UNITED STATES INTERNATIONAL UNIVERSITY

SCHOOL OF SCIENCE AND TECHNOLOGY

[FALL/SPRING/SUMMER] 20[XX] SEMESTER

APT 2050: COMPUTER NETWORKS AND TELECOMMUNICTIONS

LECTURER: []

DAYS/TIMES: MONDAY AND WEDNESDAY / 9.00AM – 10.40AM

VENUE: ICTC LAB 4

CREDIT: 3 UNITS

OFFICE HOURS DAY/TIME: MONDAY AND WEDNESDAY / 11.00AM – 1.00PM /

ROOM: SCHOOL OF BUSINESS ROOM 112

CONTACT: E-MAIL: **TELEPHONE:**

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1. COURSE RATIONALE

The future of computer technology is in computer networks. Global connectivity can be achieved through computer networks. It is important to understand the function of computer networks. Knowledge about hardware and software requirements of networks is essential. The emphasis of the course is towards the various components and software required to make a network operational.

1.1. COURSE DESCRIPTION

This course covers computer network and communications concepts, principles, components, and practices; coverage of common networking standards, topologies, architectures, and protocols; design and operational issues surrounding network planning, configuration, monitoring, troubleshooting, and management.

Prerequisites: APT 2020 Computer Organization and Assembly Programming

1.2. COURSE LEARNING OUTCOMES

At the end of the course students should be able to:

1. Articulate common networking and telecommunication concepts relating to the OSI and TCP/IP Reference models.
2. Explain the implementation of common networks and telecommunication systems such as Telephone Networks, Ethernet LANs, Wireless Networks, WANs and the Internet
3. Design an efficient organizational IP network taking into consideration desirable features of physical connectivity, internetworking and quality of service.
4. Implement designed IP networks using common network and telecommunication protocols, tools and technologies.
5. Secure network and telecommunication infrastructure, protocols and services.

1.3. LINK TO UNIVERSITY MISSION OUTCOMES

This course is expected to help students develop skills in higher order thinking, global understanding, and multicultural perspective in the students. It is expected to develop proficiency in literacy, prepare the student for future careers in Business and Information and Communication Technology (ICT). It will hone the ability in the learners to serve the community and culture students in ethical matters that will set them apart as Professional leaders of integrity.

1.4. LINKS TO SCHOOL OF SCIENCE & TECHNOLOGY MISSION OUTCOMES

This course is designed to:

- Develop competence in critical thinking, create skills, use of technology, creativity and good communication skills
- Provide service to the community: Acquire practical working experience through participation and contribution to positive/good community and societal causes
- Demonstrate preparedness for career and lifelong learning in their chosen disciplines as well as understanding of the interdisciplinary nature of knowledge.
- Demonstrate the use of qualitative and quantitative research skills in Biomedical, Communication and Information Technology
- Apply theories, concepts, and principles found in biological and physical sciences, including a thorough grounding in communication skills in multicultural & global perspectives.
- Demonstrate a thorough understanding of effective, efficient professional and ethical leadership

1.5. LINK TO PROGRAM LEARNING OUTCOMES

This course is intended to align to the following Program Learning Outcomes (PLOs)

PLO 2: Evaluate IT problems in organizations

The course explores the approaches for providing networking and telecommunication connectivity in organizations that are geographically dispersed and that utilize distributed services. It analyses the challenges posed when establishing connectivity

PLO 5: Solve IT problems in business

The course seeks to equip students with the knowledge and skills necessary to design and implement networking and telecommunication solutions for organizational connectivity

