School of Computer Science

Course Title: Fundamentals of Computer Systems

Date: 10/30/03

Course Number: COP-3402

Number of Credits: 3

| Subject Area: Computer Systems | Subject Area Coordinator: Masoud Sadjadi
email: sadjadi@cis.fiu.edu |
|--------------------------------|--------------------------------|

Catalog Description:

Yale N. Patt, Sanjay J. Patel

References:

Prerequisites Courses: COP-2210 or equivalent

Corequisites Courses: MAD 2104

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
## School of Computer Science
### COP-3402
### Fundamentals of Computer Systems

### Outline

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

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data representation</td>
<td>1</td>
</tr>
<tr>
<td>Digital circuit design</td>
<td>2</td>
</tr>
<tr>
<td>Architecture concepts</td>
<td>2</td>
</tr>
<tr>
<td>Machine language programming</td>
<td>2</td>
</tr>
<tr>
<td>Assembly language programming</td>
<td>2</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Topic</th>
<th>Core Hours</th>
<th>Advanced Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algorithms:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software Design:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Organization and Architecture:</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Data Structures:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concepts of Programming Languages:</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

Theoretical Contents

<table>
<thead>
<tr>
<th>Topic</th>
<th>Class time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean algebra</td>
<td>1.0</td>
</tr>
</tbody>
</table>

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
## The Coverage of Knowledge Units within Computer Science Body of Knowledge

<table>
<thead>
<tr>
<th>Knowledge Unit</th>
<th>Topic</th>
<th>Lecture Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL2</td>
<td>Virtual machine, hierarchy of virtual machines, intermediate languages</td>
<td>8</td>
</tr>
<tr>
<td>AR1</td>
<td>History of computer architecture, fundamental logic circuits, gate delays</td>
<td>8</td>
</tr>
<tr>
<td>AR2</td>
<td>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</td>
<td>8</td>
</tr>
<tr>
<td>AR3</td>
<td>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</td>
<td>14</td>
</tr>
</tbody>
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1See [http://www.computer.org/education/cc2001/final/chapter05.htm](http://www.computer.org/education/cc2001/final/chapter05.htm) for a description of Computer Science Knowledge units