



## Course Description:

This course introduces the underlying elements of hardware and software of computer networks. Different types of networks are introduced such as LAN, MAN and WAN. Various Network topologies such as bus, ring and star are presented. Reference models and protocol hierarchies are covered. Such as an architecture of five layers is adopted, those layers are: Physical Layer, Data Link Layer (including MAC sub layer), Network Layer, Transport Layer, and Application Layer. The protocols used to communicate in each layer are the TCP/IP protocols.

### Aims of the course:

*Students are expected to:*

- Understand computer networks and its advantages over standalone systems.
- Gain an understanding of physical aspects and software architecture of computer networks.
- Study the reference models of computer networks and the protocol stack.
- Understand Physical media, encoding, switching and multiplexing.
- Understand framing mechanisms, error handling methods, and flow control protocols.
- Understand routing algorithms, and performance measurements of computer networks.
- Understand Transport Layer protocols; TCP and UDP protocols.
- Understand different application layer protocols; such as HTTP, FTP, STMP.

### Intended Learning Outcomes (ILOs):

*Upon successful completion of this course, students will be able to:*

#### A. Knowledge and Understanding

##### A1. Concepts and Theories:

- Define computer networks and understand its advantages.
- Classify computer networks.
- Understand the layered architecture of computer networks.

##### A2. Contemporary Trends, Problems and Research:

- Understand the performance metrics of computer networks' protocols.

##### A3. Professional Responsibility:

- Abide by laws and regulations when using computer networks.

#### B. Subject-specific skills

##### B1. Problem solving skills:

- Investigate the techniques and methods used to solve problems related to computer networks.



- Investigate the techniques that ensure reliability and fault tolerance.

### **B2. Modeling and Design:**

- Design a computer network for better performance?
- Subdivide a computer network for better security and administration?

### **B3.Application of Methods and Tools:**

- Investigate examples of different computer networks' technologies.
- Investigate how computer networks contribute to other applications.

## **C. Critical-Thinking Skills**

### **C1. Analytic skills:**

- Understand how to make scale computer networks and adapt it to meet emergent requirements.

### **C2.Strategic Thinking:**

- Understand how to utilize existing assets of computer networks to solve organizational problems.

### **C3. Creative thinking and innovation:**

- Suggest solution(s) to some open problems related to computer networks

## **D. General and Transferable Skills (other skills relevant to employability and personal development)**

*Communication:* Express and communicate ideas in written and oral forms.

*Teamwork and Leadership:* Be cooperative members of a team

*Organizational and Developmental Skills:* plan, prioritize, and achieve defined goals

*Ethical and Social Responsibility:* Understand that they are accountable for their actions and there must be a balance between economic growth and the welfare of the society and environment.

### **Course Structure:**

| <b>Week</b> | <b>Hours</b> | <b>ILO's</b>  | <b>Topic</b>  | <b>Teaching Procedures</b>                          | <b>Assessment methods</b>  |
|-------------|--------------|---------------|---|---|----------------------------|
| 1           | 3            | A1            | -Overview and definition of a computer network<br>-Network uses and classifications | Lecturing with active participation , quizzes, team | Homework, quizzes, reports |
| 2           | 3            | A1            | Layered architecture and the reference models                                       | =   | =                          |
| 3,and4      | 6            | A1, B1, B2,D4 | Physical Layer Concepts: Data Rate, Communication Medium, Encoding, Modulation,     | =   | =                          |



|           |   |  |   |   |   |
|-----------|---|--|---|---|---|
| 5         | 3 | A1, A2, A3, B1, C1, C2, C3, D4                           | The data link layer: Services, Framing, and Error handling  | = | = |
|           |   |  | <b>First Exam</b>   |   |   |
| 6         | 3 | A1, A2, A3, B1, B2, B3, C1, C2, C3                       | The data link layer: Protocols; stop-and-wait, sliding window, protocols over noisy channels, Connection    | = | = |
| 7, 8      | 6 | A1, A2, A3, B1, B2, B3, C1, C2, C3                       | Multiple Access Control: Channel allocation problem, ALOHA, Slotted ALOHA, CSMA, CSMA/CD, SCMA/CA, Ethernet | = | = |
| 9, and 10 | 6 | C1, A1, A2, A3, B1, B2, B3, C1, C2, C3                   | The Network Layer: Service implementation, Routing algorithms, IPv4   | = | = |
|           |   |  | <b>Second Exam</b>  |   |   |
| 11        | 3 | C1, A1, A2, A3, B1, B2, B3, C1, C2, C3, D1, D2           | Internetworking, Congestion Control (optional)  | = | = |
| 12, 13    | 6 | C C1, A1, A2, A3, B1, B2, B3, C1, C2, C3, D1, D2, D3, D4 | The Transport Layer: Services, Addressing and Sockets, Protocols: TCP and UDP,                              | = | = |
| 14, 15    | 6 | C C1, A1, A2, A3, B1, B2, B3, C1, C2, C3, D1             | The Application Layer: Client-server model, Protocols: DNS, HTTP, FTP,                                      | = | = |
| 16        |   |  | <b>Final exam</b>   |   |   |

### References:

#### A. Main Textbook:

**Computer Networks, Andrew S. Tanenbaum And David J. Wetherall, Prentice Hall, 5th Edition, 2011.**

#### B. Data and Computer Communications, William Stallings, Pearson Education, Inc. Pearson Prentice Hall Pearson Education, Inc. Upper Saddle River, NJ07458, Eighth Edition 2007.

### Assessment Methods:

| Methods  | Grade | Date |
|--|-------|------|
| First Exam   | 20%   |      |
| Second Exam  | 20%   |      |
| Assignments (Reports /Quizzes/Seminar/Tutorials....) | 10%   |      |
| Final Examination                                    | 50%   |      |

