

## **INF 305 Network Computing I**

**LECTURER:** George Aggrey

**Office Hours:** TF: 11:30 – 12:30, F: 9:10 - 10:10, or by appointment

**Credit hours:** 3

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**Lectures:**

### **Course Description:**

This subject introduces students to the basic principles of data communications and computer networks. The topics include data transmission, multiplexing, error detection and control, data link protocols, circuit and packet switching, flow control, and routing algorithms. The ISO-OSI network layer model, local area networks, public telephone and data networks, ISDN, ATM networks and the Internet are also introduced. Multimedia communication principles and issues are finally discussed.

### **Course Objective:**

- Learn how computer network hardware and software operate
- Investigate the fundamental issues driving network design
- Learn about dominant network technologies

### **Learning Outcomes**

#### **Outcomes #1**

- Show clear understanding of the basic concepts of data communications including the key aspects of networking and their interrelationship, packet switching, circuit switching and cell switching as internal and external operations, physical structures, types, models, and internetworking
- Demonstrate the ability to unambiguously explain networking as it relates to the connection of computers, media, and devices (routing).
- Should understand the concept of unreliable and reliable transfer protocol of data and how the TCP and UDP implement these concepts
- Able to intelligently compare and contrast local area networks and wide area networks in terms of characteristics and functionalities
- Be able to demonstrate an understanding of the significance and purpose of protocols; standards and their key elements and use in data communications and networking
- Be able to understand the purpose of network layered models, network communication using the layered concept; and be able to compare and contrast Open System Interconnect (OSI) and the Internet Model.

#### **Outcomes #2**

- Be Able to distinguish between analog and digital signals and understand their characteristics

- Demonstrate the ability to discuss the relationship between data and signals as well as distinguish among and discuss their types, behavior, properties, characterization, and transmission
- Should be able to explain how noise, attenuation, and distortion affect propagation of signal through a transmission medium; discuss the factors affecting data rate as well as the theoretical limits on data rate over a noiseless and a noisy channel; Learn about dominant network technologies
- Be able to demonstrate clear understanding of digital transmission of analog and digital data, encoding techniques for parallel and serial transmission
- Be able to deal with the different forms of modulation techniques and know the advantages and limitations of the modulation systems
- Be able to differentiate between the different transmission mediums; their advantages and disadvantages over each other
- Be able to show the efficiency of using multiplexing
- Be able to compare the data transmission modes (serial and parallel as well as synchronous and asynchronous)

### **Outcomes #3**

- Should understand internetworking principles and how the Internet protocols IP operate.
- Should understand basic routing principles and algorithms
- Be able to compare the data transmission modes (serial and parallel as well as synchronous and asynchronous)
- Be able to identify the requirements for high-order communication systems; understand the techniques and protocols used (example for ATM etc).

### **Course Requirements:**

There will be home assignments quizzes and exams. The material for all exams will come from either a material covered in class, homework problems, and assignments.

Complete all required work on time. In the event that an exam must be missed, or required work can not be completed on time, due to illness or other serious and unavoidable circumstance, notify the Lecturer as far in advance as possible by phone or e-mail.

Submitting modified versions of other people's or group's work as your own is considered cheating.

There will be no make up for unannounced quizzes.

Exams will cover all topics and will be at the end of the semester.

Make up will be given if you call before the quizzes and make arrangements, have a medical certificate signed by the physician etc.

### **Evaluation:**

Two quizzes: ~ 40% (15% each)

Assignments (equal weight): ~10%

- **Network Basics**
  - Basic elements (Network Components)
  - Classification (Types)
  - Network taxonomy
    - Packet switching, circuit switching
- **Network models**
  - OSI model
  - Internet model
- **Network performance**
  - Bandwidth and propagation delay
  - Latency and throughput
- **Data Communication Concepts and Transmission**
  - Data Networks
  - Topology
  - Transmission modes
- **Physical layer and media**
  - Introduction
  - Topologies
  - Signals – transmission impairment
  - Digital Transmission - encoding
  - Analog Transmission – modulation and multiplexing
  - Transmission media and technologies - Cable Networks (Telecos) for Data
  - Network Switching
- **Data Link layer**
  - Introduction
  - Error detection and correction
  - Control and protocols
  - Point-to-point and multiple access protocols
  - Local area networks, connecting LANs (bridges).
  - ATM networks
- **Network layer**
  - Introduction
  - Internetworking; protocols(addressing)
  - Routing
  - Host-to-host delivery –routing (unicast, multicast) and addressing
- **Transport layer**
  - Introduction
  - Transport control Protocol – TCP
  - User Datagram Protocol
  - End-to-end protocols – UDP, TCP

**Grading:**

Score	Grade
$\geq 80$	A
75-79	B+
70-74	B
65 -69	C+
60-64	C
55-59	D+
50-54	D
$< 50$	F

**Feedback:**

Your comments and questions about all aspects of the course (content, grading, teaching methods, pace, textbook, etc) are welcome. You can use an email or talk to me during office hours.

**Reference:**

1. Forouzan, A. B. (2006). Data communications & networking (sie). Tata McGraw-Hill Education.
2. Stallings, W. (2007). Data and computer communications. Pearson/Prentice Hall.
3. Comer, D. E. (2008). Computer networks and internets. Prentice Hall Press.