



**King Saud University**  
**College of Computer and Information Sciences**  
**Department of Computer Engineering**

**CEN 445 – NETWORK PROTOCOLS AND ALGORITHMS (3-0-1)**  
**Semester I, Academic Year 2012-2013**  
**Required Course: Time (SMW 10:00-11:00 AM)**

**Course Description (catalog):**

Network Layer; Routing Algorithms: Optimality principle, Distance Vector, Link State, Shortest Path, Broadcast; Congestion control Algorithms: Leaky Bucket, Traffic Shaping; Internetworking Protocols: The Internet Network layer, IP Tunneling and Concatenated Virtual Circuits, IP datagram forwarding, encapsulation, fragmentation and reassembly; Transport Layer Protocols: TCP and UDP services, designs, and performance.

**Prerequisites:** - **Courses** CEN 444.  
- **Topics** Computer Networks

**Textbook(s) and/or Other Required Materials:**

**Primary:**

- A. Tanenbaum, Computer Networks, 4th Edition, Prentice Hall, 2003.

**Supplementary:**

- James F. Kurose, and Keith W Ross, *Computer Networking: A Top-Down Approach*, Addison-Wesley, 2007.
- Larry Patterson and Bruce Davis, *Computer Networks: A systems Approach*, Morgan Kaufmann, 2007.
- A. Farouzan, *Data Communications and Networking*, 3rd Edition, McGraw Hill 2004.

**Course Learning Outcomes:** This course requires the student to demonstrate the following:

1. Describe end to end transmission.
2. Compare between virtual circuit and datagram networks.
3. Apply and evaluate routing algorithms.
4. Classify and evaluate congestion control algorithms.
5. Apply and evaluate Internetworking protocols.
6. Describe IP protocol specification and operation.
7. Recognize transport layer services, designs, protocols and performance.

**Major Topics covered and schedule in weeks:**

Network Layer Design Issues	1
Routing Algorithms	2
Congestion Control	2

Quality of Service and Internetworking	2
The Network Layer in The Internet	2
Elements of Transport Protocols and The Internet Transport Protocols: UDP	2
The Internet Transport Protocols: TCP and TCP Performance Issues	3
Review and Evaluation	2

### Assessment Plan for the Course

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

### Tentative Out-of-class Assignments and dates

	Date
Homework 1 Routing Algorithms	
Homework 2 Congestion Control	
Homework 3 Quality of Service and Internetworking	
Homework 4 Network Layer in the Internet	
Homework 5 Elements of Transport Protocols and UDP	
Homework 6 TCP and TCP performance Issues	
Midterm 1	10/10/2012
Midterm 2	05/12/2012

- Make sure your email address registered at Blackboard is accurate and current.
- Announcements and course notes will be posted on the course website:  
<http://faculty.ksu.edu.sa/mdahshan/Pages/CEN445-331.aspx>.
- Homework must be submitted using Blackboard LMS no later than specified date.
- Homework assignments and projects must be done individually.
- You may not share your answers with others.
- Plagiarism is an academic misconduct and will not be tolerated.

**Contribution of Course to Meeting Curriculum Disciplines:**

Curriculum Discipline	Percentage
Mathematics and Basic Science	30
Engineering Science	60
Engineering Design	10
General Education	

**Relationship of Course to Student Outcomes**

Outcome	Student Outcome Description	Level of Contribution
(a)	an ability to apply knowledge of mathematics, science, and engineering	✓
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data	
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	
(d)	an ability to function on multidisciplinary teams	
(e)	an ability to identify, formulate, and solve engineering problems	✓
(f)	an understanding of professional and ethical responsibility	
(g)	an ability to communicate effectively	
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
(i)	a recognition of the need for, and an ability to engage in life-long learning	✓
(j)	a knowledge of contemporary issues	
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	✓

**Current Instructor, Department, Office Hours and Date:**

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Department of Computer Engineering  
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Semester I, AY 2012-2013