

<b>Course name</b>	<b>ECE 54700 Introduction to Computer Communication Networks</b>
<b>Credit and contact hours</b>	(3 cr.) Class 3
<b>Course coordinator's name</b>	Dongsoo S. Kim
<b>Textbook</b>	Alberto Leon-Garcia and Indra Widjaja, <i>Communication Networks: Fundamental Concepts and Key Architectures</i> , 2 <sup>nd</sup> Ed., McGraw-Hill, 2003, ISBN 9780072463521
<b>Course information</b>	<p><b>2020-21 IUPUI Campus Bulletin description:</b>  ECE 54700 Introduction to Computer Communication Networks (3 cr.)  P: ECE 30200 or Graduate Standing. Class 3. A qualitative and quantitative study of issues in design, analysis, and operation of computer communication and telecommunication networks as they evolve toward the integrated networks of the future, employing both packet and circuit-switching technology. Packet and circuit switching, the OSI standards for architecture and protocols, elementary queuing theory for performance evaluation, random access techniques, local area networks, reliability and error recovery, and integrated networks.</p> <p><b>Prerequisites/ Co-Requisite</b>  ECE 30200 or equivalent or graduate standing</p> <p><b>Required, Elective, or Selected Elective:</b>  EE Elective, CE Elective</p>
<b>Goals for the course</b>	<p>Upon successful completion of the course, students should be able to</p> <ol style="list-style-type: none"> <li>1. Describe the difference between circuit switching and packet switching. [1]</li> <li>2. Identify the main functionality of each layer in OSI seven-layer reference model. [1]</li> <li>3. Build a software program using the Berkeley socket API. [2]</li> <li>4. Determine a maximum capacity for a given signal-to-noise ratio. [1]</li> <li>5. Convert binary information into a digital signal based on various encoding scheme. (unipolar NRZ, polar NRZ, Bipolar encoding, Manchester encoding and differential Manchester encoding). [6]</li> <li>6. Describe the difference between ARQ and FEC. [1,2,6]</li> <li>7. Calculate transmitted code word for a given CRC generator function. List the error coverage of CRC. [6,1]</li> <li>8. Describe the major multiplexing techniques as TDM, FDM, and WDM. [4]</li> <li>9. Determine network performances for various ARQ protocols. Determine network efficient on various random access protocols and scheduling medium access controls. [1]</li> </ol>

	<p>10. Describe the method for interconnecting heterogeneous networks, the queuing disciplines in packet switching networks, and congestion control schemes. [1, 4, 2,6 ]</p> <p>11. Describe the IP address hierarchy and the major IP protocols as TCP, UDP, ICMP, DHCP, ARP, RIP and BGP. [1, 4 ]</p>
<b>List of topics to be covered</b>	<ol style="list-style-type: none"> <li>1. Introduction <ul style="list-style-type: none"> <li>• Circuit and Packet Switching</li> </ul> </li> <li>2. Layered Communication Architectures, Layered Architectures in Data Networks <ul style="list-style-type: none"> <li>• OSI Standards Architecture and Protocols</li> <li>• X.25 Protocol</li> <li>• Systems Network Architecture (SNA)</li> </ul> </li> <li>3. Elementary Queuing Theory</li> <li>4. Data Link Layer: Examples and Performance Analysis <ul style="list-style-type: none"> <li>• Stop-and-Wait Protocol, Go-Back-N protocol</li> <li>• High-level Data Link Control (HDLC)</li> </ul> </li> <li>5. Network Layer: Flow Control and Congestion Control <ul style="list-style-type: none"> <li>• Window-Flow Control</li> <li>• SNA Path Control</li> <li>• Input-buffer Limiting</li> <li>• Network Layer: Routing Function, Centralized Routing Algorithms, Virtual Circuit and Datagram Networks, Distributed Routing Algorithms</li> </ul> </li> <li>6. Transport Layer <ul style="list-style-type: none"> <li>• OSI Transport Protocol</li> <li>• Transmission Control Protocol(TCP)</li> <li>• Polling and Random Access in Data Networks, Pure Aloha, Slotted Aloha, CSMA / CD, Local Area Networks and Design Issues, CSMA/CD, Token Ring</li> <li>• Network Control</li> <li>• Reliability, Availability, and Survivability</li> </ul> </li> <li>7. Introduction to Circuit Switching <ul style="list-style-type: none"> <li>• Circuit and Packet Switching Compared</li> <li>• Digital Switching Networks</li> </ul> </li> <li>8. Integrated Networks <ul style="list-style-type: none"> <li>• Integrated Services Digital Networks (ISDN)</li> <li>• Broadband ISDN</li> </ul> </li> </ol>
<b>Syllabi approved by</b>	Dongsoo S. Kim
<b>Date of approval</b>	11/30/2021