

## School of Computing and Information Sciences

**Course Title:** Data Communications

**Date:** March 29, 2009

**Course Number:** CNT-4513

**Number of Credits:** 3

<b>Subject Area:</b> Computer Systems	<b>Subject Area Coordinator:</b> S. Masoud Sadjadi <b>email:</b> sadjadi@cs.fiu.edu
<b>Catalog Description:</b> Study of computer network models and protocol layers. Topics include: error handling, frames, broadcast networks, channel allocation; network routing algorithms, internetworking, TCP/IP, ATM protocols.	
<b>Textbook:</b> Computer Networking, A Top-Down Approach, 4 <sup>th</sup> Edition James Kurose and Keith Ross Addison Wesley (ISBN: 0321497708)	
<b>References:</b> Computer Networks, A Systems Approach, 4 <sup>th</sup> Edition Larry Peterson and Bruce Davie Morgan Kaufmann (ISBN: 0123705487)	
<b>Prerequisites Courses:</b> CDA 4101 or (CGS 4233 and COP 3804)	
<b>Corequisites Courses:</b> None	

Type: Elective

Prerequisites Topics:

- Significant Java or C++ programming experience
- Hierarchy of virtual machines

Course Outcomes:

1. Be familiar with computer network architecture (set of layers and protocols)
2. Be exposed to computer network applications
3. Master the socket programming in a high-level programming language
4. Be familiar with flow control and congestion control methods
5. Master the internetworking (TCP/IP protocols)
6. Be familiar with static and dynamic routing
7. Be familiar with virtual circuits and ATM protocols
8. Be exposed to data transmission and associated protocols – transmission media, and local & long distance communication
9. Be exposed to wireless networking, multimedia networking, network security, and network management

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**Relationship between Course Outcomes and Program Outcomes**

<b>BS in CS: Program Outcomes</b>	<b>Course Outcomes</b>
a) Demonstrate proficiency in the foundation areas of Computer Science including mathematics, discrete structures, logic and the theory of algorithms	1
b) Demonstrate proficiency in various areas of Computer Science including data structures and algorithms, concepts of programming languages and computer systems.	1, 2, 3, 4, 5
c) Demonstrate proficiency in problem solving and application of software engineering techniques	1
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:  
<http://www.cis.fiu.edu/programs/undergrad/cs/assessment/>

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**Outline**

<b>Topic</b>	<b>Number of Lecture Hours</b>	<b>Outcome</b>
<ul style="list-style-type: none"> <li>• Introduction               <ul style="list-style-type: none"> <li>○ Internet and network concepts</li> <li>○ Performance metrics</li> <li>○ Network architecture</li> <li>○ Internet history</li> </ul> </li> </ul>	5	1,2
<ul style="list-style-type: none"> <li>• Application layer               <ul style="list-style-type: none"> <li>○ Web and HTTP</li> <li>○ File transfer (FTP)</li> <li>○ Email (SMTP, POP3, IMAP)</li> <li>○ Domain name system (DNS)</li> <li>○ P2P file sharing</li> <li>○ Socket programming in a high-level programming language (e.g., Java or C++)</li> </ul> </li> </ul>	9	2,3
<ul style="list-style-type: none"> <li>• Transport layer               <ul style="list-style-type: none"> <li>○ Transport services and protocols</li> <li>○ Connectionless transport: UDP</li> <li>○ Connection-oriented transport: TCP</li> <li>○ Flow control and congestion control</li> </ul> </li> </ul>	5	4,5
<ul style="list-style-type: none"> <li>• Network layer               <ul style="list-style-type: none"> <li>○ Network functions and services</li> <li>○ Router design</li> <li>○ Internet Protocol (IP)</li> <li>○ Routing algorithms</li> <li>○ Internet routing protocols: RIP, OSPF, BGP</li> <li>○ Broadcast and multicast routing</li> </ul> </li> </ul>	8	5,6
<ul style="list-style-type: none"> <li>• Link layer               <ul style="list-style-type: none"> <li>○ Link layer functions and services</li> <li>○ Error detection and correction</li> <li>○ Multiple access protocols</li> <li>○ MAC addresses, ARP, DHCP</li> <li>○ Ethernet</li> <li>○ Link-layer switches</li> <li>○ Link virtualization: ATM, MPLS</li> </ul> </li> </ul>	6	7,8
<ul style="list-style-type: none"> <li>• Selection of advanced topics               <ul style="list-style-type: none"> <li>○ Wireless LAN (802.11)</li> <li>○ Multimedia networking</li> <li>○ Network security</li> <li>○ Network management</li> </ul> </li> </ul>	6	9

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**Course Outcomes Emphasized in Laboratory Projects / Assignments**

	<b>Outcome</b>	<b>Number of Weeks</b>
1	Application layer protocol software design Outcomes: 1,2,3	2
2	Packet trace and TCP session analysis Outcomes: 4,5	2
3	Network routing analysis Outcomes: 5,6	2

**Oral and Written Communication**

No significant coverage

**Social and Ethical Implications of Computing Topics**

No significant coverage

**Approximate number of class hours devoted to fundamental CS topics**

<b>Topic</b>	<b>Core Hours</b>	<b>Advanced Hours</b>
<b>Algorithms:</b>		<b>4.0</b>
<b>Software Design:</b>		<b>1.25</b>
<b>Computer Organization and Architecture:</b>		<b>0.5</b>
<b>Data Structures:</b>		<b>0.5</b>
<b>Concepts of Programming Languages</b>		
<b>Other CS Topics:</b>		<b>2.0</b>

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**Theoretical Contents**

Topic	Class time

**Problem Analysis Experiences**

1. 

Packet trace and TCP session analysis
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**Solution Design Experiences**

1. 

Application layer protocol software design
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2. 

Network routing analysis
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**The Coverage of Knowledge Units within Computer Science Body of Knowledge<sup>1</sup>**

Knowledge Unit	Topic	Lecture Hours
<a href="#"><u>NC1</u></a>	Network history, network architecture, and net-centric computing and network based applications	9
<a href="#"><u>NC2</u></a>	Network models; circuit & packet switching, connection-oriented and connectionless communication, transmission media, framing, error control, flow control, routing algorithm, congestion control, and reliable communication	18
<a href="#"><u>NC4</u></a>	Web based application, HTTP protocol, client-server socket programming	6
<a href="#"><u>NC9</u></a>	Network management, domain name system, name services	6

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<sup>1</sup>See <http://www.computer.org/education/cc2001/final/chapter05.htm> for a description of Computer Science Knowledge units