419mcd2018

Master Course Description for EE-419 (ABET sheet)

Title: Introduction to Computer Communication Networks

Credits: 4

UW Course Catalog Description

Coordinator: S. Roy, Professor, Electrical and Computer Engineering

Goals: Learn fundamental principles of communication networks – Internet architecture and protocol stack. Develop understanding of protocol design principles, develop analytical models and conduct protocol verification via experiments involving use of network protocol analyzer tools (Wireshark)

Learning Objectives: At the end of this course, students will be able to:

1. *Understand* the OSI Networking Model, and associated functions of each layer.
2. *Understand* protocol design and underlying concepts for the Data Link, Network, Transport and Application layers.
3. *Understand* appropriate analytical models for predicting protocol performance.
4. *Learn* the use of network analyzer tools to explore protocol features and conduct controlled performance studies.

Textbook: J. Kurose and K. W. Ross, *Computer Networking: A Top-Down Approach,* 7th Ed., Addison Wesley, 2016.

Reference Text: A. Tannenbaum, *Computer Networks,* 3rd Ed., Prentice Hall, 1996.

Prerequisites by Topic:

1. Probability and Statistics at the level of MATH/STAT 390 or IE 315
2. Continuous and Discrete-time Signals and Systems (EE235, EE341)
3. Understanding of state space concepts from Digital Systems (EE 271) and Communication Systems elements desired.

Topics:

1. Network Architecture and ISO model
2. Data Link Layer Functions: Error detection/correction, ARQ (Alternating Bit and Sliding Window) Protocols
3. Medium Access layer Protocols: Aloha, CSMA, Ethernet, Tree
4. Network layer Protocols: IP Routing algorithms and implementation in Internet
5. Transport layer Protocols: TCP/IP Congestion Control
6. Application Layer Protocols: http, ftp, smtp

Course Structure: The class meets for 4 hrs/week of lectures supplemented by a TA-led weekly tutorial session (assistance with wireshark and homework, discussion/review of background material and internet user commands). The primary objective is developing a) understanding of network architecture and principles of protocol design and b) models for performance analysis of network protocols; homework assignments and exams are used to assess understanding. These are supplemented by `laboratory-oriented' small experiments that uses Wireshark to explore various aspects of http, Transport, network and data link layer protocols.

Computer Resources: The students conduct the laboratory exercises on their own individual personal computers.

Laboratory Resources: No specialized support is needed for the experiments - wireshark is open source software and the text includes an experiment manual.

Grading: 20% Homework, 20% labs, 25% Mid-Term, 35% Final.

ABET Student Outcome Coverage: This course addresses the following outcomes:

H = high relevance, M = medium relevance, L = low relevance to course.

(1) *An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics* **(H)** The course uses basic skills of probabilistic analysis as applied to Internet architecture and protocols for understanding network performance.

(2) *An ability to communicate effectively with a range of audiences* **(L)** This is assessed via in-class and tutorial participation as well via specifically constructed homework question.

(3) *An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts* **(M)** The programming/simulation experiments provide experience in protocol implementations that follow recognized standards. Since networking technology is global, this enables students to understand the process and significance of standard setting for a global marketplace.

(4) *An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions* **(H)** The experiments require students to develop skills in acquiring, analyzing and interpreting data for protocol performance.

(5) *An ability to acquire and apply new knowledge as needed, using appropriate learning strategies* **(M)** Students are required to explore how features of various Internet protocols were developed and evolved, beyond the information given to them either in text or lectures.

Prepared By: Sumit Roy

Last revised: 3/25/2019