

Undergraduate Handbook

2022-2023 Edition

Department of Computer Science
California State University, Fullerton

August 17, 2022

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Introduction

1.1 The Field of Computer Science

Computer Science is the systematic study of computing systems and computation. The body of knowledge contains the theoretical foundation for understanding computing systems, design methodology, algorithms, and software and hardware tools.

The programs at Cal State Fullerton cover a wide range of areas, including:

- multimedia and digital game technologies,
- Internet and enterprise computing,
- wireless and mobile computing,
- databases and data mining,
- computer security,
- software engineering, and
- computational bioinformatics.

Computer Science prepares graduates for rewarding careers in all areas of business, government, education and industry. These organizations, large and small, need computer professionals to address their needs with specific programs and systems. Computer science professionals tackle complicated problems and create computer solutions to solve them, devising new ways to use computers.

1.2 The Department

The faculty and staff of the Computer Science Department welcome you into our program and sincerely wish you good luck on your journey into higher education, and continued success.

Whenever you have a question about the Department—its policies, its curriculum, its services, your progress, or anything else—feel free to contact us.

Web: <http://fullerton.edu/ecs/cs/>
E-mail: csdept@fullerton.edu
In person: Room CS-522
Telephone: (657) 278-3700
Fax: (657) 278-7168
Postal mail: California State University, Fullerton
Department of Computer Science

P.O. Box 6870

Fullerton, CA 92834-6870

1.3 Accreditation

The Bachelor of Science in Computer Science degree at CSUF is accredited by the Computing Accreditation Commission of ABET (<http://www.abet.org>).



1.4 The Programs

The Department offers the following Undergraduate programs, which are documented in this Handbook:

1. Bachelor of Science in Computer Science (B.S. CS),
2. Bachelor of Science in Computer Science with Concentration in Cybersecurity, and
3. Minor in Computer Science.

The Department also offers Graduate programs, which are documented elsewhere:

1. Master of Science in Computer Science (M.S. CS),
2. Master of Science in Software Engineering (M.S.E.), and

3. Accelerated Master of Science in Software Engineering (A.M.S.E.).

CS courses are also components of Computer Engineering, Electrical Engineering, and Mathematics programs at CSUF.

1.5 Objectives and Outcomes

The Program Educational Objectives and Program Outcomes for the B.S. Computer Science are documented in the University Catalog at <http://www.fullerton.edu/ecs/cs/about/peo-so.php>

1.6 Using This Document

This handbook covers information on how to complete a B.S. or a Minor in Computer Science, and contains information relevant to students pursuing them. If you are pursuing a Masters degree, please refer to the Graduate Handbook instead of this document.

In order to minimize duplicated information, this document references other documents rather than copying their content. The PDF version of this Handbook presents these references as clickable links.

Some aspects of our programs are complex, and you may find it difficult to choose among alternatives. In those cases, we present our suggested default choice as a tip, as shown below. You are not required to follow these tips, but doing so is often a prudent choice.

TIP When in doubt, heed tips such as this one.

This document has been formatted so that it may be printed as a booklet. Print double-sided with staples (or other binding) on the left side. The document will look best if printed in color, but it may also be printed in grayscale (a.k.a. semitone).

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Sources of Information

You may find the following sources to be helpful.

- The University Catalog: <http://catalog.fullerton.edu/>
- Advising:
 - CS Department Advising: <http://www.fullerton.edu/ecs/cs/resources/advisement.php>
 - Center for Academic Support in ECS (CASECS): <http://www.fullerton.edu/ecs/resources/casecs.php>
 - Student Success Center: <http://www.fullerton.edu/ecs/resources/StudentSuccessCenter.php>
 - Academic Advisement Center (GE advising): <https://www.fullerton.edu/aac/>
- Department of Computer Science: <http://www.fullerton.edu/ecs/cs/>
- General Education (GE): http://www.fullerton.edu/undergraduate/general_education/index.php
- Course transfer database: <http://www.assist.org>
- Center for Internships & Community Engagement — Academic Internships: <http://www.fullerton.edu/cice/students/internships.php>
- Catalogs of nearby community colleges:
 - Cypress College: <https://catalog.nocccd.edu/cypress-college/>
 - Fullerton College: <https://www.fullcoll.edu/schedule/>
 - Golden West College: <http://www.goldenwestcollege.edu/catalog/>
 - Irvine Valley College: <https://catalog.ivc.edu/>
 - Orange Coast College: <http://www.orangecoastcollege.edu/academics/CourseCatalog/Pages/default.aspx>
 - Saddleback College: <http://www.saddleback.edu/cc/course-catalog>
 - Santa Ana College: <https://www.sac.edu/CatalogAndSchedule/Pages/catalog.aspx>
 - Santiago Canyon College: <https://sccollege.elumenapp.com/catalog/2022-2023/home>

3

The CS Major

3.1 Major Requirements at a Glance

The requirements for the B.S. CS are detailed in the University Catalog. The requirements fit into 6 categories:

1. *Lower-Division Core:* 100/200-level CPSC courses covering computer programming, data structures, and cybersecurity.
2. *Mathematics Requirements:* MATH courses laying the foundation for CS theory and practice.
3. *Science and Mathematics Electives:* Physical science and/or mathematics courses that provide a breadth of scientific knowledge and prepare students for certain upper-division electives.
4. *Upper-Division Core:* 300/400-level CPSC courses that build directly upon the Lower-Division Core, Mathematics, and Science courses listed above, and complete the computer science canon.
5. *Major Electives:* You may choose elective courses that support your interests and career goals.
6. *General Education (GE):* A blend of varied topics that round out a broad, liberal arts education, and satisfy University graduation requirements.

Our accreditor, ABET, requires at least 30 units of mathematics and science courses. The Mathematics Requirements and Science and Mathematics Electives together satisfy this 30-unit requirement.

3.2 Major Prerequisite Tree

The following tree graph diagram illustrates the prerequisite and corequisite relationships between courses required for the major.

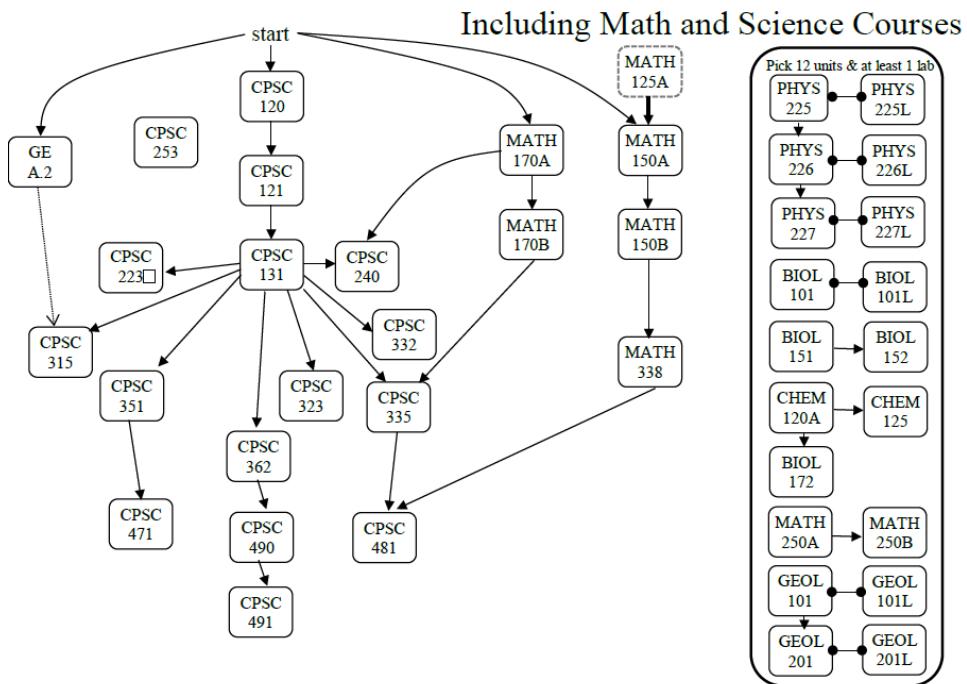


Figure 3.1: Prerequisite relations for the BS CS Core

TIP

You are ordinarily limited to 16 units each term. In order to finish the B.S. program in 8 semesters, you will need to take five classes each semester. Almost all CPSC and GE courses are 3 units each; almost all mathematics and science courses are 4 units each. Plan on taking four 3-unit courses (CPSC and/or GE), and one 4-unit course (mathematics or science) each semester, for a total of 16 units, until you have completed all required 4-unit courses.

