CTE307 Network Structures and Communication
Syllabus

Course Details
Course Name: CTE307 – Network Structures and Communication
Course Credits: 3
ECTS Credits: 5
Prerequisite: CTE214 Operating Systems
Semester: 2011-2012 Fall
Instructor: Serhat M. Azgur
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Room, Phone: GZ-14A, x-3361
Office Hours: Weekdays, 08:30 – 18:00
Lecture hours and place: Mon: 10:40 – 12:30, GZ52 - Thu: 08:40 – 10:30, GB52
URL (web pages): http://2011-2012-fall.moodle.bilkent.edu.tr/

Course Description
This course is designed to provide the information about fundamentals of data communications and contemporary computer network principles and applications. In particular:

- Electronic Communications,
- Analog & Digital Signals,
- Data Communications,
- Local Area Networks,
- Wide Area Networks,
- The OSI Layers,
- Internetworking (TCP/IP, the Ethernet Technology),
- Information security, firewalls and other detection and prevention methods shall be discussed.

This course is the basic step and it prepares students for more advanced topics in networking, computer forensics, information security, Internet programming, and broadcasting.

Aims
- This syllabus (hence, the course) is designed for a typical higher education student where the goal is to introduce them to the basic principles of modern computer networking.
- To provide coverage of basic computer network terminology.
- To provide a grand tour of the major network architecture and related network services, network hardware and topologies.
- To describe the OSI reference model, common protocols and their operation, IP network addressing and current industry trends.
- To provide enough information about the information security, abuse detection and prevention issues in computer networks.
- Basic Unix/Linux knowledge to administer simple network functions and hands-on applications at the Lab environment.
Learning Outcomes
Upon successful completion of this course students will be able to:

• Demonstrate understanding of computer networking, computing models, and basic network services.
• Recognize and describe logical and physical network topologies in terms of media and network hardware.
• Compare current network technologies in terms of speed, access method, operation, topology, and media.
• Define layers of the OSI model and identify the protocols, and services associated with each layer.
• Identify the purpose, features, and functions of current common network hardware and the OSI layer with which each is associated.
• Explain the operation principles of current common network hardware devices.
• Describe current common protocols in terms of their function, routing, addressing schemes, interoperability, and naming conventions.
• Justify information security issues in computer networks.
• Manage common network administration activities using Unix/Linux Operating System.

Course Outline:
• Introduction to Communications and Computer Networking
• Data Communications, Transmission Methods and Media
• Computer Networking Hardware, Network Topologies
• OSI Layers. Networking Standards and the OSI Model
• Internetworking and Network Communication Protocols
• LANs
• WANs
• Network Security
• Basic Unix/Linux knowledge to administer simple network functions

Text Book:

Other Resources:
Students can also make use the two online textbooks available through Safari Books Online. Please note that this online book service is available only on computers that belong to Bilkent University Network. You will have to click the link to use the Academic License link at the right of the page.

• Essential Guide to Telecommunications, by Annabel Z. Dodd
• Absolute Beginner's Guide to Networking, by Joe Habraken
• and of course, any books available in the library, and a huge collection of info on the Net.

All of my course materials are also available online (through Moodle) in Adobe PDF (Portable Document Format). Please keep in mind that the lecture notes are highlights of the material covered in the textbook and aimed to introduce the basic concepts. You should study them from the textbook, and solve the problems at the end of each section.
WWW is a huge library and students are encouraged to take advantage of Web references and resources.
Instructional methods, techniques and tools:
- In class teaching,
- Lab Sessions, Labworks concerning UNIX network commands (Ubuntu operating system).
- Subject related questions-answers and discussions on the web through Moodle,
- Invited guests from the Industry.

Assessments & Grading:
To receive a passing credit, students must achieve at least 50 percent on the course composite grade (= "D"). Although, the assessments and weights may vary from semester to semester, the weighting of the course composite grade for this semester is as follows:
- Quizzes & Homeworks: 10%
- Midterm: 35%
- Final: 45%
- In-class participation: 10%

There will be several quizzes and homeworks; the number will depend on the particular academic semester.

Moodle Course Management System is extensively used throughout the academic semester. Questions and answers of quizzes and exams can be found in Moodle together with the other related resources.

Attendance:
According to Bilkent University's regulations attendance is mandatory. In-class Participation, which is 10% of the final grade, is going to be decided on the following factors:
- Lecture attendances (although attendance is compulsory, I take roll calls).
- Active participation in class discussions.
- Reflection letter to be written at the end of the semester, and
- Online participation in Moodle.

Lab attendance is mandatory. If you miss more than three lab sessions (all valid excuses must be endorsed by the Bilkent Health Center and/or Department Chair), you will receive an automatic zero as the Lab grade.

Make-up Policy
If you have missed any one of the assessments (whether an exam or any other type) due to a serious problem, you must inform the instructor immediately, together with the supporting documentation (e.g. hospital report, police report etc.). You may not be able to get a make-up exam or any other type of compensation if your case is not convincing.

