

# Knight Foundation School of Computing and Information Sciences

**Course Title:** Applied Computer Networking

**Date:** 10/01/2022

**Course Number:** CGS 4285

**Number of Credits:** 3

<b>Subject Area:</b> Networking	<b>Subject Area Coordinator:</b> Deng Pan <b>email:</b> pand@fiu.edu
<b>Catalog Description:</b> Principles of computer network design, operation and management. Topics include network protocols, network configuration and network security.	
<b>Textbook:</b> James Kurose and Keith Ross, Computer Networking: A Top Down Approach (7th Edition), Addison-Wesley, 2016. ISBN: 978-0133594140.	
<b>References:</b> Larry Peterson and Bruce Davie, Computer Networks: A Systems Approach, Morgan Kaufmann.	
<b>Prerequisites Courses:</b> <a href="#">CGS 3767</a>	
<b>Corequisites Courses:</b>	

Type: Required (CY, IT)

Prerequisites Topics:

- Discrete Math
- Basic programming

Course Outcomes:

1. Describe the TCP/IP protocol stack. [Understanding]
2. Compare the client-server and peer-to-peer application architectures. [Analyzing]
3. Describe TCP and UDP segment structures. [Understanding]
4. Apply routing algorithms. [Applying]
5. Compare Layer 3 routing and Layer 2 switching. [Analyzing]
6. List wireless MAC protocols. [Remembering]
7. Explain digital signatures and digital certificates. [Understanding]
8. List network security protocols and tools. [Remembering]
9. Carry out network analysis in team-based course projects. [Applying]

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**Association between Student Outcomes and Course Outcomes**

<b>BS in Computing: Student Outcomes</b>	<b>Course Outcomes</b>
1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.	2, 3, 4
2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.	1, 5, 6
3) Communicate effectively in a variety of professional contexts.	
4) Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.	
5) Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.	9
<b>Program Specific Student Outcomes</b>	
6) Apply computer science theory and software development fundamentals to produce computing-based solutions. [CS]	N/A
6) Apply security principles and practices to maintain operations in the presence of risks and threats. [CY]	7, 8
6) Use systemic approaches to select, develop, apply, integrate, and administer secure computing technologies to accomplish user goals. [IT]	7, 8

**Assessment Plan for the Course and how Data in the Course are used to assess Student 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.cis.fiu.edu/>

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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 components</li> <li>○ TCP/IP protocol stack</li> </ul> </li> </ul>	2	1
<ul style="list-style-type: none"> <li>• Application layer               <ul style="list-style-type: none"> <li>○ Application architectures</li> <li>○ HTTP</li> <li>○ DNS</li> <li>○ BitTorrent</li> </ul> </li> </ul>	4	2
<ul style="list-style-type: none"> <li>• Transport layer               <ul style="list-style-type: none"> <li>○ Multiplexing and demultiplexing</li> <li>○ Reliable data transfer</li> <li>○ TCP</li> <li>○ UDP</li> </ul> </li> </ul>	6	3, 9
<ul style="list-style-type: none"> <li>• Network layer               <ul style="list-style-type: none"> <li>○ Data plane and control plane</li> <li>○ Routing algorithms</li> <li>○ Routing protocols</li> <li>○ IP</li> <li>○ Software defined networking</li> </ul> </li> </ul>	6	4, 9
<ul style="list-style-type: none"> <li>• Link layer               <ul style="list-style-type: none"> <li>○ Error detection</li> <li>○ Multiple access control</li> <li>○ Switching</li> </ul> </li> </ul>	4	5, 9
<ul style="list-style-type: none"> <li>• Wireless networks               <ul style="list-style-type: none"> <li>○ CDMA</li> <li>○ CSMA/CA</li> <li>○ Wireless LANs</li> </ul> </li> </ul>	2	6
<ul style="list-style-type: none"> <li>• Network security               <ul style="list-style-type: none"> <li>○ Cryptography</li> <li>○ Message integrity</li> <li>○ Digital signatures</li> <li>○ Digital certificates</li> <li>○ Network security protocols</li> </ul> </li> </ul>	4	7, 8, 9

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

	<b>Outcome</b>	<b>Number of Weeks</b>
1	Wireshark introduction lab Outcome: 1, 2, 9	2
2	Wireshark TCP lab Outcomes: 3, 9	2
3	Mininet routing and switching lab Outcomes: 5, 9	2
4	Mininet firewall lab Outcomes: 8, 9	2

**Oral and Written Communication:**

Number of written reports: 4

Approximate number of pages for each report: 5

Number of required oral presentations: 0

Approximate time for each presentation: 0

**Social and Ethical Implications of Computing Topics**

<b>Topic</b>	<b>Class time</b>	<b>Student performance measures</b>
Security	<b>1</b>	<b>none</b>

**Theoretical Contents**

<b>Topic</b>	<b>Class time</b>
Routing algorithms	1

**Problem Analysis Experiences**

1. 

Network analysis using Wireshark

**Solution Design Experiences**

1. 

Network design using Mininet