Computer Science Department
cs.salemstate.edu

CSC 223 Microcomputing Systems (formerly CSC 330A) **4 cr.**

Instructor: TBA **Office:** location **Phone:** (978) 542-extension
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Section	Time	Room	Final Exam
nn	days and times	location	date and time
Lnn	days and times	location	

Catalog description:

The technology and functions of the microprocessor chip are discussed. Several different architectures are compared. Control functions, real-time techniques, interrupt processing, multiprocessing, and input/output operations are discussed from the microprocessor point of view. The role of high-level programming languages in microcomputer systems is treated. One or more specific microcomputer instruction sets will be used for programming assignments. Three lecture hours and two hours of scheduled laboratory per week. Not open to students who have received credit for CSC 330A.

Prerequisites: CSC 105, and CSC 110 or CSC 201J, and PHS 205.

Goals:

The purpose of this course is to introduce students to different microcomputer and microcontroller architectures, functions, and programming. More specifically,

CG01: to present an assortment of computer architectures and explain the differences among them;
CG02: to explain the functional parts of a microprocessor, including the ALU, control, memory, I/O, and buses;
CG03: to present the various parts of a microcontroller and the microcontroller units that are present in addition to the standard microprocessor configuration;
CG04: to present the instruction set of at least one simple microprocessor and the elements that are used to perform sequence, selection, and looping patterns;
CG05: to discuss problems associated with microcontrollers and their use in controlling simple functions and processes of a microcomputer chip.

Objectives:

Upon successful completion of this course, a student will have demonstrated the ability to:

CO01: diagram the configurations of the architecture of 16-, 32-, and 64-bit microprocessors;
CO02: explain the functional characteristics of the ALU, control unit, memory, I/O, and buses;
CO03: discuss analog-to-digital and digital-to-analog conversion, clocks, and counters;
CO04: write simple programs for microcomputers using the sequence, selection, and loop patterns expressed in the microprocessor machine language;
CO05: write simple programs for microcontrollers which detect and decode sensors and activate a proper response output.

Program Outcome vs. Course Objectives matrix

Program Objective (condensed form)	CO01	CO02	CO03	CO04	CO05
PO-A: apply knowledge of computing and math	✓	✓	✓	✓	✓
PO-B: analyze a problem and define its computing requirements		✓	✓	✓	✓
PO-C: design, implement and evaluate applications				✓	✓
PO-D: function effectively in teams to accomplish a common goal				✓	✓

Program Objective (condensed form)	CO01	CO02	CO03	CO04	CO05
PO-E: professional, ethical, and social responsibilities					
PO-F: communicate effectively with a range of audiences					
PO-G: local and global impact of computing on people and society					
PO-H: need for continuing professional development					
PO-I: use current techniques, skills, and tools	✓	✓	✓	✓	✓
PO-J: apply theory and principles to model and design systems					
PO-K: apply design and development principles in constructing software					
note - full statements of the Program Outcomes (program objectives) for the Computer Science Major can be found in the document *Computer Science Major Program Educational Objectives and Program Outcomes* on the Assessment page of the Computer Science Major (cs.salemstate.edu)					

Topics:

- Essential elements of a computer **AR1(1), AR2(1), AR4(2)**
  - Arithmetic/Logic Unit (ALU)
  - input/output (I/O) elements
  - memory element
  - Control Unit element
- Microprocessor: Most of a Computer on a Chip **AR6(4)**
  - microprocessor buses
  - microprocessor ALU, I/O, and Control elements
- Single-chip microprocessors
- Microcontrollers: I/O-oriented single-chip microprocessors **AR5(3)**
  - microcontroller I/O
  - interrupts
  - ALU
  - timers
  - parallel and serial I/O
  - external devices
  - configurations of microprocessors and microcontrollers
- Computer instruction set **AR3(2), AR7(4)**
  - desirable characteristics of instruction sets
  - instruction formats
  - addressing modes
  - SISC, RISC, and CISC
- Task-oriented instructions SE12(1), AR8(3) (not core)
  - instructions for business, text processing and data manipulation
  - scientific-oriented instructions
  - control-oriented instructions
- Microcontroller Unit (MCU) instruction sets
  - a comparison of four MCU instruction sets
  - I/O instructions
  - arithmetic instructions
  - bit-manipulation instructions
- Microcontroller software implementation **OS4(2), OS5(3)** OS6(4), OS7(3) (not core)
  - software development procedures
  - real-time process control
  - conversion from Petri Table to software
  - interfacing C and assembly language

Assignments:

There will be extensive laboratory exercises with one or more specific microcontrollers such as the Parallax Propeller. Assignments will be work-alone or group projects depending on the nature of the assignment and the availability of equipment. There will also be periodic written assignments.

