TEL3214 COMPUTER COMMUNICATION NETWORKS

Hours per Semester				Weighted	Weighted	Weighted	Credit
				Total Mark	Exam Mark	Continuous Assessment Mark	Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

Rationale

The course introduces communication systems and the principles of design, deployments and operation of modern computer and communication networks

Course Objectives

- To understand Principles including basic engineering principles, design algorithms behind building blocks of computer networks as well as Practices describing how things are done in practice (in the case of Internet and the Web)

Detailed Course Content:

Review of Telecommunication networks: **[2 Hours]**
Hardware and software, reference models (Communications Protocol starks): The OSI Model Vs the TCP/IP Model, transmission media, wireless transmission, the telephone system and the new telecommunication systems.
Brief discussion of the Physical Layer: **[5 Hours]**
electromagnetic signals ".on the wire" Transmission: Modulation, Digitization, Synchronization, Transmission Media, Physical Layer Standards : RS-232, CCITT X.21,
Link Layer: **[9 Hours]**
Data transfer between neighboring network elements including encoding, framing, error correction, access control for shared links (MAC protocols) examples to include Ethernet, fast ethernet, satellite etc
Network Layer: host-to-host connectivity, detailed study of routing and addressing. **[9 Hours]**
Transport Layer: **[8 Hours]**
Host-to-host data transport. Detailed study of reliable data transport, congestion control, flow control with examples of TCP and UDP
TCP/IP Application layer: **[6 Hours]**
Detailed study of the Network Applications including HTTP, FTP, electronic mail protocols (SMTP,POP3,IMAP), DNS and distributed file sharing.
Advanced topics in computer networks: **[6 Hours]**
Multimedia networking (quality of service), computer security, wireless networks, overlay networks;
Case studies of emerging network systems /technologies: HTTP load balancing, Network caching, Content distribution (Akamai), Peer-to-peer systems (Gnutella/BitTorrent).

Learning Outcomes

- Identify some contributors to networks and relate their achievements to the knowledge area; identify some components of a network; name some network devices and describe their purpose; describe advantages of a star topology over a ring topology; describe advantages of a ring topology over a star topology; define the meaning of a protocol; explain the importance of security when dealing with networks; and describe how computer engineering uses or benefits from networks.
- Understand fundamental concepts of networks and their topologies; and understand the concept of network architecture and its hardware components.
- Demonstrate understanding of the elements of a protocol, and the concept of layering; recognize the importance of networking standards, and their regulatory committees; describe the seven layers of the OSI model; compare and contrast the OSI model with the TCP/IP model;

and demonstrate understanding of the differences between circuit switching and packet switching.

- Understand the basic concepts of LAN and WAN technologies and topologies; demonstrate understanding of different components and requirements of network protocols; demonstrate understanding of basic concepts of error detection and correction at the data link layer and below; and design and build a simple network by implementing (and designing) a simple network protocol that operates at the physical and data link layers of the OSI model.
- Explain the different roles and responsibilities of clients and servers for a range of possible applications; select a range of tools that will ensure an efficient approach to implementing various client-server possibilities; and design and build a simple interactive web-based application (e.g., a simple web form that collects information from the client and stores it in a file on the server).
- Understand common barriers to network security and the major issues involved in implementing proper security measures; describe the purpose of encryption and the function of public and private keys; compare and contrast the various types of firewalls; generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message; and explain the concept of and necessity for transport layer security.
- Describe the main characteristics of mobile IP and explain how differs from IP with regard to mobility management and location management as well as performance; illustrate (with home agents and foreign agents) how e-mail and other traffic is routed using mobile IP; be aware of the many areas of interest that lie within this area, including networking, multimedia, wireless, and mobile computing, and distributed computing.
- Define performance metric; and describe how each affects a particular network and/or service paradigm.
- Demonstrate understanding of the fundamental concepts of data communications; understand signals and signal encoding methods to communication service methods and data transmission modes.
- Explain the issues for network management arising from a range of security threats, including viruses, worms, Trojan horses, and denial-of-service attack; summarize the strengths and weaknesses associated with different approaches to security; develop a strategy for ensuring appropriate levels of security in a system designed for a particular purpose; and implement a network firewall.
- Summarize the basic characteristics of sampling and quantization for digital representation.
- Select, giving reasons that are sensitive to the specific application and particular circumstances, the most appropriate compression techniques for text, audio, image, and video information; explain the asymmetric property of compression and decompression algorithms; illustrate the concept of run-length encoding; and illustrate how a program like the UNIX *compress* utility, which uses Huffman coding and the Ziv-Lempel algorithm, would compress a typical text file.

Method of Teaching /Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40%
Final examination	60%
Total	**100%**

Recommended and Reference Books

[1] Andrew S. Tanenbaum1996. *Computer Networks*. Prentice Hall; 3rd Edition. ISBN-10: 0133499456, ISBN-13: 978-0133499452

[2] James F. Kurose and Keith W, 2007.*Computer Networking: A Top-Down*. Addison Wesley; 4 Edition. ISBN-10: 0321497708, ISBN-13: 978-0321497703

[3] Natalia Olifer and Victor Olifer, 2006. *Computer Networks: Principles, Technologies and Protocols for Network Design.* Wiley. ISBN-10: 0470869828, ISBN-13: 978-0470869826

[4] Douglas E. Comer, 2003. *Computer Networks and Internets with Internet Applications.* 4th Edition. Prentice Hall. ISBN-10: 0131433512, ISBN-13: 978-0131433519

[5] Larry L. Peterson, Bruce S. Davie, 2007.*Computer Networks: A Systems Approach, Fourth Edition* (The Morgan Kaufmann Series in Networking). Morgan Kaufmann; 4 Edition. ISBN-10:
0123705487, ISBN-13: 978-0123705488

[6] Nader F. Mir, 2006. *Computer and Communication Networks*. Prentice Hall PTR; 1 Edition . ISBN-10: 0131747991, ISBN-13: *978*-0131747999

Possible Lecturers:

Dr. D. Okello
Mr. S. Mwanje
Mr. A.
Tumwesigye
Mr. P. I.
Musasizi Mr. P.
Serwanga