3.3 Lower-Division Core

The first three courses in the major are CPSC 120, 121, and 131. These courses must be taken in sequence, and are prerequisites to practically every other CS course.

TIP

Prioritize completing CPSC 120, 121, then 131 as soon as possible.

If you come to CSUF with prior programming expertise, you may be able to skip some of these courses. See sections 5.2 and 5.4 for more information.

Our introductory programming courses are taught in C++, but cover concepts that are common to practically all programming languages. To establish some breadth of programming fluency, you are required to learn a second

programming language. This is accomplished by passing one of the CPSC 223 courses.

TIP Choose *CPSC 223P - Python Programming* if you plan on taking security-related courses later on.

TIP Python is used in many upper-division courses, so unless you are on one of the two specific paths above, take *CPSC 223P - Python Programming*.

3.4 Tuffix

Students enrolled in CSPC 120, CPSC 121, and CPSC 131 are recommended to use the Computer Science Department official GNU/Linux development environment, Tuffix. Tuffix is Tuffy the Titans Linux distribution.

Instructions on how to install Tuffix or a Tuffix based VM are online at <http://csufcs.com/tuffixinstall>. The Tuffix Titanium Community for Students, <https://communities.fullerton.edu/course/view.php?id=1547> is the best venue to receive help with Tuffix.

Students may self-enroll in the community; first login to your portal, then navigate to *Titanium communities*, next under the dashboard to the left click *Site home*, then click *Search Courses* on the right, search for Tuffix, in the results click *Tuffix Students*, under the gear in the upper right select *Enrol me in this course*, finally click on the button *Enrol me*. You may unenroll at any time.

The Tuffix home page is <https://github.com/kevinwortman/tuffix>.

Students interested in using Microsoft development tools may request a Dreamspark account at <http://dsreqform.ecs.fullerton.edu/>. A student may, at no monetary cost, download full featured versions of Microsoft Visual Studio.

Students interested in using Apple development tools can freely download Xcode through the App Store application bundled with macOS. Students may download Xcode directly from <https://developer.apple.com/xcode/>.

A CentOS-based shell server is available through secure shell (ssh) and secure file transfer protocol (sftp). The host-name is ecs.fullerton.edu. If your email address is malcolm@csu.fullerton.edu, then your username is malcolm. If you are using a command-line ssh client, then your command to connect to ecs.fullerton.edu will be ‘ssh malcolm@ecs.fullerton.edu’.

3.5 Mathematics Requirements

Before enrolling in Math 150A, you must either have recently passed *MATH 125 - Precalculus*, an equivalent course at another institution, or passed the Mathematics Qualifying Exam. Additional information on this exam is available in the online registration guide, and from the Fullerton Testing Center, University Hall 229, and (657) 278-3838.

3.6 Science and Mathematics Electives

As stated in the University Catalog, you must complete at least 12 units of natural science and/or mathematics courses chosen from a designated list. The list includes only courses that dovetail with CS material, and may fit within a coherent 12-unit curriculum. Due to GE and ABET requirements, you must take at least one course with a laboratory experience. Eligible laboratory courses are designated in the Catalog.

Choose a set of courses that support each other and your future studies. Plan ahead, and discuss your plan for this requirement with your adviser.

TIP

PHYS 225, 225L, 226, 226L, and MATH 250A provide a strong foundation for later CS courses, meet all Science and Mathematics requirements, and fit within 12 units. Take this set of electives unless you are working toward a specific study plan focusing on biology, chemistry, geology, or mathematics.

The two-semester biology sequence is BIOL 151 and BIOL 152. This sequence replaced older courses numbered BIOL 171 and 172. Current students should take 151 and 152, but you may see references to 171 and 172 in some documents. Students who took 171 and 172 while they were offered may count those courses toward the Science and Mathematics Electives requirement.

3.7 Upper Division Core

CPSC 491 - Senior Capstone Project in Computer Science is the Core course with the longest chain of prerequisites. Plan your schedule so that you make steady progress toward meeting 491's prerequisites.

TIP

If possible, make progress on each of the following prerequisite chains every semester:

1. CPSC 120, 121, 131, 362, 490, 491
2. MATH 270A, 270B
3. MATH 150A, 150B, 338

3.8 Computer Science Major Electives

You must select 15 units of electives, ordinarily five 3-unit courses, to satisfy your degree requirements. Select elective courses that are best aligned with your personal objectives. For example, if you aspire to create web applications and mobile apps, then courses such as CPSC 411, CPSC 411A, CPSC 431, CPSC 349 and CPSC 449 are excellent choices. Consult mentors and advisors in selecting the elective courses that match your goals.

Courses outside of the computer science department may be used as elective courses. You must seek approval from a major advisor before taking the course.

Computer science related internship may be approved for 3 units of elective course. You must enroll in EGGN 495 to receive the credits. Independent Study can also be counted for elective credits. You must enroll in CPSC 499 under the supervision of a faculty advisor.

3.8.1 Lower Division CS Electives

You may complete at most 3.0 units of Lower Division CS Electives (200 level courses). Students who need additional units due to the Placement Examination, transfer, or other circumstances are encouraged to consult with a major advisor.

3.8.2 Upper Division CS Electives

Your are required to complete at least 12.0 units of Upper Division CS Electives. You may need to take additional electives if you are short on units due to the Placement Examination, transfer, or other circumstances.

A course may be used as an Upper Division CS Elective if it is a 3-unit, 300/400 level CPSC course that is not a core requirement. Therefore, the following courses may count as Upper Division CS Electives:

- CPSC 301 - Programming Lab Practicum (2)
- CPSC 349 - Web Front-End Engineering (3)
- CPSC 375 - Introduction to Data Science and Big Data (3)
- CPSC 386 - Introduction to Game Design and Production (3)
- CPSC 411 - Mobile Device Application Programming (3)
- CPSC 411A - Mobile Device Application Programming for Android (3)
- CPSC 431 - Database and Applications (3)
- CPSC 439 - Theory of Computation (3)
- CPSC 440 - Computer System Architecture (3)
- CPSC 449 - Web Back-End Engineering (3)
- CPSC 452 - Cryptography (3)

- CPSC 454 - Cloud Computing and Security (3)
- CPSC 455 - Web Security (3)
- CPSC 456 - Network Security Fundamentals (3)
- CPSC 458 - Malware Analysis (3)
- CPSC 459 - Blockchain Technologies (3)
- CPSC 462 - Software Design (3)
- CPSC 463 - Software Testing (3)
- CPSC 464 - Software Architecture (3)
- CPSC 466 - Software Process (3)
- CPSC 474 - Parallel and Distributed Computing (3)
- CPSC 479 - Introduction to High Performance Computing (3)
- CPSC 483 - Introduction to Machine Learning (3)
- CPSC 484 - Principles of Computer Graphics (3)
- CPSC 485 - Computational Bioinformatics (3)
- CPSC 486 - Game Programming (3)
- CPSC 489 - Game Development Project (3)
- CPSC 499 - Independent Study (3)

You may be able to use an adviser-approved course not on this list as an Upper Division CS Elective. Such a course must be at least 3 units and directly related to your academic goals. If this interests you, discuss it with a major adviser. You may need to file a request form; see Section 5.10.

