

**Submitting College:** VCCS – Transfer VA

**Course Title:** CSC 205: Computer Organization

### **Course Description**

Examines the hierarchical structure of computer architecture. Focuses on multi-level machine organization. Uses assembler programming to complete simple projects. Includes processors, instruction, execution, addressing techniques, data representation and digital logic. Lecture 3 hours. Total 3 hours per week. 3 credits

### **General Course Purpose**

CSC 205 or CSC 215 is intended to fulfill a first course in Computer Architecture, Organization and Systems in the CS curriculum. The focus of CSC 205 is on Architecture and Organization with a sampling of Systems content.

### **Course Prerequisites/Corequisites**

CSC 221

### **Course Objectives**

Upon completing the course, the student will be able to:

#### **Machine level data representations**

- Describe how numbers, text, analog, and other information are stored in a digital form
- Interpret computer data representation of unsigned integer, signed integer (in 2's complement form) and floating-point values in the IEEE-754 formats
- Explain the impact due to the limitations of data representations such as rounding effects and how their propagation affects the accuracy of chained calculations, overflow errors, and mapping of continuous information to discrete representation

#### **CPU and Instruction set architectures**

- Differentiate various instruction set architectures
- Correlate instruction set architecture, microarchitecture, and system architecture
- Explain the concept of an instruction set architecture, ISA, and the nature of a machine-level instruction in terms of its functionality and use of resources (registers and memory).
- Define the various classes of instruction: data movement, arithmetic, logical, and flow control
- Describe the low-level operation and architecture of a typical CPU, including components, data pathways, and control signals
- Explore Instruction Set Architecture (ISA) design options
- Discuss CPU and Cache performance
- Describe hardware multithreading techniques

#### **Memory Hierarchy**

- Identify the memory technologies found in computer processors, and computing systems

- Describe the various ways of organizing memory and the impacts on cost-performance tradeoffs, speed, capacity, latency, and volatility (also include long term storage with tape drives, hard drives, and SSDs with performance enhancements like RAID.)

### **Memory Model**

- Explains how high-level languages structure memory into stack, static, and dynamic regions and explain how each is used to include Mapping logical addresses to physical memory chips

### **Digital logic, digital systems, and digital design**

- Design a simple combinational circuit using logic gates
- Apply Boolean functions, algebraic theorems, and Karnaugh Maps to simplify combinational circuits
- Explain the role feedback plays in sequential circuits
- Identify and analyze common combinational and sequential circuits used in computer systems.
- Language hierarchy
- Explain how programming language abstractions at multiple levels are translated to lower levels and are executed

### **I/O**

- Explain how interrupts are used to implement I/O control and data transfers.
- Identify various types of buses in a computer system and describe how devices compete for a bus and are granted access to the bus.

### **Major Topics to be Included**

CPU and Instruction set architectures

Memory Hierarchy

Memory Model

Digital logic, digital systems, and digital design

Language hierarchy

I/O