2. COURSE CONTENT & CLASS SCHEDULE

Week	Topic	Learning Outcomes	Activities/ Assignments	Aids/ References	Remarks *(filled during semester)*
1.	Welcome and Overview	This first week will be used to give an outline of the course, discuss the course syllabus, and set expectations on learning outcomes with the students. By the end of this week the students should be clear on what the course aims to deliver and they should have access to all the necessary class materials, course texts and lab resources needed to successfully undertake the course. This includes relevant laboratory software and the Blackboard learning system Introductory discussions will begin on: • Definition of terminologies in networking and telecommunications such as: Telecommunications, protocols, broadcasting, multicasting, unicasting, • Outline of a simplified communications model • Discuss common use of networks in business organizations • Describe the common network architectures – PAN, Ethernet LAN, MAN, WAN, Telephone Networks, Wireless Networks, Internet	• Discussion: Course Expectations and Class Policy • Demonstrate Access to Online Learning Resources i.e. eBrary, Blackboard	Ch 1 Tanenbaum Ch 1 Stallings	
2.	Introduction to computer networks and telecommunications	At the end of this week, students should: • Distinguish between connection-oriented and connectionless services, circuit and packet switching • Outline a typical communication process using service primitives • Describe the OSI Reference Model • Describe the TCP/IP Reference Model • Compare and contrast the OSI and TCP/IP Reference Models • Discuss the role of network and telecommunications regulation and identify the main players – ISO, ITU, IETF, NIST	Assignment: Outline the architecture of the Internet describing your connectivity to the rest of the world from your USIU PC	Ch 1Tanenbaum Ch 1 Stallings	
3.	Data Transmission and Channel Transmission Calculations	At the end of this week, students should be able to: • Describe common terminology relating to data transmission – simplex vs duplex, frequency, spectrum, bandwidth, analog vs digital data • Calculate various channel transmission characteristics using Fourier analysis, Nyquist's theorem and Shannon's theorem • Describe how data is encoded • Identify common media for guided and unguided transmission and discuss when they should be used – twisted pair, coaxial, optical fiber, wireless, microwave, radio, infrared	Discussion: When are the different transmission media suitable for use in an organization? Assignment: Calculation of data rates and bandwidth	Ch 2Tanenbaum Ch 2 Stallings	
4.	Local Area Network (LAN)Technology	At the end of this week, students should be able to: • Define common Local Area Network (LAN) terminology • Discuss frame transmission, MAC, IP addressing, Discuss different LAN topologies e.g bus, star, ring and use of repeaters, bridges,	Discussion: Design a typical organization's LAN with desirable features for connectivity Lab Exercise: Crimping	Ch 6Tanenbaum Ch 13-14 Stallings	

Week	Topic	Learning Outcomes	Activities/ Assignments	Aids/ References	Remarks *(filled during semester)*
		switches and routers	straight-through and cross-over cables		
5.	Wireless Networks	At the end of this week, students should be able to: • Describe the different wireless transmission technologies – Bluetooth and WiFi • Discuss the implementation of the mobile telephone system – AMPS, GSM, 3G	**Quiz 1**	Ch 2 Tanenbaum Ch 3,4,5 Stallings	
6.	Data Communications Interface, the Data Link Layer and Medium Access Control	At the end of this week, students should be able to: • Describe the features of the data communication interface • Distinguish between synchronous and asynchronous transmission • Describe flow control and why it is desirable in networks • Discuss the different techniques for flow control e.g. sliding windows • Describe the common Medium Access Control protocols – particularly the CSMA/CD protocol and Multiplexing	Discussion: Demonstrate contention for shared resources and how you can resolve this	Ch 3,4Tanenbaum Ch 6,7,8 Stallings	
7.	**MID-TERM EXAMS & REVISION**				
8.	Network Layer	At the end of this week, students should be able to: • Distinguish between circuit switching and packet switching connectivity between networks • Describe common networking architectures including wireless networking	Discussion: Legacy network architectures vs Current network architectures	Ch 5Tanenbaum Ch 9,10Stallings	
9.	IP Addressing and Subnetting	At the end of this week, students should be able to: • Describe IP packet structure, addressing and classes of addresses • Perform subnetting for an typical organizational network with NAT • Outline techniques for quality of service.	Assignment: IP Network design	Ch 5Tanenbaum Ch 6,7 Stallings	
10.	Routing Protocols	At the end of this week, students should be able to: • Discuss the features of common routing protocols – OSPF, BGP, EGRP, MPLS, VPN	Lab Assignment: Packet Tracer implementation and testing of network design	Ch 5Tanenbaum Ch 6,7 Stallings	
11.	Transport Layer	At the end of this week, students should be able to: • Describe the importance of transport layer by discussing concepts of flow and error control • Outline the Transport Control Protocol (TCP) and User Datagram Protocol (UDP)	Lab Exercise: TCP socket implementation for file transfer	Ch 7Tanenbaum Ch 17 Stallings	
12.	Application Layer	At the end of this week, students should be able to: • Discuss common internet applications –DNS, e-mail (SMTP, POP, IMAP), World Wide Web services, file transfer, cloud services	**Quiz 2**	Ch 7Tanenbaum Ch 19 Stallings	
13.	Network Security	At the end of this week, students should be able to: • Describe essential requirements for network security especially through correct configuration, disabling unnecessary services, using newer protocols and encryption (Public Key, Digital Signatures, IPSec)	Lab Assignment: Configuring secure features and encryption	Ch 8Tanenbaum Ch 18 Stallings	
14.	**END SEMESTER EXAMS**				

