Course Objective

- To provide students with the main concepts in internetworking, network design and network management.

- To help students build the necessary skills for designing and managing networks.

- To prepare students for the professional life in the area of internetwork design and management.

Course Learning Outcomes

1. To demonstrate understanding in the area of internetworking including devices, protocols, topologies, etc.
2. To demonstrate understanding of bridging and switching technologies and be able to differentiate between bridging/switching and routing.
3. To demonstrate understanding of network design concepts and structured cabling systems (SCS) standards.
4. To demonstrate understanding of the network development life cycle (NDLC) and be able to analyze requirements, perform a market survey and design an enterprise network by following a network analysis and design methodology.
5. To be able to write and understand a Request For Proposal (RFP) and perform quotation analysis.
6. To perform topology design and traffic flow analysis of a network, and to be able to use some of the algorithms widely used in this area.
7. To be able to simulate a network and estimate its performance using network simulation tools.
8. To be able to define performance metrics and describe how each affects a particular network and/or service paradigm.
9. To demonstrate understanding of network management concepts including the ISO functional areas of management.
10. To demonstrate understanding of network management standards including SNMP (Simple Network Management Protocol).
11. To become familiar with some network management tools.
12. To demonstrate understanding of network security and be able to compare and contrast the various types of firewalls.
Course Description


Prerequisite: COE 442

Text Book
There is no textbook for this course. Copies from several references are provided throughout the course.

References include:
1. "Computer Networks" by Andrew S. Tanenbaum, Fourth Edition
2. "Local & Metropolitan Area Networks" by Stallings, Sixth Edition

Course Topics (Weekly breakdown)

<table>
<thead>
<tr>
<th>Week #</th>
<th>Topic</th>
<th>Reference</th>
<th>Design Aspect</th>
</tr>
</thead>
</table>
| 1. | **1. Overview of Computer Networks**
Types of computer networks. LANs and WANs. Protocols and protocol families. The OSI reference model. The TCP/IP protocol. | 1 | N/A |
| 2. | **2. Internetworking**
Basic terminology. Principles of internetworking. Types of internetworking devices. Repeaters, hubs. | 1 | N/A |
| 3. | **2. Internetworking (Cont.)**
Bridges, Transparent and source-routing bridges. | 2 | - Choice between types of bridging in bridges and switches |
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| **4.** | **2. Internetworking (Cont.)** | - Choice between switches/bridges and routers  
- Choice between layer-2 and multilayer switches  
- Choice of the VLAN grouping type  
3 & 4 |
| **5.** | **3. The Network Development Life Cycle** | - Network design methodology including tradeoffs to be considered  
5 & 6 |
| **6.** | **4. Enterprise Network Design** | - Choice between different backbone design topologies  
- Decision on the number of layers and functionality of each in the network being designed  
5 & 7 |
| **7.** | **4. Enterprise Network Design (Cont.)** | - Choice of the cabling to be used in different types of networks  
7 & 8 |
| **8.** | **5. Topology design and analysis** | - Choice of the right algorithm to use for different types of problems in network design  
9 |
| **9.** | **5. Topology design and analysis (Cont.)** | - Decision on how to model the problem and which algorithm to use.  
9 |
| **10.** | **5. Topology design and analysis (Cont.)** | - Decision on which parameters to look at and how to analyze the information in studying real networks  
9 |
| **11.** | **5. Topology design and analysis (Cont.)** | - Decision on what reliability is required for a network and how to meet that  
9 |
| **12.** | **6. Network Management** | - Decision on what functional areas are needed in a network  
10 |
| **13.** | **6. Network Management (Cont.)** | - Tools to use in different situations for monitoring networks  
- Use of data monitored for network redesign  
10 |
14. **Network Management (Cont.)**
SNMP architecture & operations.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| **10** | - Gathering information from network components  
- Choice of the parameters that will provide useful information |

15. **Network Security and Troubleshooting Problems**
Network security and firewalls.
Troubleshooting common network problems.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>- Types of firewalls to use</strong></td>
<td></td>
</tr>
</tbody>
</table>

---

**Laboratory Requirements**
N/A

**Computer Usage**
- A Network design and simulation tool is used by the students, usually using a UNIX lab.
- Students are introduced to a network management tool.

**Design Aspect(s)**
- Students are given case studies where they read problem specifications and design a network by following a methodology learned in the course.
- A project in network design and simulation is also given to the students. Part one involves designing an enterprise network including a market survey. Part two is concerned with the simulation of this design using a network simulation tool. The project is performed by teams of 3 to 4 students.