

The New Computer Science Curriculum

March 2021

A new curriculum has been designed and will go into effect as of Fall 2021. The changes start with the lower division courses in the coming Fall and over the next several semesters other changes will be implemented. The purpose of this document is to provide information about the new curriculum, and explain how the changes will affect current and new students. Please note that this announcement is intended to generally inform students of the changes. We will provide updates on special cases as they become available.

What was the need for a new curriculum?

The computer science discipline has gone through major changes in the past two decades. Computer science has vastly expanded with a number of specialization areas. A few subjects such as artificial intelligence that were previously considered highly specialized have now become mainstream CS topics. Several of the courses that were previously upper division courses are now taught at lower division due to the maturation of these subjects. Our existing computer science syllabi had to be updated to keep up with these changes. The proposed program, designed by the CS department curriculum committee, has taken these trends into consideration. These changes are not only important from the academic viewpoint, but will also help to satisfy industry needs, and will prepare students for competitive employment opportunities, as well as maintaining the program accreditation.

What are the differences between the existing and new curriculums?

1. **Preparation for major** courses have undergone substantial changes as follows:
 - (a) CS107-Introductory Programming and CS108-Intermediate Programming have been updated as CS150 and CS160 to include more material with the addition of two 1-unit lab components CS150L and CS160L.
 - (b) CS237- Machine Organization and Assembly Language has been updated into CS240- Computer Organization to emphasize interconnection between software and hardware.
 - (c) A new course, CS250 Introduction to Software Systems, has been added that introduces principles and practices of software engineering at the lower division.
 - (d) CS310-Data Structures has been updated and its number has been changed to CS210 as many upper division courses have this fundamental CS course as a prerequisite.
2. **Required science courses:** Required mathematics courses have not changed, they remain as Math 150, 151, 245, 254 and STAT 250. The free choice of one year sequence in science courses - physics, chemistry and biology - has been restricted to physics sequence PHYS195+195L and PHYS196+196L as they are more relevant to CS, and also help in complying with the CSU's rules. The required science courses units have been reduced from 12 units to 8 units.
3. **Upper division required courses** have also gone through several changes as follows:

- (a) A new course CS450 - Artificial Intelligence, has been added. This course introduces a subject that in recent years has matured and has become a main stream computer science topic with substantial growth in applications and job opportunities.
 - (b) CS560-Algorithms and their Analysis, as well as CS570-Operating Systems have now been somewhat redesigned as CS460 and CS480. Renumbering these courses would allow students to take subsequent courses in a timely manner. In addition, CS560 and CS570 were not available for graduate credit, and being 500 level courses required checking and also confusion among graduate students. By demoting their numbers this problem is resolved.
 - (c) CS 490- Senior Seminar and CS 440-Social, Legal and Ethical Issues in Computer Science have been removed from the requirements and their contents have been spread among several CS courses. CS 530 – Systems Programming has become an elective course.
4. **Elective courses:** The elective courses have been restructured, and three areas of computer science that are in much need in industry and their relevant courses have been identified. The areas are identified as (i) Computer Systems, (ii) Intelligent Systems and (iii) Data Science. While students can take their electives from courses under any of the three areas, the division of courses into these areas provides a guidance for students if they choose to specialize in one or two areas. In addition several new courses have been introduced to keep up with the trends and applications. These courses are CS549-Machine Learning, CS561-Natural Language Processing and CS577-Principles of Techniques of Data Science.

How Does the New Curriculum Affect CS Majors?

(a) Students who are already CS majors, CS pre-majors or those who can declare a CS major before the Fall 2021 semester begins have the following two choices:

- (i) Use the catalog in effect when the student declared their major. In this case these students will be minimally affected by the changes in the curriculum. In some instances they may need to take a substitute course if the old required course is no longer offered when they want to take it. Substitute courses are listed in Table 1.
- (ii) Use the catalog in effect at the semester in which the student graduates. In this case the students must follow the new curriculum.

Note that a similar rule is in effect for General Education (GE) requirements; i.e. students can follow the GE catalog for the year they started at a California university or a community college, or they may instead comply with the GE requirements in the year in which they graduate assuming continuous enrollment.

(b) Currently, students attempting to declare a Computer Science major must first complete ALL the lower-division CS/Math/Science requirements with acceptable grades.

What are Equivalent and Substitute Courses?

As mentioned above, the new curriculum will be gradually phased in, and old courses will be removed or substituted with the new courses. If a student, who entered the CS before Fall of 2021, wishes to take a required course that is no longer offered, they can take an equivalent or a substitute course given in the following table.

Table 1: Substitute courses

Current required courses	New required courses	Comment
CS 107	CS 150 + CS 150L	Equivalent
CS 108	CS 160 + CS 160L	Equivalent
CS 237	CS 240	Equivalent
	CS 250	Added in the new curriculum
CS 310	CS 210 or CS 496-Data Structure*	Equivalent
CS 320	CS 520	Substitute
CS 370	CS 370	Equivalent
CS 440	CS 450	Substitute
CS 490	None	Not required in the new curriculum
CS 530		Elective in the new curriculum
CS 560	CS 460	Equivalent
CS 570	CS 480	Equivalent

*Not available for students beginning the CS program in Fall 2021 and later.

How Does the New Curriculum Affect CS Minors?

(a) Students who are already CS minors or those who can declare a CS minor before the Fall 2021 semester begins have the following two choices:

- (i) Use the catalog in effect when the student declared their minor. In this case these students will be minimally affected by the changes in the curriculum. In some instances they may need to take the substitute courses (Table 1) if the old required course is no longer offered when they want to take it.
- (ii) Use the catalog in effect at the semester in which the student graduates. In this case the students must follow the new curriculum.

Note that a similar rule is true for General Education (GE) requirements; i.e. students must follow the GE catalog for the year they started at a California university or a community college, or they may instead comply with the GE requirements in the year in which they graduate assuming continuous enrollment.

(b) Students still working on becoming a CS minor when Fall 2021 semester starts thus will be required to follow the new CS curriculum. Current students attempting to declare a Computer Science minor must first complete CS107 (or CS150+150L if they have not already completed CS107) and CS108 (or CS160+160L if they have not already completed CS108) with acceptable grades. CS496 - Data Structures, or CS496 –Data Structures for Scientists and Engineers, is equivalent to CS 310 or CS201. Only three units of these four data structures courses can be counted towards the degree. Minors should review upper division courses for prerequisites which may include CS 240 or CS 250.