

# Course Profile --- CSC 320 Computer Architecture

## Catalog Description:

*Prerequisite: CSC 131.*

Introduction to the architecture and internal operation of computers, including assembly language. A study of the major components, functional organization, and sequential operation of digital computers during program execution. Several computer architectures will be studied. 4(4-0) F,S

This course is a prerequisite to CSC 333 and CSC460.

## Required Texts:

David A. Patterson and John L. Hennessy, Computer Organization and Design, Morgan Kaufmann, ISBN: 9780123747501

## Major Topics

1. The importance of computer architecture
2. Calculation of CPU execution time of processors
3. Steps for translating and starting a high programming language program and relationships among high programming language programs, assembly language codes, and machine codes
4. Arithmetic operations, logical operations, bit operations and masking
5. Programming with assembly language, such as loops, decision, procedure call, stacks and pointers.
6. Representation of integers, IEEE 754 floating point standard numbers, and strings
7. Relationship of an arithmetic algorithm to the hardware that implemented it
8. Single-Cycle circuit for implementation of a computer architecture
9. Pipelined circuit for implementation of a computer architecture
10. Stalls and hazards in pipelined circuit
11. Concepts of memory hierarchy
12. Concepts of locality
13. Organization of cache
14. Performance of multiple level cache

## Student Learning Outcomes Assessed in CSC 320

- A. Students will attain an ability to apply knowledge of computing and mathematics appropriate to the discipline
- B. Students will attain an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
- C. Students will attain an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

## CAC Characteristics Enabled But Not Assessed in CSC 320

- D. Students will attain an ability to function effectively on teams to accomplish a common goal
- I. Students will attain an ability to use current techniques, skills, and tools necessary for computing practice

**Table 1. Student Learning Outcomes assessed by CSC 320**

<b>CSC 320 Student Learning Outcomes</b>	<b>CSC 320 Performance Indicators</b>	<b>CSC 320 Assessment Goals</b>
<b>CSC 320 contributes to SO A:</b> Students will attain an ability to apply knowledge of computing and mathematics appropriate to the discipline	<b>PI 320-1a:</b> Improve the execution time of a program according to Amdahl's Law	<b>PI 320-1a:</b> $\geq 70\%$ getting passing grade
	<b>PI 320-1b:</b> Calculate the CPU time for running a program on a computer, and evaluate the performance of computers.	<b>PI 320-1b:</b> $\geq 60\%$ getting passing grade
	<b>PI 320-1c:</b> Represent floating-point numbers in computers according to IEEE 754 standard	<b>PI 320-1c:</b> $\geq 60\%$ getting passing grade
<b>CSC 320 contributes to SO B:</b> Students will attain an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution	<b>PI 320-2a:</b> Write assembly codes to solve simple problems that use loops, procedure call, several types of registers, memory address accessing, and system calls	<b>PI 320-2a:</b> $\geq 70\%$ getting passing grade
<b>CSC 320 contributes to SO C:</b> Students will attain an ability to design, implement, and evaluate a computer-based system, process, component,	<b>PI 320-3a:</b> Understand hazards in pipelined circuit implementation of processors and the effect on instruction throughput.	<b>PI 320-3a:</b> $\geq 70\%$ getting passing grade

or program to meet desired needs	<b>PI 320-4a:</b> Understand the basic implementation principles of data path in single-cycle circuit processor	<b>PI 320-4a:</b> >= 60% getting passing grade
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**Table 2. CAC Characteristics enabled by CSC 320**

<b>CSC 320 CAC Characteristics</b>	<b>CSC 320 Characteritics Enablers</b>
<b>CSC 320 enables Characteristic D:</b> Students will attain an ability to function effectively on teams to accomplish a common goal	<b>CE 320-1.</b> Students form groups to complete a project which require that students understand the VGA output by using the Altera DE2 development and education board.
<b>CSC 320 enables Characteristic I:</b> Students will attain an ability to use current techniques, skills, and tools necessary for computing practice	<b>CE 320-2.</b> Students write assembly language programs designed by the instructor to meet given specifications.