## COMP 311 Computer Networks

## Lab 01 – Understanding of Networks Topologies and Networking Devices

### **Learning Objectives:**

Students are expected to be familiar with the network topologies and their characteristics, networking devices with their specific role in forming a network/Internet after completing this lab.

### **Evaluation:**

Students will be asked questions (Oral/Written) for their understanding of basic network components and configuration.

### **Task 1 Topology Observation and Analysis:**

Take a look at the computer networks around you (e.g., campus network, office network, home network) and determine their topology. Afterwards, briefly describe the characteristics of the observed topology, including its advantages and disadvantages.

ANS:

**Campus Network**: It uses mesh topology. It needs to support 2-way communication, and every device has a dedicated point to point connection.  
Advantages:

* Robust
* Fault can be identified quickly
* Privacy and security

Disadvantages:

* More cables
* Installation cost

**Home Network:** It uses star topology. For example, in the router which is the main device to which many other devices are connected.  
Advantages:

* Fewer cables
* Easy to set up

Disadvantages:

* If the central hub fails then the entire network is affected
* More connected devices affect the performance of the network
* Devices can only send or receive data one at a time

### **Task 2 Real-World Examples of Network Topologies:**

Provide real-world examples for each of the major network topologies (e.g., bus, star, ring, mesh, hybrid).

**Bus:** Extension cable **Star:** LAN in offices **Ring:** Radio stations **Mesh:** Internet **Hybrid:** Office setup

### **Task 3 Networking Devices Overview**

Briefly explain the respective purpose of commonly used networking devices (e.g. Router, Switch, Hub, Access Point, Modem, Firewall, Network Interface Card, Repeater, Bridge, Gateway).

* + Router: For connecting multiple networks and directing traffic between them.
  + Switch: For connecting multiple devices within a local network and facilitating communication between them.
  + Hub: Like a switch but operates at the physical layer, broadcasting data to all devices connected to it.
  + Access Point: Allows wireless devices to connect to a wired network.
  + Modem: Converts digital data from a network into analog signals for transmission over telephone or cable lines, and vice versa.
  + Firewall: Monitors and controls incoming and outgoing network traffic based on predetermined security rules.
  + Network Interface Card (NIC): Allows a device to connect to a network, translating data between the device and the network.
  + Repeater: Extends the range of a network by regenerating incoming signals and retransmitting them at a higher power level.
  + Bridge: Connects two separate network segments, filtering and forwarding traffic between them based on MAC addresses.
  + Gateway: Connects different types of networks, translating protocols to enable communication between them.