

King Fahd University of Petroleum & Minerals
College of Computer Sciences and Engineering

CSE 550 – Computer Network Design (3-0-3)

UT: 8:00-9:15 PM, Room: 24-104

Spring 2010 (Term 092)

Syllabus

Catalog Description:

Types of computer networks: LANs, VLANs, and WANs. Routing algorithms and routing protocols. The network development life cycle. Network analysis and design methodology. Network design issues: Manageability; Node placement and sizing; Link topology and sizing; Routing; Reliability. Data in support of network design. Structured enterprise network design. Hierarchical tree network design: Terminal assignment; Concentrator location. Mesh topology optimization. Traffic flow analysis. Analysis of loss and delay in networks. Network reliability issues.

Prerequisite: (COE 540 and (ICS 431 or Equivalent)) or Consent of Instructor.

Instructor: Dr. Mohammed Houssaini Sqalli

Office: 22-149 **Phone:** 1725 **Email:** sqalli@kfupm.edu.sa

Office hours: SMW 10:00-11:00AM, and by appointment.

Course Material: WebCT will be used for discussions and for posting any course-related information.

Text Book:

There is no assigned text book for this class, but the following are the main references used:

- P. Oppenheimer, "Top-Down Network Design," Cisco Press, 2nd edition, 2004.
- J. McCabe, "Network Analysis, Architecture, and Design" Morgan Kaufmann Publishers, Inc., 2nd edition, 2003.
- M. Pióro and D. Medhi, "Routing, Flow, and Capacity Design in Communication and Computer Networks", Morgan Kaufmann Publishers, Inc., 2004.
- A. Kershenbaum, "Telecommunications Network Design Algorithms", McGraw-Hill, 1993.
- R. Cahn, "Wide Area Network Design: Concepts and Tools for Optimization", Morgan Kaufmann Publishers, Inc., 1998.

Grading Policy:

Assignments/Quizzes	20%
Project	30%
Midterm	20%
Final Exam	25%
Attendance and participation	5%

Attendance: Attendance is required by all students. Official excuse for an authorized absence must be presented to the instructor no later than one week following the absence. More than 6 unexcused absences lead to a “DN” grade.

Course Objectives: The aim of this course is to provide students with a comprehensive and structured view of network design from a theoretical and a practical perspective. It presents basic principles and methods for developing traffic characterization and optimization models for a subset of network design problems. It also aims at helping students to understand recent advances and to be exposed to research problems in network design.

Course Outcomes: After successfully completing the course, students should be able to:

- Analyze and design a new and/or an existing network to meet specific requirements.
- Compare and contrast the different options in designing a network.
- List the major steps of the design process and identify tradeoffs involved in each one.
- Apply quantitative and qualitative techniques to design or upgrade a network.
- Gain practical knowledge using network simulation and management tools.
- Analyze network traffic flow and evaluate its performance.
- Identify network issues, risks, bottlenecks, etc.
- Apply algorithms to solve network design problems.
- Evaluate and choose the appropriate network technologies and interconnection strategies to meet design goals.
- Learn how to be a good team player by working on a semester-long project.
- Write a technical report describing a subject briefly or elaborately as required.
- Communicate design content, risk assessment, security issues and budgetary considerations to upper-management.

Tentative Course Topics:

- Introduction to Computer Network Design
 - The Network Development Life Cycle
 - Network Analysis and Design Methodology
- The Science of Network Design
 - Traffic Flow Analysis and Performance Evaluation
 - Network Simulation and Traffic Measurement Tools
 - Topology Design and Terminal Assignment
 - Concentrator Location and Servers Placement
 - Traffic Engineering
 - Network Reliability
- The Art of Network Design
 - Structured Enterprise Network Design
 - Hierarchical Network Design Model
 - LAN and WAN Network Design
 - Backbone Design: Centralized vs. Distributed
 - Node Placement
 - Addressing and Routing
 - Reliability and Redundancy
 - Network Management and Security
 - Technology Choices
 - Structured Cabling Systems
- Case Studies