3. COURSE TEXT AND OTHER READINGS

Course Text:

1. William Stallings, *Data and Computer Communications*, 9th Edition, 2011. Pearson Education
2. Andrew S. Tanenbaum. *Computer Networks*, 2011, Pearson Education

Recommended Reference Material:

1. Douglas E. Comer, *Computer Networks and Internets with Internet Applications*,2004, 4th Edition, Prentice Hall
2. Current IT Journal articles and Internet resources .

4. LEARNING APPROACHES

A series of lectures and laboratory exercises will be used to study the concepts. Audio-visual aids will be used in the lectures. Group discussion, case studies and exercises will also be used. Ask questions and consult where you are not clear.

No distractions will be allowed. Turn off your cell phones. Do not operate workstations unless permitted. Listen attentively and do not have side conversations.

5. KEY INSTITUTIONAL ACADEMIC POLICIES

Students are asked to abide by the Academic Code of Conduct and Ethics as stipulated in the USIU Student Handbook. Students are also to follow the governing Policies and Regulations at USIU as detailed in the Student Handbook especially as related to the use of Information Technology resources, Computer Laboratories and all other relevant regulations.

6. COURSE EVALUATION

There will be at least two assessed assignments, one mid-term exam and a final exam. In addition, laboratory exercises will be used in the evaluation.

Assignments are due 1 week after being handed out and a late assignment will be marked down 25% for every subsequent lesson. Maximum delay is 2 weeks of being handed out – after which a 0 mark is awarded

Class attendance will contribute to the awarded marks. Missing >25% of class sessions, that is 7 classes (whether excused or not) is an F grade regardless of marks in assessments.

No Plagiarism, copying or cheating will be tolerated in quizzes, assignments or examinations. It will attract a 0 mark for assignments/quizzes and F grade for exams. In addition, students may be sent to the Dean's office for further disciplinary action.

There will be NO make-ups for quizzes, exercises or exams as guided by the University Policy unless granted by DVCAA or Dean School of Science and Technology

The lecturer under advisement of the Dean School of Science and Technology has the final word on facilitating classes and assignment of grades.

Distribution of marks

Attendance and Participation	*5%*
Quizzes	15%
Class/Group Assignments	15%
Lab Assignments	15%
Mid-semester	20%
Final Exam	30%

Grading

Letter grading for distribution of marks is as follows:

Numeric Average (100% Max)	Letter Grade
90% and above	**A**
87-89	**A-**
84-86	**B+**
80-83	**B**
77-79	**B-**
74-76	**C+**
70-73	**C**
67-69	**C-**
64-66	**D+**
62-63	**D**
60-61	**D-**
0-59	**F**