CEN 449

Broadband and High Speed Networks

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COURSE DESCRIPTION

❖ This course provides students with the characteristics and architecture of high-speed networks. In addition, it covers several examples of high-speed networks. It gives a theoretical and practical understanding of the following:

➢ Switching in high-speed networks

➢ Network Control/Management Protocols in high-speed networks

➢ Plesiochronous Digital Hierarchy (PDH)

➢ Synchronous Optical Network (SONET)

➢ Synchronous Digital Hierarchy (SDH)

➢ Asynchronous Transfer Mode (ATM)

COURSE LEARNING OUTCOMES

This course requires the student to demonstrate the following:

1. Characterize high-speed networks.

2. Classify high-performance switches.

3. Solve internal blocking in electronic/optical switches.

4. Classify routing, congestion, and error control protocols.

5. Analyze management protocols in high-speed networks.

6. Evaluate quality of service performance in high-speed networks.

7. Apply fault tolerance techniques.

8. Recognize current high-speed networks in the local market.

9. Identify standards and migration paths to future technologies.

MAJOR TOPICS COVERED AND SCHEDULE IN WEEKS:

- Characteristics of high-speed networks   1
- High performance switches   2
- Network Control/Management Protocols   2
- SDH/SONET   2
- High speed networks   5
- Review and evaluation   2

TOPICS TO BE COVERED

Topic	No of Weeks	Contact Hours
Introduction to Broadband Networks Characteristics of High-Speed Networks	1	4

Switching
    Crossbar Switches
    Multistage Interconnection Networks (MINs)
    Omega Networks
    Delta Networks
    ATM Switches
    The Batcher-Banyan Switches
    High Performance Switches
	2	8

Network Control/Management Protocols in High Speed Networks
    Medium-Access Control Protocols
    Routing Protocols
    Flow Control/Congestion Control
    Error Control
	1	4

Plesiochronous Digital Hierarchy (PDH)
    Standards
    PDH components and operation
	1	4

Synchronous Optical Network (SONET)
    Introduction
    SONET Equipments
    SONET Multiplexing
    SONET Frame Structure
    Virtual Tributaries
    SONET Layers
	2	8

Synchronous Digital Hierarchy (SDH)
    SDH Multiplexing Structure
    SDH Frame Structure
    SDH Networks Elements
	1	4

Topic	No of Weeks	Contact Hours
Asynchronous Transfer Mode (ATM)	3	12
ATM Cell Basic Format		
Switching Technology		
ATM Devices		
ATM Network Interfaces		
ATM Services		
ATM Switching Operations		
ATM Reference Model		
ATM Service Categories		
ATM Adaptation Layer		
Organization of a Q.2931 Message		
ATM Quality of Service		
Congestion Control		
ATM Signalling and Connection Establishment		
Private Network-Network Interface (PNNI)		
Integrated Local Management Interface (ILMI)		
Multiprotocol Label Switching (MPLS)	2	8
MPLS Basics		
FECs and Label Imposition		
MPLS Architecture Example		
MPLS Data Structures		
Penultimate Hop Popping		
Label Encapsulation		
Presentations	2	8

REFERENCE BOOKS

PRIMARY

Broadband Network Architectures:
Designing and Deploying Triple-Play Services

2007, Prentice Hall

by

Chris Hellberg, Dylan Greene, and Truman Boyes

SUPPLEMENTARY

Local and Metropolitan Area Networks

6th Edition, 2000, Prentice Hall

by

William Stallings

ASSESSMENT PLAN FOR THE COURSE

Homework/Quizzes	10%
Projects	10%
Midterm 1	20%
Midterm 2	20%
Final Exam	40%