3.9 B. S. in Computer Science with Cybersecurity Concentration

The cybersecurity concentration prepares computer science students for entry-level cybersecurity positions, including security engineer, security administrator, penetration tester and security applications developer. The concentration emphasizes cybersecurity foundations and principles, including risk analysis, network security and cryptography, and covers current approaches to malware analysis and web, cloud and blockchain security.

- Required Course (3 units)
 - CPSC 456 - Network Security Fundamentals (3)
- Cybersecurity Electives (9 units)
 - CPSC 452 - Cryptography (3)
 - CPSC 454 - Cloud Computing and Security (3)

- CPSC 455 - Web Security (3)
- CPSC 458 - Malware Analysis (3)
- CPSC 459 - Blockchain Technologies (3)
- CPSC 483 - Introduction to Machine Learning (3)
- EGCP 447 - Introduction to Cyber-Physical Systems Security (3)

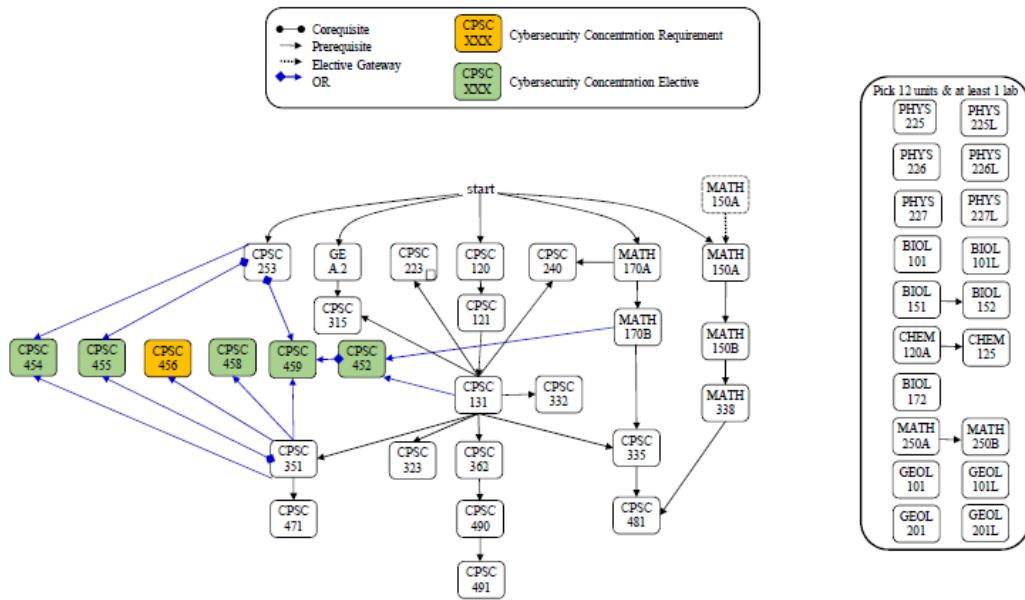


Figure 3.2: Prerequisite relations for the BS CS with Cybersecurity Concentration

3.10 General Education (GE)

The Undergraduate Studies & General Education website

http://www.fullerton.edu/undergraduate/general_education/index.php

describes University GE requirements in detail. You are encouraged to check your TDA (Titan Degree Audit) to find out about the GE requirements. The TDA provides a list of courses that may be taken to satisfy each category of GE. You may also meet with an advisor at the Academic Advising Center to discuss your options for GE.

Prior to Fall 2018 CSUF students are ordinarily required to take at least 51 units and 19 categories of GE courses. CS majors meet some of these requirements through their required courses, and some requirements are waived for CS majors.

Beginning in Fall 2018, CSUF students are ordinarily required to take at least 48 units and 18 categories of GE courses. CS majors meet some of these requirements through their required courses, and some requirements are waived for CS majors.

This leaves 27 units and 10 categories which must be satisfied by additional courses.

Table 3.1: Pre-2018 GE Waivers

GE area	Satisfied by
A.3. Critical Thinking (3 units)	waived for CS majors
B.1. Physical Science (3 units)	GEOL 101, PHYS 225, or CHEM 120A, part of Science and Mathematics Electives
B.2. Life Science (3 units)	waived for CS majors
B.3. Laboratory Experience	GEOL 101L or PHYS 225L, part of Science and Mathematics Electives
B.4. Mathematics and Quantitative Reasoning (3 units)	MATH 150A, part of Mathematics Requirements
B.5. Implications and Explorations of Mathematics and Natural Sciences (3 units)	MATH 338, part of Mathematics Requirements
D.2. World Civilizations and Cultures (3 units)	waived for CS majors who take HIST 110A to satisfy C.4
D.5. Explorations in Social Sciences (3 units)	waived for CS majors
E. Lifelong Learning and Self Development (3 units)	waived for CS majors
Total: 24 units, 9 categories	

Table 3.2: Fall 2018 and Later GE Waivers

GE area	Satisfied by
A.3. Critical Thinking (3 units)	waived for CS majors
B.1. Physical Science (3 units)	GEOL 101, PHYS 225, or CHEM 120A, part of Science and Mathematics Electives
B.2. Life Science (3 units)	waived for CS majors
B.3. Laboratory Experience	GEOL 101L or PHYS 225L, part of Science and Mathematics Electives
B.4. Mathematics and Quantitative Reasoning (3 units)	MATH 150A, part of Mathematics Requirements
B.5. Implications and Explorations of Mathematics and Natural Sciences (3 units)	MATH 338, part of Mathematics Requirements
D.4. Explorations in Social Sciences (3 units)	waived for CS majors
E. Lifelong Learning and Self Development (3 units)	waived for CS majors
Total: 18 units, 6 categories	

Table 3.3: Pre-2021 GE Requirements & Suggestions

GE area	Suggested Course
A.1. Oral Communications (3 units)	HCOM 102 Public Speaking (3)
A.2. Written Communications (3 units)	ENGL 101 - Beginning College Writing (3)
C.1. Introduction to Art (3 units)	ART 101 - Introduction to Art (3) (many alternatives)
C.2. Introduction to Humanities (3 units)	LING 106 - Language and Linguistics (3); many alternatives
C.3. Explorations of Arts and Humanities (3 units)	MUS 303 - World Music (3); C.1 is prerequisite; many alternatives
D.1. Introduction to Social Sciences (3 units)	EGCE/CP/EE/ME 401; MATH 150A is prerequisite; must be 401 specifically
D.3. American History, Institutions and Values (3 units)	AMST 201 - Introduction to American Studies (3); many alternatives
Z. Cultural Diversity	already satisfied by MUS 303 above
Total: 27 units, 10 categories	

In addition, CSUF students are required to take at least 6 units of GE at the upper-division (300/400) level. 4 of these are satisfied by MATH 338, so at least 2 of your additional GE units must be upper-division.

The following tables list the remaining GE categories, and a suggested course for each category.

TIP Effective Fall 2017, upper-division GE courses can only be taken by students at upper-division class standing.

TIP To conserve units, make sure that the course you take for category C.3 (pre-2018) or C.4 (2018 and later) is upper-division and also satisfies category Z. Z-category courses are marked with an asterisk on the <http://www.fullerton.edu/undergraduate/courses/2021.php> page.

