-Oriented Programming and Data Structures (CS)</td>
<td>3</td>
<td>C</td>
<td>- Three (3) lab science classes are required. Two of the three classes must be from the same subject area or discipline.</td>
</tr>
<tr>
<td>ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: First-Year Composition</td>
<td>3</td>
<td>C</td>
<td>- Create a Handshake profile.</td>
</tr>
<tr>
<td>MAT 266: Calculus for Engineers II (MA)</td>
<td>3</td>
<td>C</td>
<td>- Get involved with EPICS, the Generator Labs, and the Fulton Start-Up Center.</td>
</tr>
<tr>
<td>Lab Science Requirement AND Natural Science - Quantitative (SQ)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humanities, Arts and Design (HU) AND Cultural Diversity in the U.S. (C)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete ENG 101 OR ENG 105 OR ENG 107 course(s).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete MAT 170 OR MAT 171 OR MAT 265 OR MAT 270 course(s).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum 2.00 GPA ASU Cumulative.</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Term hours subtotal: 16

### Term 3 31 - 47 Credit Hours
#### Critical course signified by ♦

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 120: Digital Design Fundamentals</td>
<td>3</td>
<td>C</td>
<td>- Three (3) lab science classes are required. Two of the three classes must be from the same subject area or discipline.</td>
</tr>
<tr>
<td>CSE 240: Introduction to Programming Languages</td>
<td>3</td>
<td>C</td>
<td>- Prep for success using the Sophomore Guide.</td>
</tr>
<tr>
<td>MAT 243: Discrete Mathematical Structures</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>MAT 267: Calculus for Engineers III (MA) OR CSE 259: Logic in Computer Science</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>
Lab Science Requirement AND Natural Science - General (SG) or Natural Science - Quantitative (SQ)

- Complete MAT 266 OR MAT 271 course(s).
- Complete First-Year Composition requirement.
- Minimum 2.00 GPA ASU Cumulative.

Complete Mathematics (MA) requirement.

Term hours subtotal: 16

<table>
<thead>
<tr>
<th>Term 4 47 - 63 Credit Hours</th>
<th>Critical course signified by</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 230: Computer Organization and Assembly Language Programming</td>
<td>3</td>
<td>C</td>
<td>• Three (3) lab science classes are required. Two of the three classes must be from the same subject area or discipline.</td>
<td></td>
</tr>
<tr>
<td>CSE 310: Data Structures and Algorithms</td>
<td>3</td>
<td>C</td>
<td>• Pursue an undergraduate research experience.</td>
<td></td>
</tr>
<tr>
<td>Lab Science Requirement AND Natural Science - General (SG) or Natural Science - Quantitative (SQ)</td>
<td>4</td>
<td></td>
<td>• Apply for internships.</td>
<td></td>
</tr>
<tr>
<td>Humanities, Arts and Design (HU)</td>
<td>3</td>
<td></td>
<td>• Attend career fairs and events.</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete CSE 295 OR MAT 267 OR MAT 272 course(s).</td>
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<td></td>
</tr>
<tr>
<td>Minimum 2.00 GPA ASU Cumulative.</td>
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</tbody>
</table>

Term hours subtotal: 16

<table>
<thead>
<tr>
<th>Term 5 63 - 79 Credit Hours</th>
<th>Necessary course signified by</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 355: Introduction to Theoretical Computer Science</td>
<td>3</td>
<td>C</td>
<td>• Plan for success using the Junior Guide.</td>
<td></td>
</tr>
<tr>
<td>CSE 301: Computing Ethics</td>
<td>1</td>
<td>C</td>
<td>• Network at student organization competitions or professional societies.</td>
<td></td>
</tr>
<tr>
<td>CSE 360: Introduction to Software Engineering</td>
<td>3</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSE 365: Information Assurance</td>
<td>3</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEE 380: Probability and Statistics for Engineering Problem Solving (CS)</td>
<td>3</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social-Behavioral Sciences (SB) AND Historical Awareness (H)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Term hours subtotal: 16