Examinations:

There will be two one-hour examinations given in class, and a comprehensive two-hour final examination given during the scheduled final exam period.

Grading:

Final grades will be determined using the following approximate weights: written homework, 20%; lab experiments, 40%; hour examinations, 10% each; final examination, 20% .

Course Objective / Assessment Mechanism matrix

	Written Homework	Lab Exercises	Hour Exams	Final Exam
CO01	✓		✓	✓
CO02	✓		✓	✓
CO03	✓		✓	✓
CO04	✓	✓	✓	✓
CO05	✓	✓	✓	✓

Bibliography:

Brey, Barry B. **Microprocessor and System Design.** Newnes-elsevier, 2008

Crisp, John. **Introduction to Microprocessors and Microcontrollers.** Newnes-Elsevier 2nd Edition, 2004

Kumar, N. Senthil. **Microprocessors and Microcontrollers.** Oxford University Press USA, 2011

Peatman .**Microcomputer-based Design.** John Wiley 1995.

Rafiquzzaman. **Fundamentals of Digital Logic and Microcomputer Design. Fifth Edition.** John Wiley, 2005.

Rafiquzzaman, **Microprocessors and Microprocessor-Based System Design.** CRC Press, 2003.

Stallings. **Computer Organization and Architecture. Eighth Edition.** John Wiley, 2009.

Stokes, John. **Inside the Machine: An Illustrated Introduction to Microprocessors and Computer Architecture.** No Search Press, 2006

Wakerly. **Microcomputer Architecture and Programming. Fourth Edition.** John Wiley, 2001.

Academic Integrity Statement:

"Salem State University assumes that all students come to the University with serious educational intent and expects them to be mature, responsible individuals who will exhibit high standards of honesty and personal conduct in their academic life. All forms of academic dishonesty are considered to be serious offences against the University community. The University will apply sanctions when student conduct interferes with the University primary responsibility of ensuring its educational objectives." Consult the University catalog for further details on Academic Integrity Regulations and, in particular, the University definition of academic dishonesty.

The Academic Integrity Policy and Regulations can be found in the University Catalog and on the University website (http://catalog.salemstate.edu/content.php?catoid=13&navoid=1295#Academic_Integrity). The formal regulations are extensive and detailed - familiarize yourself with them if you have not previously done so. A concise summary of and direct quote from the regulations: "Materials (written or otherwise) submitted to fulfill academic requirements must represent a student's own efforts". *Submission of other's work as one's own without proper attribution is in direct violation of the University's Policy* and will be dealt with according to the University's formal Procedures. *Copying without attribution is considered cheating in an academic environment - simply put,* ***do not do it!***

University-Declared Critical Emergency Statement:

In the event of a university-declared emergency, Salem State University reserves the right to alter this course plan. Students should refer to www.salemstate.edu for further information and updates. The course attendance policy stays in effect until there is a university-declared critical emergency.

In the event of an emergency, please refer to the alternative educational plans for this course, which will be distributed via standing class communication protocols. Students should review the plans and act accordingly. Any required material that may

be necessary will have been previously distributed to students electronically or will be made available as needed via email and/or Internet access.

Equal Access Statement:

"Salem State University is committed to providing equal access to the educational experience for all students in compliance with Section 504 of The Rehabilitation Act and The Americans with Disabilities Act and to providing all reasonable academic accommodations, aids and adjustments. **Any student who has a documented disability requiring an accommodation, aid or adjustment should speak with the instructor immediately.** Students with Disabilities who have not previously done so should provide documentation to and schedule an appointment with the Office for Students with Disabilities and obtain appropriate services."

Note: This syllabus represents the intended structure of the course for the semester. If changes are necessary, students will be notified in writing and via email.