TIP Catalog years Fall 2015 through Spring 2018, CS majors *must* satisfy GE area D.1 with EGCE/CP/EE/ME 401. Starting in Fall 2018, CS majors may use any D.1 course.

3.11 Academic Requirements

Your GPA for courses required in your major must remain at or above 2.0. Grade requirements for courses are summarized below.

Table 3.4: 2021 and later GE Requirements & Suggestions

GE area	Suggested Course
A.1. Oral Communications (3 units)	HCOM 102 Public Speaking (3)
A.2. Written Communications (3 units)	ENGL 101 - Beginning College Writing (3)
C.1. Introduction to Art (3 units)	ART 101 - Introduction to Art (3); many alternatives
C.2. Introduction to Humanities (3 units)	LING 106 - Language and Linguistics (3); many alternatives
C.3. Explorations of Arts and Humanities++ (3 units)	MUS 303 - World Music (3); many alternatives
D.1. Introduction to Social Sciences (3 units)	SOCI 101 - Introduction to Sociology (3) or EGCE/CP/EE/ME 401; many alternatives
D.2. American History, Institutions, and Values (3 units)	HIST 190 Survey of American History with Emphasis on Ethnic Minorities (3); many alternatives
Z. Cultural Diversity	already satisfied by MUS 303 above; many alternatives
Graduation Requirement (3 units)	POSC 100 - American Government (3)
Total: 27 units, 10 categories	

Course Type	Minimum Grade
GE courses, including MATH 150A, MATH 338, EGCE/CP/EE/ME 401	C-
CPSC 490 and 491	C
All other major courses	D-

3.11.1 Grades

A repeatable grade is a “D”, “F”, or “W” grade. Students may repeat courses for which a “C-” or lower grades were earned at CSUF or other institutions. When repeating a course, the traditional grading system (“A”, “B”, “C”, etc.) shall be used (i.e. “CR”/“NC” is not an option). In computing the grade-point average, only the most recently earned grades and grade points shall be used for the first 16 units of repeated. This is called grade forgiveness, yet the original grade shall remain on your academic record.

In the case of any repetition beyond the 16-unit limit or in courses for which a C or better grade was awarded, both grades are considered in computing grade-point averages. Students may be permitted to repeat an additional 12 units in addition to the 16 units for which grade forgiveness is permitted. This process is by petition through Admissions & Records and you must seek the support of an academic advisor and the department chair. The repeat grade shall not replace the original grade. Both grades shall be calculated in the student’s overall grade-point average.

Students earning a grade of “D-” (grade-point 0.7) or better have earned a passing grade and will earn the units towards their degree. Students must have a grade-point average of 2.0 or greater to earn a degree.

Students are strongly advised to repeat courses that lay the foundation for their education such as their lower- and upper-division core courses. In circumstances where a student earns a grade between “D-” and “C+” due to poor health, difficulties outside of the classroom, or other circumstances that impacted the student’s ability to succeed, the student is strongly recommended to meet with an academic advisor and determine in consultation with the advisor if not repeating the class is in the student’s best interest.

4

The CS Minor

There is strong demand for expertise in programming, data representation, and computational principles. The rise of the web; digital music, film, and humanities; and other interdisciplinary fields shows that a CS Minor can complement any field of study.

To select Computer Science as your minor, visit the CS office and fill out a Request for Minor Objective form.

4.1 Minor Requirements at a Glance

The requirements for the CS minor are detailed in the University Catalog (https://catalog.fullerton.edu/preview_program.php?catoid=75&poid=35651&returnto=9871). units of computer science coursework (ordinarily 5 courses). A minimum six of the 15 units for the minor must be upper-division (300/400-level) courses and completed at CSUF. Courses may not include CPSC 311, CPSC 315 or those numbered CPSC 490-CPSC 499.

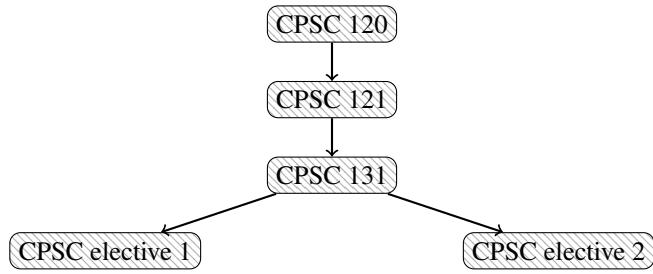
At least 12 units, including the minimum 6 units of upper division course work, must be courses that are not being used to fulfill requirements for your major.

The following are prerequisites for most upper-division Computer Science courses. It is recommended that Computer Science minors complete them first. Other CPSC courses may require additional prerequisites.

- CPSC 120 - Introduction to Programming (3)
- CPSC 121 - Object-Oriented Programming (3)
- CPSC 131 - Data Structures (3)

In addition to the above three courses, you will still need to complete 6 units of upper-division Computer Science courses at CSUF. Most of the upper-division courses are available to students after successfully completing CPSC 131. You may have to take additional courses to meet the prerequisites for some upper-division CS courses.

4.2 Minor Prerequisite Tree



4.3 For Majors in Related Fields

As stated above, at least 12 units, including the minimum 6 units of upper division course work, must be courses that are not being used to fulfill requirements for your major. This has implications for students whose major includes some CPSC courses.

Computer Engineering Major and Computer Science Minor

The Computer Engineering major includes CPSC 120, 121, 131, 253U, and 351, so none of these count toward the 12-unit requirement. A Computer Engineering major may count only 3 of these units toward a Computer Science minor. To complete the minor they must pass at least 12 additional units of CPSC courses that are distinct from their major. Altogether, a Computer Engineering major must usually pass a total of 25 units of CPSC course work to complete a Computer Science minor.

Electrical Engineering Major and Computer Science minor

The Electrical Engineering major includes CPSC 120, so CPSC 120 does not count toward the 12-unit requirement. However, the remaining 12 units of minor courses ordinarily do not count toward the Electrical Engineering major, so Electrical Engineering majors typically only need to pass 15 units of CPSC courses to complete a Computer Science minor.

Information Systems and Decision Sciences and Computer Science Double Majors

The Information Systems and Decision Sciences major includes ISDS 309, which is not equivalent to any CPSC course.

5

Alternative Pathways

5.1 Transfer

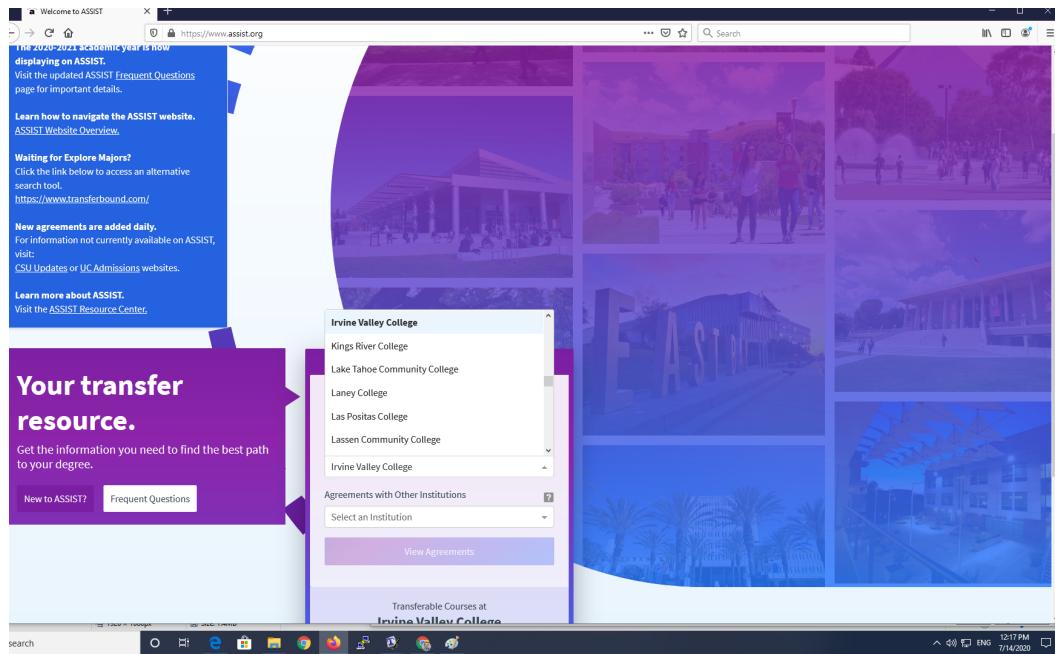
If you are a transfer student from a California Community College, you should refer to <http://www.assist.org>. A department adviser can help you with these equivalencies and give the required approval.

