Course Description

30 Hours Lecture plus laboratory. 3 Credits.

An accelerated and selective introduction to three cornerstones of computer science: computer architecture, operating systems and networking. The course provides a survey of the principles and methodologies used in the design and implementation of modern computer systems and networks. The topics covered are essential to study of scientific digital forensics. Detailed theoretical and conceptual development of topics is complemented by practical laboratory exercises.

Prerequisites

Admission to the MS in Forensic Computing CSIBridge Program or permission of the Forensic Computing Program Director.

Prospective Course Outline

The topics below are the essential foundation concepts and skills to be included in the course. The organization and specific topics of the syllabus may vary based on the instructor.

<table>
<thead>
<tr>
<th>WEEK #</th>
<th>TOPICS</th>
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<tr>
<td>1</td>
<td>① Description of Class Requirements&lt;br&gt;② Evolutions of Computers&lt;br&gt;③ Basic Terminologies and Overview of Computer&lt;br&gt;  ④ bit, byte, word&lt;br&gt;  ⑤ Microcomputer, ALU, CPU&lt;br&gt;  ⑥ ROM, RAM, Register, BUS</td>
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<td>2</td>
<td>⑦ Number Systems&lt;br&gt;  ⑧ Decimal Number system&lt;br&gt;  ⑨ Binary Number system&lt;br&gt;  ⑩ Octal Number system&lt;br&gt;  ⑪ Hexadecimal Number system</td>
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</table>
Converting numbers from one base to another

- Binary-Coded-Decimal Code (8421 Code)

Arithmetic Operations
- Binary Arithmetic
- BCD Arithmetic

Concept of Error
- Parity
- Error detection and Correction

Boolean Algebra and Digital Logic Gates
- NOT
- OR
- AND
- NOR
- NAND
- XOR
- XNOR
- Venn Diagrams

Microcomputer Architecture, Programming and System Design Concepts
- Basic blocks of a Microcomputer
- Typical Microcomputer Architecture
- Single-chip Microprocessor
  - Register
  - Control Unit
  - Arithmetic and Logic Unit (ALU)
- Memory
  - RAM
  - ROM
  - READ and WRITE Operations
  - Memory Organization

Microcomputer Architecture, Programming and System Design Concepts
- I/O
  - Programmed I/O
  - Interrupt I/O
  - Direct Memory Access (DMA)
- Microcomputer Programming Concepts
  - Machine Language
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<td>5</td>
<td>&lt;ul&gt;&lt;li&gt;Assembly Language&lt;/li&gt;&lt;li&gt;High-level Languages&lt;/li&gt;&lt;/ul&gt;</td>
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<td>9</td>
<td>&lt;ul&gt;&lt;li&gt;The Web and HTTP&lt;/li&gt;&lt;li&gt;Overview of HTTP&lt;/li&gt;&lt;li&gt;Nonpersistent and Persistent Connections&lt;/li&gt;&lt;/ul&gt;</td>
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| 10   | HTTP Message Format  
|      | User-Server Interaction: Authorization and Cookies  
|      | The Conditional GET  
|      | HTTP Content  
|      | DNS--The Internet's Directory Service  
|      | Services Provided by DNS  
|      | Overview of How DNS Works  
|      | DNS Records  
|      | DNS Messages  
| 11   | Case Studies  
|      | Wireshark: Application Layer Protocols  
| 12   | Transport Layer  
|      | Connectionless Transport: UDP  
|      | Principles of Reliable Data Transfer  
|      | Go-Back-N (GBN)  
|      | Selective Repeat (SR)  
|      | Connection-Oriented Transport: TCP  
|      | Case Studies  
|      | Wireshark: Transport layer protocols  
| 13   | Routing Principles  
|      | The Internet Protocol (IP)  
|      | IPv4 Addressing  
|      | Moving a Datagram from Source to Destination: Addressing, Routing, and Forwarding  
|      | ICMP: Internet Control Message Protocol  
|      | Dynamic Host Configuration Protocol  
|      | What's Inside a Router?  
| 14   | Data Link Layer: Introduction and Services  
|      | Multiple Access Protocols  
|      | Channel Partitioning Protocols  
|      | Random Access Protocols  
|      | Taking-Turns Protocols  
|      | Local Area Networks (LANs)  
|      | LAN Addresses  
|      | Ethernet  

| 14 | - CSMA/CD: Ethernet's Multiple Access Protocol
|    |   - Wireless Networks
|    |   - Wi-Fi
|    |   - Security in networks (wired and wireless)