Academic Integrity
We trust our students are honorable and honest, so that they do not copy from each other’s work to receive a grade they do not deserve. We believe, each student has a responsibility to understand, accept and comply with the university's standards of academic conduct as set forth by the Code of Academic Conduct, as well as policies established by the schools and colleges. Cheating, collusion, misconduct, fabrication, and plagiarism are considered serious offense. "Student Code Of Discipline" is presented in the following web page:

http://www.bilkent.edu.tr/bilkent/admin-unit/hukukm/edisiplin.html
**Weekly outline:** (based on a semester with 14 full weeks, with a week reserved for midterm)

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<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
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<tr>
<td>01</td>
<td>Electronic Communications – Network media, types &amp; characteristics. Analogue &amp; digital signals. Transmission media (guided and unguided media – copper wires, optical cables, wireless). &lt;br&gt;<em>Course outcome 2</em></td>
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<tr>
<td>02</td>
<td>Data communications &amp; xmission methods, xmission rate, xmission quality. Packet/Circuit Switching. Loss and Delay (processing delay, queuing delay, propagation delay). &lt;br&gt;<em>Course outcome 5</em></td>
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<td>03</td>
<td>ISO-OSI Layers. Networking Standards and the OSI Model. Protocol Suites; design principles and network problems. &lt;br&gt;<em>Learning outcome 4</em></td>
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<td>04</td>
<td>ISO-OSI Layers. Networking Standards and the OSI Model. (cont’d) Protocol Suites; design principles and network problems. &lt;br&gt;<em>Learning outcome 4</em>  &lt;br&gt;<strong>Labwork#1 – UNIX-simple network commands</strong></td>
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<td>05</td>
<td>The OSI Layers. Networking Standards and the OSI model. Physical Layer, Data Layer, Network Layer &lt;br&gt;<em>Learning outcome 4</em></td>
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<td>06</td>
<td>The OSI Layers. Networking Standards and the OSI model. Transport Layer, Application Layer. &lt;br&gt;<em>Learning outcome 4</em></td>
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<td>07</td>
<td>MIDTERM EXAM</td>
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<td>08</td>
<td>Networking hardware (media and connectors, network interface, hardware repeaters, bridges, routers, hubs, switches, gateways, wireless (wifi, bluetooth). Network cards (MAC address). Modem technologies (ADSL, remote desktop connection, wireless). &lt;br&gt;<em>Learning outcome 6</em></td>
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<td>09</td>
<td>Network Topologies. Ethernet Network, Token ring Network. &lt;br&gt;<em>Learning outcome 6</em>  &lt;br&gt;LANs (Local Area Networks, introduction to networking, benefits/drawbacks, types of networks, network terminology, network topologies (star, ring, bus), client-server programming, Central Computing Facilities (mainframes vs. networked (Grid) Computing), LAN topologies (Bus, Star, Ring), LAN protocols (Ethernet, Token Ring), Network Operating Systems (MSNetwork, TCP-IP, Netware), designing a simple LAN). &lt;br&gt;<em>Learning outcomes 1 – 4</em></td>
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<td>10</td>
<td>WANs (Wide Area Networks and Remote Connectivity – Interconnecting LANs, Hardware, WAN xmission media, WAN connection options, Leased Lines, Switching Networks (circuit switching, packet switching), ATM, PSTN, ISDN, TDM, Frame Relay, Satellite Communications). Routing in a WAN. &lt;br&gt;<em>Learning outcomes 1, 2, 3, 5, 6, 7</em></td>
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<td>11</td>
<td>Internetworking and Network Communication protocols (TCP/IP, data packets, the Ethernet technology (MACs, physical layer), TCP/IP addressing, ARP (Address Resolution Protocol), RARP (Reverse Address Resolution Protocol), TCP/IP Ports, sockets, TCP/IP services (telnet, ftp, remote services, SNMP, NFS, smtp, DNS), routing (RIP, BGP, protocols, tables, dynamic &amp; static routing), other protocols (IPX/SPX, NetBeui, AppleTalk). &lt;br&gt;<em>Learning outcome 4, 5, 6, 7</em></td>
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<td>12</td>
<td>Network Security. Properties, personal &amp; firm based security, hardware and software of firewalls, intrusion detection systems, honey pots, etc. Port scanning, spoofing, etc.. &lt;br&gt;<em>Learning outcome: 8</em></td>
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| **13** | Network Security. Filtering; packet filtering, stateful inspection, NAT, VLANs. Static routing vs. dynamic routing, VOIP.  
*Learning outcome: 8* |
| **14** | Basic Unix/Linux knowledge to administer simple network functions and hands-on applications at the Lab environment. Peer-to-peer networking (Configuration), Client/Server networking (Server installation and configurationUnix type operating systems), Network Administration (Setting up user accounts, Server management, Monitoring and managing performance, Managing resources, Managing security, Maintenance and troubleshooting), Basic Network Design (Media and hardware selection, Operating system selection, Wiring design and installation), Network types (small home, small office, organizational networks).  
*Learning outcomes 1, 5, 6, 8, 9* |