Transfer courses cannot be applied toward the major or accepted as prerequisites until they are recorded in the Titan Degree Audit (TDA) system. You should have your official transcripts sent to the office of Admissions. see http://admissions.fullerton.edu/prospectivestudent/college_transcripts.php for more information.

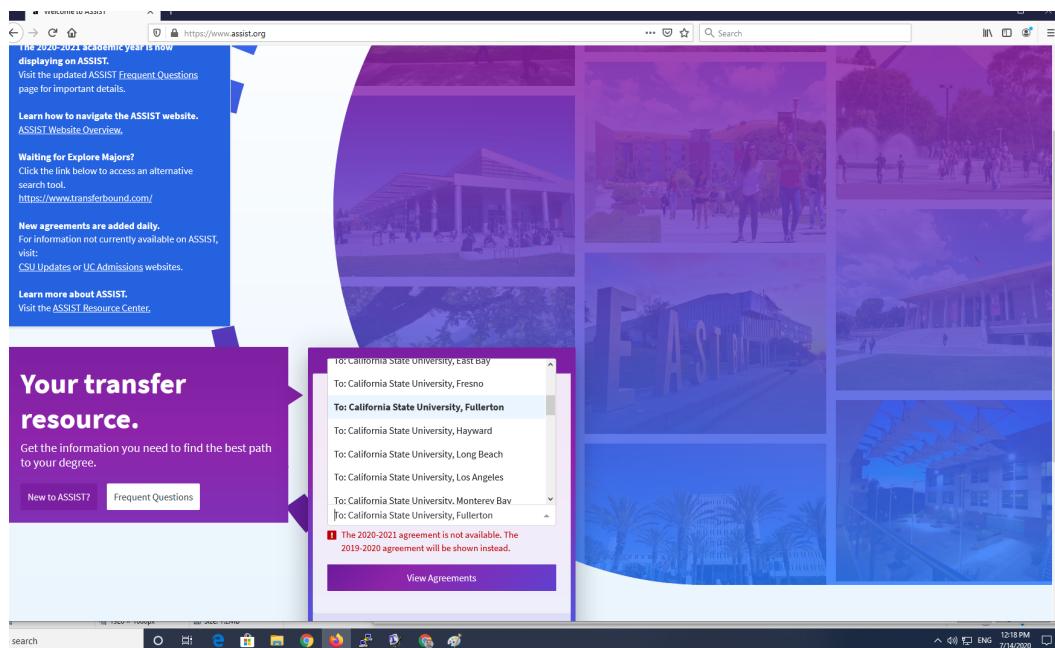
To find articulation agreements in the assist.org database, start by loading the web page <http://www.assist.org>, as shown below.

The screenshot shows the ASSIST website interface. At the top, there's a logo with the word "assist" and a blue swoosh graphic. Below it, a purple header bar says "ASSIST is here to help". On the left, there's a sidebar with sections for "Important Notes from ASSIST", "Academic Year 2022-2023 Information Now Available", and "Institution Name Change". The main content area has two large search boxes. The left one is titled "Search below for articulation agreements" and includes fields for "Academic Year" (set to 2022-2023), "Institution" (dropdown menu), and "Agreements with Other Institutions" (dropdown menu). A "View Agreements" button is at the bottom. The right search box is titled "Search below for transferable courses" and includes fields for "Academic Year" (set to 2022-2023), "Community College" (dropdown menu), and a list of course types with radio buttons: "CSU Transferable Courses", "CSU GE-Breadth Certification Courses", "CSU US History, Constitution, and American Ideals Courses (CSU AI)", "IGETC for UC and CSU", "UC Transferable Courses", and "UC Transfer Admission Eligibility Courses". A "View Transferability Lists" button is at the bottom. Both search boxes have a question mark icon in the top right corner.

Select the institution you'd like to transfer *from*; in this example we will use Irvine Valley College (IVC).



Then indicate that you are transferring *to* CSUF.



Finally, indicate that you are interested in courses relevant to the Computer Science major.

The screenshot shows the ASSIST website interface. On the left, there's a sidebar with 'Transfer Information' sections for Academic Year (2019-2020), Institution (Irvine Valley College), and Agreements with Other Institutions (To: California State University, Fullerton). Below these are buttons for 'View Agreements', 'Transferable Courses at Irvine Valley College' (with a dropdown menu 'Select...'), 'View Transferability Lists', and 'Frequent Questions'. The main content area is titled '2019-2020 to California State University, Fullerton from Irvine Valley College'. It shows an 'Agreement by Department' for 'Computer Science'. A search bar is present. Below it is a list of courses: CPSC 120, CPSC 121, CPSC 131, CPSC 223C, CPSC 223H, CPSC 223J, CPSC 223N, CPSC 223P, CPSC 240, CPSC 253U, CPSC 254, CS 36, CS 37, CS 41, CS 30, CS 38, CS 39, CS 10, CS 40A, and CIM 161. There are also notes about UC Admissions and CSU Updates. A message at the bottom states that ASSIST does not take the place of a counselor.

The text within the scroll bars shows established articulations between CSUF and IVC. For instance, IVC CS 36 is equivalent to CSUF CPSC 120.

This screenshot shows a detailed articulation agreement report. The title is 'Articulation Agreement by Department' effective during the 2019-2020 Academic Year. It lists courses from both institutions: To: California State University, Fullerton 2019-2020 General Catalog, Semester; From: Irvine Valley College 2019-2020 General Catalog, Semester. The 'Computer Science' section shows equivalents for CPSC 120, 121, 131, 223J, 223H, 223N, 223P, 240, 253U, and 254, along with other courses like CS 36, 37, 41, 30, 38, 39, 10, 40A, and CIM 161. A note indicates 'No Course Articulated' for CPSC 254. The page ends with 'END OF AGREEMENT'.

If you explore the page, you will see that IVC offers equivalents for all of the required lower-division CS courses. IVC CS 36, 37, 41, 38, 40A, and 40B articulate to CPSC 120, 121, 131, 223J, and 240, which are the entirety of the Lower-Division Core courses. IVC MATH 3A, 3B, 30, and 31 articulate to CSUF MATH 150A, 150B, 270A, and 270B, which are all Mathematics Requirements except MATH 338. IVC PHYS 4A, PHYS 4B, and MATH 4A articulate to

CSUF PHYS 225, 225L, 226, 226L, and MATH 250A, which together satisfy the Science and Mathematics Electives requirement.

5.2 Computer Science Placement Examination

Our courses CPSC 120 and CPSC 121 cover computer programming. If you are proficient in this material, but do not have academic credit, you may attempt to establish your proficiency and skip one or both courses by taking the Computer Science Placement Examination. If you have taken CPSC 120, 121, or 131 at CSUF, you are not eligible to take the Placement Examination.

