Knight Foundation School of Computing and Information Sciences

Course Title: Fundamentals of Computer Systems **Date:** 2/12/2018

Course Number: CDA 3103

Number of Credits: 3

Subject Area: Computer Organization	**Subject Area Coordinator:** Nagarajan Prabakar **email:** prabakar@cis.fiu.edu
Catalog Description: Overview of computer systems organization. Data representation. Machine and assembly language programming. This course will have additional fees.	
Textbook: Introduction to Computing Systems, 2nd Edition, Yale N. Patt, Sanjay J. Patel McGraw-Hill (ISBN: 0072467509)	
References:	
Prerequisites Courses: COP 2210	
Corequisites Courses: None	

Type: Required

Prerequisites Topics:

- High level programming language constructs
- Function call/return
- Parameters of a function(method)

Course Outcomes:

1. Master the representations of numeric and character data
2. Master the implementation of some basic combinational circuits, registers and memories
3. Be familiar with the data path of a simple von Neumann architecture and its relation to the instruction execution cycle
4. Master simple machine and assembly language programming
5. Master the implementation of high-level language constructs in lower levels: selection, iteration, function call/return
6. Be familiar with interrupts and traps

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Relationship between Course Outcomes and Program Outcomes

BS in CS: Program Outcomes	Course Outcomes
a) Demonstrate proficiency in the foundation areas of Computer Science including mathematics, discrete structures, logic and the theory of algorithms	1,2,3
b) Demonstrate proficiency in various areas of Computer Science including data structures and algorithms, concepts of programming languages and computer systems.	3,4,5
c) Demonstrate proficiency in problem solving and application of software engineering techniques	
d) Demonstrate mastery of at least one modern programming language and proficiency in at least one other.	
e) Demonstrate understanding of the social and ethical concerns of the practicing computer scientist.	
f) Demonstrate the ability to work cooperatively in teams.	
g) Demonstrate effective communication skills.	

Assessment Plan for the Course & how Data in the Course are used to assess Program Outcomes

Student and Instructor Course Outcome Surveys are administered at the conclusion of each offering, and are evaluated as described in the School's Assessment Plan: https://abet.cs.fiu.edu/csassessment/

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Outline

Topic	Number of Lecture Hours	Outcome
• Machine level representation o Numeric data representation o Signed & unsigned representation o Fixed- and floating-point systems o Integer arithmetic o Boolean operations	8	1
• Digital logic o Fundamental building blocks (logic gates, combinational circuits) o Von Neumann model o Instruction execution cycle	8	2,3
• Assembly level machine organization o Instruction sets and types o Assembly language programming o Addressing modes o Subroutines and system routines o I/O and interrupts o Bit level manipulation o Assembly process and linking	14	4,5
• Introduction to architecture o Hierarchy of virtual machines o Interpretation and translation o Simple machine architecture	8	3

Course Outcomes Emphasized in Laboratory Projects / Assignments

	Outcome	Number of Weeks
1	Data representation Outcome: 1	1
2	Digital circuit design Outcomes: 2	2
3	Architecture concepts Outcomes: 3	2
4	Machine language programming Outcomes: 4	2
5	Assembly language programming Outcomes: 5	2
6	Assembly language programming Outcomes: 5	2

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Oral and Written Communication:

No significant coverage

Social and Ethical Implications of Computing Topics

No significant coverage

Approximate number of credit hours devoted to fundamental CS topics

Topic	Core Hours	Advanced Hours
Algorithms:		
Software Design:		
Computer Organization and Architecture:	**2.0**	
Data Structures:		
Concepts of Programming Languages:	**1.0**	

Theoretical Contents

Topic	Class time
Boolean algebra	1.0

Problem Analysis Experiences

Implementation of high level programming language constructs in low level languages

Solution Design Experiences

1.	Digital circuit design
2.	Assembly language programming

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The Coverage of Knowledge Units within Computer Science Body of Knowledge[1]

Knowledge Unit	Topic	Lecture Hours
PL2	Virtual machine, hierarchy of virtual machines, intermediate languages	8
AR1	History of computer architecture, fundamental logic circuits, gate delays	8
AR2	Bits, bytes, and words, numeric data representation, fixed- and floating-point systems, signed and twos-complement representations, nonnumeric data (character codes, graphical data), representation of records and arrays	8
AR3	von Neumann machine, control unit; instruction fetch, decode, and execution, instruction sets and types (data manipulation, control, I/O), assembly/machine language programming, instruction formats, addressing modes, subroutine call and return mechanisms, I/O and interrupts	14

[1]See https://www.acm.org/binaries/content/assets/education/cs2013_web_final.pdf
a description of Computer Science Knowledge units