COURSE OUTLINE

Course Number	Course Title	Credits
COS 231	**Fundamentals of Computer Architecture**	**4**
Hours: Lecture/Lab/Other	**Co- or Pre-requisite**	**Implementation Semester & Year**
3 lecture / 2 lab	**Pre-requisite: COS 102**	**Spring 2022**

Catalog description:

Explores the levels of organization in digital computers: logic circuit design, integrated circuits and assembly language coding.

General Education Category:
Not GenEd

Course coordinator:

Meimei Gao, 609-570-3483, gaom@mccc.edu

Required texts & Other materials:
Murdocca & Heuring, Principles of Computer Architecture, ISBN-10: 0201436647, ISBN-13: 978-0201436648 (optional)
Complementary materials will be provided by the instructor in class
A microcontroller kit: the detailed info will be provided by the instructor in class

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:

1. Describe the structure and organization of computers [Supports ILG # 4, 11; PLO #1]
2. Describe data representations and manipulation in Computer Systems [Supports ILG # 2, 4, 11; PLO #1, 2, 3]
3. Implement machine structures in terms of digital circuits and logic gates [Supports ILG #2, 4, 11; PLO #1, 2, 3]
4. Describe instruction set structures and instruction processing [Supports ILG # 4, 11; PLO #1, 2]
5. Write assembly language programs [Supports ILG # 4, 11; PLO #1, 2]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.
Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for Computer Science AS (PLO)

1. Apply the fundamental concepts and techniques of computation, algorithms, and software design to a specific problem in a variety of applied fields;
2. Provide detailed specifications, analyze the problem, and design a solution that functions as desired, has satisfactory performance, is reliable and maintainable, and meets desired criteria;
3. Apply a firm understanding in areas of mathematics and science.

Units of study in detail – Unit Student Learning Outcomes:

Unit I **Levels of Computer Architecture [**Supports Course SLO #1]

Learning Objectives

The student will be able to:

- Identify the basic parts of a computer.
- Formulate a high-level view of a computer system.

Unit II **Data Representation [**Supports Course SLO #2]

Learning Objectives

The student will be able to:

- Explain how information is represented in a computer.
- Convert a binary number to a decimal number.
- Convert a decimal number to a binary number.
- Convert from binary to hexadecimal and conversely.
- Describe character codes.

Unit III **Digital Logic [**Supports Course SLO #3]

Learning Objectives

The student will be able to:

- Write truth table for AND, OR, NAND, NOR, NOT, XOR and XNOR gates.
- Simplify Boolean expressions.
- Interpret circuit diagrams.
- Analyze combinational circuits and sequential circuits.
- Analyze flip-flop circuits using timing diagram.

Unit IV **Instruction Set Architecture and Languages [**Supports Course SLO #2, 4, 5]

Learning Objectives

The student will be able to:

- Explain instruction processing.
- Interpret different Instruction formats and types.
- Describe the compilation and assembly processes.
- Use assembly language instruction sets to write assembly language programs.

Unit V **Memory and I/O Systems [**Supports Course SLO #1, 2, 4]

Learning Objectives

The student will be able to:

- Understand different types of memory, the memory hierarchy and cache mapping.
- Interpret virtual memory and paging.
- Explain I/O architectures and control methods.
- Describe I/O bus communications and transmission modes.

Unit VI **Alternative Architectures [**Supports Course SLO #1, 2, 4]

Learning Objectives

The student will be able to:

- Distinguish between RISC (Reduced Instruction Set Computer) and CISC (Complex Instruction Set Computer).
- Explain parallel and distributed architecture systems.

Evaluation of student learning:

Specific methods for evaluating student progress through the course is up to the discretion of the instructor. Below is an example:

Participation = 10% of the grade
Homework/Projects = 30% of the grade
Tests/Quizzes = 30% of the grade
Final Exam = 30% of the grade