The date, time, and location of Placement Exams are given in the Department Placement Exams section of the Registration Guide for the current term. Before you show up in the exam please contact the Undergraduate Coordinator to understand whether the exam is appropriate for you.

5.3 Missing CPSC 120 or 121

If you bypass CPSC 120 by passing the Computer Science Placement Examination, you will be short 3 units in the Lower Division Core major requirement. Likewise, if you bypass both CPSC 120 and 121, you will be short 6 units. Some uncommon transfer situations can also cause you to be short on units, for instance if you transfer from a school on the quarter system.

If you are short on Lower Division Core units, you will need to earn substitute units by taking extra units of CPSC 223 and/or Computer Science Major Electives (listed in Section 3.8).

5.4 Advanced Placement (AP)

If you took the Computer Science AP exam and scored well, you may be able to get credit for CPSC 120, or both 120 and 121. See the Credit by Advanced Placement Chart http://www.fullerton.edu/ecs/_resources/pdf/new_student_advising_reg/2021_registration/CreditByExamAP_CLEP_IB_2021.pdf.

5.5 Internships

Learning takes place in many settings, not just in the classroom. When you complete your educational career and are entering the professional job market for the first time, extensive professional experience can be highly beneficial. For this reason, the University and the Computer Science Department maintain an active internship program as a service to all students interested in obtaining employment while still in school.

Academic internships bear credit at CSUF. Students enroll in an internship course and complete course requirements. The number of units you receive depends on the number of hours you complete at your internship site.

Hours at Internship Site	Units
40–60 hours	1 unit
80–100 hours	2 units
120–150 hours	3 units

An academic internship is a work-learning partnership between a student, the university, and a host company or organization that bears a direct relationship to a student's major and professional goals.

EGGN 495 is a “supervision only” class. There are no class meetings. Students will receive a letter grade at the end of the semester based on their performance in the internship project. As far as the coursework is concerned, all that is required is that students complete the internship with the company and submit a final report by the end of the semester. The company name and the project supervisor’s name must be included in the report. The report does not have to be approved/signed by the company. Students should address the following items in the report:

1. Details of the project.
2. Tasks the student was primarily responsible for.
3. What the student learned from the project he/she completed.
4. How the project benefited the student from an academic standpoint.

Benefits of the internship program in Computer Science include:

- Industrial work experience.
- Job placement assistance from the Center for Internships & Community Engagement (CICE) (<http://www.fullerton.edu/cice/students/internships.php>).
- Up to 3 units of credit.

We recommend that you consider an internship when you reach junior or senior status.

To register for an internship, follow the instructions at CICE’s website (<http://www.fullerton.edu/cice/students/internships.php>).

The ECS students must follow the ECS Internship process <https://www.fullerton.edu/ecs/resources/ecs-academic-internship.php>

5.6 International Students

International students must obtain a *CPT I-20* form from the International Education and Exchange office in UH-244. Check with IEE for admissible dates prior to completing the CICE Registration.

5.7 ROTC

Computer Science majors interested in joining the Reserve Officers' Training Corps (ROTC) program should schedule a long appointment (30 minutes) with an advisor in their freshman year to map out the complete study plan. Prior to the meeting, the student must obtain the proper documents from ROTC office located in MS-101 (Military Science Building room 101) and bring those documents with them to the advising session.

5.8 Independent Study

You may take CPSC 499 Independent Study as an Upper Division CS Elective. This course allows you to pursue a topic that is not covered by any regular course, under the supervision of a faculty advisor.

All independent study applications must be approved by the study's faculty advisor and department chair by the end of the semester prior to the proposal's start date. That means independent study proposals for the Fall are due in by the end of the previous Spring semester, and proposals for the Spring are due in the previous Fall semester.

You must submit an Independent Study Application to the department office, which will supply the form. As stated on the form, the Application must be accompanied by a study plan which includes the study's objective(s), the study's outcome(s), a 16 week study plan, the basis for evaluation, and the date(s) that student work is due. A template is available at <http://csufcs.com/isplan>.

You may take up to three units per semester, and apply a maximum of six units towards the degree.

You will not be able to register for this course until the Department grants you permission to do so. You should contact the Department to verify that this has been done.

Graduate students may not enroll in CPSC 499. Graduate students interested in self-directed study should consider CPSC 597, 598, or 599 instead.

5.9 Petitioning for Classes

When a class is closed because all the seats in the class are full, a student may petition to add the course once the semester begins. This is where a student attends the class and places his or her name on the paper waiting list that the instructor passes out in class.

The Titan Online waiting lists, also called the *electronic waiting lists*, have no impact on the petitioning process and the Department's paper waiting lists.

The paper waiting lists are returned to the CS Department Office and the Department attempts to enroll as many students as possible, giving priority to those closest to graduation. This process does not guarantee enrolling in the desired course.

Students are encouraged to attend as many classes as possible to maximize the number of waiting lists their name appears on. This signals to the Department office that you are able to attend the course. The use of proxies (asking friends to attend the class for you) is prohibited and is considered an act of academic dishonesty.

5.10 Request Forms

The TDA software system usually does a good job of automatically tracking your completion of major and minor requirements. Unfortunately, though, it may mishandle exceptional circumstances, such as a transfer from a university on the quarter system. If your TDA is inaccurate, you need to ask the Department to correct your TDA manually.

There are three forms that you can use to request that the Department adjust your TDA.

1. Use the *Domestic Course Articulation Request* to ask the Department whether courses from another college or university in the United States can count toward Computer Science major or minor requirements.
2. Use the *International Course Articulation Request* to ask whether courses from a college or university in a different country can count toward Computer Science major or minor requirements.
3. Use the *Undergraduate Course Reallocation Request* form to ask the Department to reallocate a course that appears on your TDA which does not appear in the correct category. This may happen if you have taken an advisor-approved elective which was not automatically recognized by the TDA software, you have changed catalog years, or courses transferred from another institution appear uncatagorized or the incorrect category. Another common case is when you take a course that was created after your catalog year. For example, CS 223C and the cybersecurity courses are new courses that do not appear on the 2007 or 2011 TDAs. Use *Undergraduate Course Reallocation Request* to count these courses towards your degree.

Blank forms are available at <http://www.fullerton.edu/ecs/cs/resources/documents.php>, or as hard-copies in the Department office. To file a request, submit a completed hard-copy form to the Department office or email to csoffice@fullerton.edu. The request will typically be processed within ten business days. The outcome of the request will be communicated to the applicant through an Advising Note in the applicant's TDA. The Department Chair or designee has sole discretion to approve or deny these requests and those decisions are final and non-negotiable.

6

Advisement

It can be frustrating to find out that you took a class that wasn't useful for your course of study. Not being able to take a class when you want because of a needed prerequisite is even worse—it slows your progress and can delay your graduation. To avoid problems like these, the University offers advisement counseling to all students. This is your opportunity to review your progress toward your degree and to discuss electives that match your career goals.

Developing the skills in identifying and connecting with formal and informal advisors and mentors is a skill that students need to develop. Set a goal for yourself to find mentors who will support you and keep you motivated on your path through the university.

6.1 General Advice

Any student who wishes to discuss any concern may contact the Student Success Center. Find out contact information here: <http://www.fullerton.edu/ecs/resources/StudentSuccessCenter.php>

6.2 Major Advisement

Students may seek major advising from major advisors in the computer science department and through the ECS Student Success Center.

