**The University of Texas at Tyler**
**Department of Electrical and Computer Engineering**

# CMPE 4320: Computer Architecture and Design (Required)

## Syllabus

Catalog Description:

Introduction to computer architecture, RISC/CISC, processors, data path, control, ALU; pipelining, memory, cache, I/O, digital logic; micro architecture, instruction sets, addressing modes; operating systems, virtual memory, processes, assembly language.

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| Prerequisites: | COSC 2315 Computer Organization and EENG 4307 Microprocessors and Embedded Systems Design |

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| Credits: | ( | 3 | hours lecture, | 0 | hours laboratory per week ) | |

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| Text(s): | Patterson and Hennessy, **Computer Organization and Design, 5th ed.**, Morgan Kaufman, 2013, ISBN: 9780124077263 |

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| Additional Material: | TBD |

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| Course Coordinator: | Vijayalakshmi Saravanan, Assistant Professor, Electrical and Computer Engineering |

Topics Covered: (paragraph of topics separated by semicolons)

Introduction to Computer Architecture: structured computer organization, hardwired and programmed control, example computer families; Computer Systems: processors, memory organization, cache design, I/O organization; Digital Logic: circuits, memory, buses, hardware for integer and floating point operations; Microarchitecture: microprogramming, microinstructions, data path and control unit design; Instruction Set Architecture: opcodes, addressing modes, instruction formats and types; Operating Systems: virtual memory, processes; Assembly Language: macros, assemblers, linking and loading;

Evaluation Methods: (only items in dark print apply):

1. Examinations / Quizzes
2. Homework
3. Report
4. Computer Programming
5. Project
6. Presentation
7. Course Participation
8. Peer Review

Course Learning Outcomes[1]: By the end of this course students will be able to:

1. Explain a contemporary issue in computer architecture referring to relevant codes and standards as appropriate [3]
2. Evaluate the performance of a computer system given the hardware specifications [1]
3. Justify the need to design multicore processors to improve computer performance [1]
4. Solve design problems at the digital logic, microarchitecture, instruction set architecture level and explain the function of each level [1]

5. Convert decimal numbers to IEEE floating point numbers [1]
6. Contrast the differences between a RISC versus CISC architecture [1]
7. Discuss relevant professional ethics related to the professional practice of modern technology e.g. product reliability, effect on environment, teamwork ethics etc. [3]
8. Recognize how the memory hierarchy (registers, cache, RAM, disk) impacts performance [1]
9. Outline how pipelining is used to improve processor performance [1]
10. Describe the architecture of a superscalar processor [1]
11. Describe the impact of multicore processors on society [3]
12. Incorporate information gained by independent learning from technical reference manuals and other sources to implement a project (write subroutines in assembly language) and enhance reports [3,4]

[1]*Numbers in brackets refer to method(s) used to evaluate the course objective.*

Relationship to Student Outcomes (only items in dark print apply)[2]: This course supports the following Electrical Engineering Student Outcomes, which state that our students will possess:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics [3-6, 8-10]
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts [1, 7, 11]
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions [2]
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. [12]

[2]*Numbers in brackets refer to course objective(s) that address the Student Outcome.*

Contribution to Meeting Professional Component: (in semester hours)

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| Mathematics and Basic Sciences: | | hours |
| Engineering Sciences and Design: | 3 | hours |
| General Education Component: | | hours |

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| Prepared By: | Mukul V. Shirvaikar | Date: | 28 November 2022 |
| Updated By: | Vijayalakshmi Saravanan | Date: | 6 January 2026 |
| Updated By: | | Date: | |