<table>
<thead>
<tr>
<th>Term 6 79 - 94 Credit Hours</th>
<th>Necessary course signified by</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 340: Principles of Programming Languages</td>
<td>3</td>
<td>C</td>
<td>• Research and prepare for graduate school.</td>
<td></td>
</tr>
<tr>
<td>CSE 330: Operating Systems</td>
<td>3</td>
<td>C</td>
<td>• Apply for an engineering 4+1 program.</td>
<td></td>
</tr>
<tr>
<td>CSE 412: Database Management OR CSE 434: Computer Networks OR CSE 445: Distributed Software Development</td>
<td>3</td>
<td>C</td>
<td>• Develop a professional profile online.</td>
<td></td>
</tr>
<tr>
<td>MAT 343: Applied Linear Algebra</td>
<td>3</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Division Humanities, Arts and Design (HU) OR Upper Division Social-Behavioral Sciences (SB)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete Cultural Diversity in the U.S. (C) AND Global Awareness (G) AND Historical Awareness (H) course(s).</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Term hours subtotal: 15

<table>
<thead>
<tr>
<th>Term 7 94 - 108 Credit Hours</th>
<th>Necessary course signified by</th>
<th>Hours</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 485: Computer Science Capstone Project 1 (L)</td>
<td>3</td>
<td>C</td>
<td>• Please see course lists below for Technical Electives. Contact CIDSE Advising or visit the CIDSE website for additional information.</td>
<td></td>
</tr>
<tr>
<td>Complete 2 courses:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSE 4** Elective</td>
<td>6</td>
<td>C</td>
<td>• Plan for success using the Senior Guide.</td>
<td></td>
</tr>
<tr>
<td>Upper Division Technical Elective</td>
<td>3</td>
<td>C</td>
<td>• Use Handshake to apply for full-time positions.</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Term hours subtotal: 14
### Lab Science Requirement

- **BIO 181: General Biology I (SQ)**
- **BIO 182: General Biology II (SG)**
- **CHM 113: General Chemistry I (SQ)**
- **CHM 116: General Chemistry II (SQ)**
- **GLG 101: Introduction to Geology I (Physical) (SQ)**
- **GLG 103: Introduction to Geology I-Laboratory (SQ)**
- **GLG 102: Introduction to Geology II (Historical) (SG & H)**
- **GLG 104: Introduction to Geology II-Laboratory (SG)**
- **GLG 110: Dangerous World (SQ & G)**
- **GLG 111: Dangerous World Laboratory (SQ)**
- **PHY 121: University Physics I: Mechanics (SQ) AND PHY 122: University Physics Laboratory I (SQ)**
- **PHY 131: University Physics II: Electricity and Magnetism (SQ) AND PHY 132: University Physics Laboratory II (SQ)**

### Technical Electives

- **AEE 415: Vibration Analysis**
- **AEE 426: Design of Aerospace Structures**
- **AEE 462: Space Vehicle Dynamics and Control**
- **AEE 463: Aircraft Propulsion**
- **AEE 465: Rocket Propulsion**
- **AEE 468: Aircraft Systems Design**
- **AEE 471: Computational Fluid Dynamics**
- **AME 430: Mac Development for Media Arts**
- **AME 435: Mobile Development**
- **BCH 361: Advanced Principles of Biochemistry**
- **BCH 461: General Biochemistry**
- **BCH 462: General Biochemistry**
- **BIO 340: General Genetics**
- **BIO 343: Genetic Engineering and Society (L)**
- **BIO 345: Evolution**
- **BME 350: Signals and Systems for Bioengineers**
- **BME 413: Biomedical Instrumentation (L)**
- **BME 416: Advanced Biomechanics**
- **CEE 412: Pavement Analysis and Design**
- **CEE 432: Developing Software for Engineering Applications**
- **CEE 440: Hydrology**
- **CEE 441: Water Resources Engineering**

### Technical Electives continued

- **EEE 304: Signals and Systems II**
- **EEE 333: Hardware Design Languages and Programmable Logic**
- **EEE 350: Random Signal Analysis**
- **EEE 360: Energy Systems and Power Electronics**
- **EEE 404: Real-Time DSP Systems**
- **EEE 407: Digital Signal Processing**
- **EEE 425: Digital Systems and Circuits**
- **EEE 433: Analog Integrated Circuits**
- **EEE 434: Quantum Mechanics for Engineers**
- **EEE 435: Fundamentals of CMOS and MEMS**
- **EEE 436: Fundamentals of Solid-State Devices**
- **EEE 437: Optoelectronics**
- **EEE 439: Semiconductor Facilities and Cleanroom Practices**
- **EEE 443: Antennas for Wireless Communications**
- **EEE 445: Microwaves**
- **EEE 448: Fiber Optics**
- **EEE 455: Communication Systems**
- **EEE 459: Communication Networks**
- **EEE 460: Nuclear Power Engineering**
- **EEE 463: Electrical Power Plants**
- **EEE 470: Electric Power Devices**

### Notes

- Complete 2 courses:
  - CSE 486: Computer Science Capstone Project II (L)
- Upper Division Technical Elective

- **Complete an in person or virtual practice interview.**

- Please see course lists below for Technical Electives. Contact CIDSE Advising or visit the CIDSE website for additional information.