The Student Success Center on the second floor of the Computer Science Building can answer many of your questions regarding General Education as well. They are located in room CS 201. Their phone number is 657-278-3879. Their web site is <https://www.fullerton.edu/ecs/resources/StudentSuccessCenter.php>

Computer Science department advisors are members of the faculty and you may schedule an appointment to see one by contacting the department office. The contact information for the department is in Section 1.2. The following web-page provides the Academic Advisement information <http://www.fullerton.edu/ecs/cs/resources/advisement.php>

6.3 Required Advisement

The College of Engineering and Computer Science places a registration hold on all undergraduate students once a year to ensure the student meets with a department advisor. You will not be able to register for any courses until you consult with a department advisor and the hold is subsequently removed.

Students who are in good academic standing and have the last two digits of their CWID ending in an odd number are required to complete mandatory advisement in the Fall term. Students in good academic standing and have the last two digits of their CWID ending in an even number are required to complete mandatory advisement during the Spring term.

Freshmen and sophomore students must see an advisor in the ECS Student Success Center to lift the registration hold. Junior and senior students must see one of the department's major advisors to lift the registration hold.

Probation students are required to complete mandatory advisement every semester regardless of odd/even CWIDS. Detailed information is at <http://www.fullerton.edu/ecs/cs/resources/advisement.php>

6.4 General Education (GE) Advisement

The University encourages all students to seek GE advisement, each semester, well in advance of registration. You may obtain information about the CSUF GE curriculum and degree requirements by visiting the Academic Advising Center in UH-123B.

6.5 First-time Freshmen

You should make an appointment to see the adviser as early as possible. It is very important that you understand the program and the sequence in which you should take courses. The freshmen advising is conducted in the Student Success Center <https://www.fullerton.edu/ecs/resources/StudentSuccessCenter.php>

6.6 Career Advising

The CSUF Career Center is online at <http://www.fullerton.edu/career/>. You should make an appointment to see the ECS Career Specialist at <https://www.fullerton.edu/ecs/resources/StudentSuccessCenter.php>

6.7 Studying Abroad

The Study Abroad Office, <http://international.fullerton.edu/study-abroad>, can connect you with international opportunities that will fit into your study plan. The office is located in University Hall 244. Their phone number is

(657) 278-2787 and they can be reached by email at sabroad@fullerton.edu. Search their database of programs at <http://fullerton-sa.terradotta.com/index.cfm?FuseAction=Programs.AdvancedSearch>.

6.8 Transfer Students

You should make an advisement appointment as early as possible. The department adviser can answer your questions about transfer credit for general education courses and can evaluate courses that apply to your major. Please bring any transcripts or grade reports you have, official or not, to this appointment. A catalog from your prior institution may be useful, particularly from those outside the Orange County area.

6.9 Nearing Graduation (Within One Year)

After completing 90 units of coursework, you are eligible to apply for graduation. The only way to apply for graduation is online through the TITAN Online Student Center. You cannot graduate without a completed Grad Check. The University Catalog has more information on Grad Checks (<https://catalog.fullerton.edu/content.php?catoid=17&navoid=2049#graduation-requirement-check>). You may make an appointment to see the ECS Graduation specialist at the Student Success Center.

6.10 Probation

If you are on probation, it is definitely time to see an adviser. Until you do so, a hold will be in place on your file, preventing you from registering in classes. Your adviser will discuss with you the problems that led to your probation and review strategies you should take to get off probation. Make your advisement appointment early so your registration is not held up.

6.11 Peer Advising & Clubs

There are lots of student clubs on this campus for all sorts of interests. Visit <http://www.fullerton.edu/sll/involvement/clubs/> and look at the different clubs that are at CSU Fullerton. You start your own club if you don't see a club that aligns to your interests.

Some clubs that are computer science clubs are ACM, ACM-W, OSS, Machine Learning club.

Sample Four Year Plans

The following two pages are an example of semester-by-semester class plans through the B.S. program and the cyber-security concentration. These plans completes all major requirements in 8 semesters (4 years), satisfy all prerequisites along the way, and follow all tips in this Handbook.

Roadmap for BS in Computer Science (Catalog Year 2022 – 2023)

First Semester			Second Semester			Third Semester			Fourth Semester		
AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS
Computer Science Core	CPSC 120A + 120L	3	Computer Science Core	CPSC 121A + 121L	3	Computer Science Core	CPSC 131	3	Computer Science Core	CPSC 223	3
Mathematics Requirements	MATH 170A (270A)*	3	Mathematics Requirements	MATH 170B (270B)*	3	Mathematics Requirements	MATH 150B	4	Computer Science Core	CPSC 240	3
GE subarea A.1 Oral Communication		3	Mathematics Requirements	MATH 150A	4	Science and Math Elective I + Lab		4	Science and Mathematics Elective II		4
GE subarea A.2 Written Communication		3	GE subarea C.1 Introduction to the Arts		3	GE subarea C.3/Z Explorations in Arts or Humanities/Cultural Diversity Requirement		3	Science and Mathematics Elective III		4
GE subarea D.1 Introduction to the Social Sciences		3	GE subarea C.2 Introduction to the Humanities		3	GE subarea D.2 American History, Institution & Values		3	Graduation Requirement in American Government		3
Total		15	Total		16	Total		17	Total		17

*Math 270A/B -> 170A/B

+Upper-Division

Fifth Semester			Sixth Semester			Seventh Semester			Eighth Semester		
AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS
Computer Science Core	CPSC 351	3	Computer Science Core	CPSC 332	3	Computer Science Core	CPSC 323	3	Computer Science Core	CPSC 315	3
Computer Science Core	CPSC 253 (353)*	3	Computer Science Core	CPSC 335	3	Computer Science Core	CPSC 481	3	Computer Science Core	CPSC 491	3
Computer Science Core	CPSC 362	3	Computer Science Core	CPSC 471	3	Computer Science Core	CPSC 490	3	CPSC Elective IV		3
Mathematics Requirements	MATH 338	4	CPSC Elective II		3	CPSC Elective III		3	CPSC Elective V		3
CPSC Elective I		3	F. Ethnic Studies		3	Total		12	Total		12
Total		16	Total		15						

*CPSC 353 -> 253

See the University Catalog (for your Catalog Year): <https://catalog.fullerton.edu/>
(e.g.) for 2021-2022 Catalog Year: https://catalog.fullerton.edu/preview_entity.php?catoid=70&ent_oid=7941&returnto=8443

Run your Titan Degree Audit (TDA) to see the degree requirements: <http://records.fullerton.edu/academics/degreeaudit.php>

Advising (for new & transferred students): <http://www.fullerton.edu/ecs/resources/StudentSuccessCenter.php>

Advising (for junior & senior students): <http://www.fullerton.edu/ecs/cs/resources/advise ment.php>

For CS-minor & graduate programs: <http://www.fullerton.edu/ecs/cs/degree/>

CSU Fullerton – Department of Computer Science: <http://www.fullerton.edu/ecs/cs/>

Roadmap for BS in CS (CyberSecurity Concentration) 2022– 2023

First Semester			Second Semester			Third Semester			Fourth Semester		
AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS
Cybersecurity Core	CPSC 120	3	Cybersecurity Core	CPSC 121	3	Cybersecurity Core	CPSC 131	3	Cybersecurity Core	CPSC 223	3
Mathematics Requirements	MATH 170A (270A)	3	Mathematics Requirements	MATH 170B (270B)	3	Mathematics Requirements	MATH 150B	4	Cybersecurity Core	CPSC 240	3
GE subarea A.1 Oral Communication		3	Mathematics Requirements	MATH 150A	4	Cybersecurity Core	CPSC 253	3	Cybersecurity Core	CPSC-351	3
GE subarea A.2 Written Communication		3	GE subarea C.1 Introduction to the Arts		3	GE subarea C.3/Z Explorations in Arts or Humanities/ Cultural Diversity Requirement		3	Cybersecurity Elective I		3
GE subarea D.1 Introduction to the Social Sciences		3	GE subarea C.2 Introduction to the Humanities		3	Science and Math Elective I + Lab		4	Science and Mathematics Elective II		4
Total		15	Total		16	Total		17	Total		17