- Hide Course List(s)/Track Group(s)

- Term hours subtotal: 12

- Please see course lists below for Technical Electives. Contact CIDSE Advising or visit the CIDSE website for additional information.
CEE 452: Foundations
CEE 462: Unit Operations in Environmental Engineering
CEE 466: Urban Water System Design
CEE 467: Environmental Microbiology
CEE 474: Transportation Systems Planning
CEE 475: Highway Geometric Design
CEE 481: Civil Engineering Project Management
CEE 483: Highway Materials, Construction, and Quality
CEE 486: Integrated Civil Engineering Design (L)
CHE 342: Introduction to Applied Chemical Thermodynamics
CHE 432: Principles of Chemical Engineering Design
CHE 442: Introduction to Chemical Reactor Design
CHE 461: Process Dynamic Control (CS)
CHE 462: Process Design (L)
CHE 469: Air Quality Engineering
CHE 475: Biochemical Engineering
CIS 415: Big Data Analytics in Business
CPI 311: Game Engine Development
CPI 350: Evaluation of Informatics Systems
CPI 360: Decision Making and Problem Solving
CPI 411: Graphics for Games
CPI 460: Intelligent Interactive Instructional Systems
CPI 462: Design for Learning in Virtual Worlds
CSE 320: Design and Synthesis of Digital Hardware
CSE 325: Embedded Microprocessor Systems
CSE 335: Principles of Mobile Application Development
CSE 4** Elective
EEE 471: Power System Analysis
EEE 473: Electrical Machinery
EEE 480: Feedback Systems
EEE 481: Computer-Controlled Systems
FSE 301: Entrepreneurship and Value Creation
IEE 376: Operations Research Deterministic Techniques/Applications
IEE 381: Lean Six Sigma Methodology
IEE 385: Engineering Statistics: Probability
IEE 412: Introduction to Financial Engineering
IEE 426: Operations Research in Healthcare
IEE 431: Engineering Administration (L)
IEE 456: Introduction to Systems Engineering
IEE 458: Project Management
IEE 461: Production Control
IEE 470: Stochastic Operations Research
IEE 474: Quality Control
IEE 473: Simulating Stochastic Systems (CS)
MAE 341: Mechanism Analysis and Design
MAE 404: Finite Elements in Engineering
MAE 417: System Dynamics and Control II
MAE 436: Combustion
MAE 455: Polymers and Composites
MAT Upper Division Elective
Except for: MAT 300, MAT 340, MAT 342, MAT 343 and MAT 485
MEE 434: Internal Combustion Engines
MEE 446: Energy Systems Design
PHY 302: Mathematical Methods in Physics II
PHY 361: Introductory Modern Physics
PHY 462: Particle and Nuclear Physics
SER 421: Web-Based Applications
SER 422: Web Application Programming
SER 423: Mobile Systems
STP 421: Probability
STP 425: Stochastic Processes
First-Year Composition: All students are placed in ENG 101 unless submission of SAT, ACT, Accuplacer, IELTS, or TOEFL score, or college-level transfer credit or test credit equivalent to ASU’s first-year composition course(s), determines otherwise. Students on Polytechnic, Downtown Phoenix and West Campuses are encouraged to complete the Directed Self-Placement survey to choose the first-year composition option they believe best suits their needs. Visit: https://cisa.asu.edu/DSP

Mathematics Placement Assessment score determines placement in first mathematics course.

Notes:

* Total Hours: 120
* Upper Division Hours: 45 minimum
* Major GPA: 2.00 minimum
* Cumulative GPA: 2.00 minimum
* Total hrs at ASU: 30 minimum
* Hrs Resident Credit for Academic Recognition: 56 minimum
* Total Community College Hrs: 64 maximum

General University Requirements Legend

General Studies Core Requirements:

* Literacy and Critical Inquiry (L)
* Mathematical Studies (MA)
* Computer/Statistics/Quantitative Applications (CS)
* Humanities, Arts and Design (HU)
* Social-Behavioral Sciences (SB)
* Natural Science - Quantitative (SQ)
* Natural Science - General (SG)

General Studies Awareness Requirements:

* Cultural Diversity in the U.S. (C)
* Global Awareness (G)
* Historical Awareness (H)

First-Year Composition

General Studies designations listed on the major map are current for the 2021 - 2022 academic year.