+Upper-Division

Fifth Semester			Sixth Semester			Seventh Semester			Eighth Semester		
AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS	AREA (as listed on TDA)	COURSE	UNITS
Cybersecurity Core	CPSC 362	3	Cybersecurity Core	CPSC 332	3	Cybersecurity Core	CPSC 323	3	Cybersecurity Core	CPSC 315	3
Cybersecurity Core	CPSC 456	3	Cybersecurity Core	CPSC 335	3	Cybersecurity Core	CPSC 481	3	Cybersecurity Core	CPSC 491	3
Mathematics Requirements	MATH 338	4	Cybersecurity Core	CPSC 471	3	Cybersecurity Core	CPSC 490	3	Science and Mathematics Elective III		4
GE subarea D.2 American History, Institution & Values		3	Cybersecurity Elective II		3	Cybersecurity Elective III		3	CPSC Elective V		3
Graduation Requirement in American Government		3	F. Ethnic Studies		3						
Total		16	Total		15	Total		12	Total		13

See the **University Catalog** (for your Catalog Year): <https://catalog.fullerton.edu/>
(e.g.) for 2022-2023 Catalog Year: https://catalog.fullerton.edu/preview_entity.php?catoid=75&ent_oid=8655&returnto=9871

Run your **Titan Degree Audit (TDA)** to see the degree requirements: <http://records.fullerton.edu/academics/degreeaudit.php>

Advising (for new & transferred students): <http://www.fullerton.edu/ecs/resources/StudentSuccessCenter.php>
Advising (for junior & senior students): <http://www.fullerton.edu/ecs/cs/resources/advancement.php>

For CS-minor & graduate programs: <http://www.fullerton.edu/ecs/cs/degree/>

Academic Calendar: <https://apps.fullerton.edu/AcademicCalendar/>
Registration Calendars: <http://records.fullerton.edu/apps/calendars.aspx>

How to register: <http://records.fullerton.edu/registration/>

CSU Fullerton – Department of Computer Science: <http://www.fullerton.edu/ecs/cs/>

8

Credits and Revision History

Copyright 2015–2018, Department of Computer Science, California State University, Fullerton.

This document has been maintained by Sandra Boulanger, David Falconer, Mikhail Gofman, Michael Shafae, and Kevin Wortman.

Last revision by Shanw X. Wang for the 2020 - 2021 and 2022 - 2023 editions.

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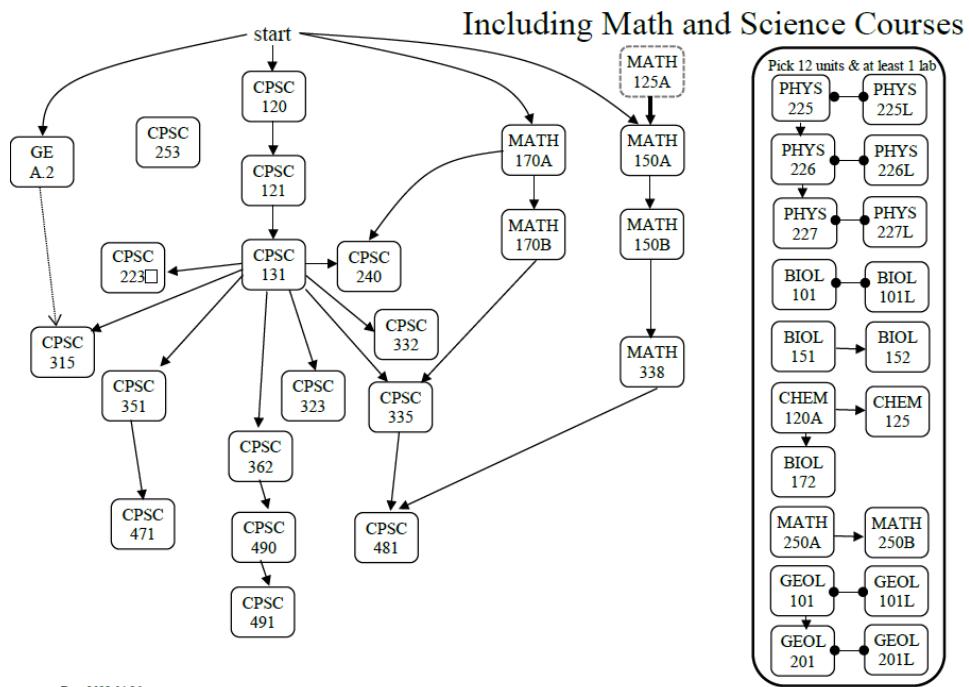


Figure 8.1: Prerequisite relations for the BS CS Core

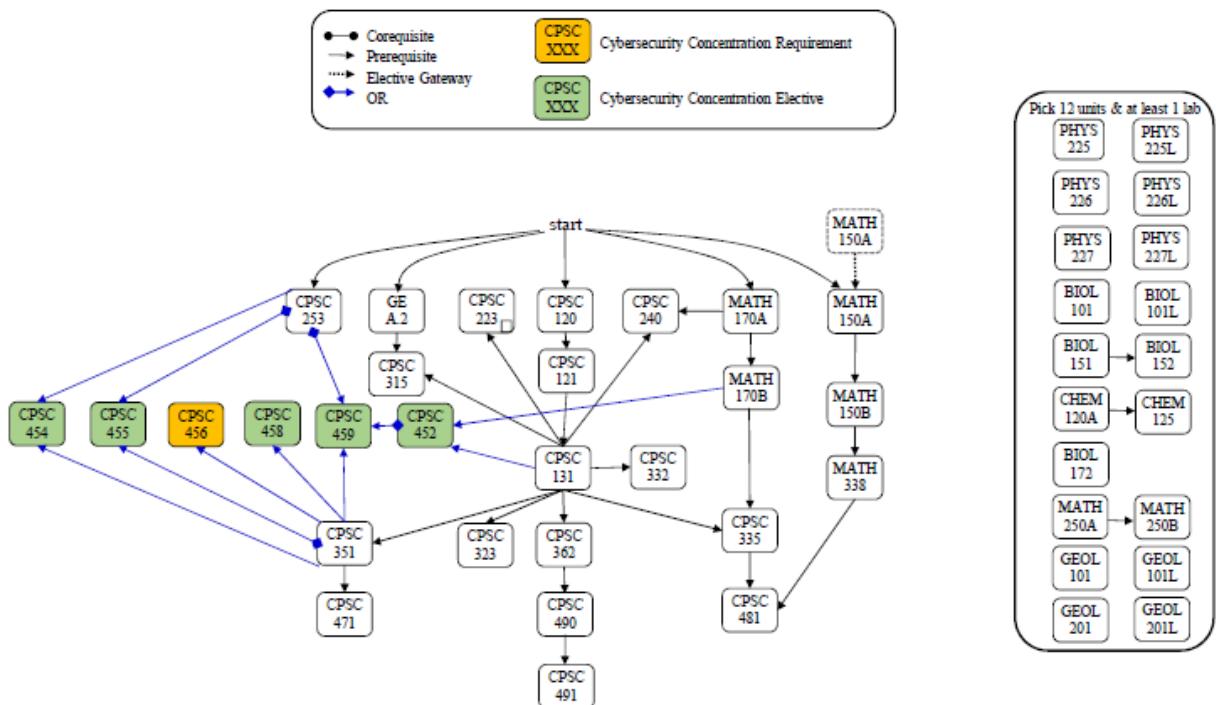


Figure 8.2: Prerequisite relations for the BS CS with Cybersecurity Concentration