Course Specification

Program on which the course is given: IT Diploma
Department offering the program: Computer Science
Department offering the course: Computer Science
Academic year /level: 2008/2009 – First year

Date of specification approval:

A- Basic Information

Title Computer Networks Essentials
Lecture Three Hours /Week
Code: CS555

B- Professional Information

1- Overall Aims of Course:
By the end of the course, a successful student should be able to:

- Understand Internet architecture and its layers.
- Compare and contrast the OSI and TCP/IP models.
- Explain the service provided by IP and TCP protocols to upper layers and the specific functions performed to provide the service.
- Explain network protocols for routing, flow control and congestion control.
- Learn and understand the design, operation and management of TCP/IP based networks.
- Know the details of TCP including its limitations and how to improve on those limitations.

2- Intended Learning Outcomes of Course:
   a) Knowledge and Understandings:
      At the end of the course, the student should be able to:
      a1- Fully understand computer systems and the relationship between hardware, operating system and other software in addition to basic networking systems and WW technology.

   b) Intellectual Skills:
      At the end of the course, the student will be able to:
b1-Solve a wide range of problems related to the analysis, design and construction of computer systems.
b2-Identify a range of solutions and critically evaluate and justify proposed design solutions.
b3-Solve computer science problems with pressing commercial or industrial constraints.
b4-Work with and model computer systems at different and appropriate levels of abstraction.

c) Professional and Practical Skills:
At the end of the course, the student will be able to:
c1-Plan and undertake a major individual project.
c2-Prepare and deliver coherent and structured verbal and written technical reports

d) General and Transferable Skills:
At the end of the course, the student will be able to:
d1-Display an integrated approach to the deployment of communication skills.
d2-Work effectively with and for others.
d3-Choose and formulate suitable strategies to accomplish well-defined goals.
d4-Use project management, risk analyze, quality assurance and system validation skills for a variety of project in different fields.

e) Attitude:
At the end of the course, the student will be able to:
e1-Enhance self-study abilities.
e2-Enhance team-work skills.

3- Course Content:

<table>
<thead>
<tr>
<th>Lecture Topic</th>
<th>Lecture</th>
<th>ILOs</th>
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<tbody>
<tr>
<td><strong>Introduction To TCP/IP</strong></td>
<td></td>
<td>a1,b1,b2, c1,</td>
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<tr>
<td>• Layering</td>
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<tr>
<td>• TCP/IP Layering</td>
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<td>• Internet Addresses</td>
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<td>• The Domain Name System</td>
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<td>• Encapsulation</td>
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<td>• Demultiplexing</td>
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<td>• Client-Server Model</td>
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</table>

3
<p>| Port Numbers | Standardization Process | RFCs | Standard, Simple Services | The Internet | d1,d3,d4 |
| Internet Protocol | IP Header | IP Routing | Subnet Addressing | Subnet Mask | Special Case IP Address | A Subnet Example | ifconfig Command | netstat Command | IP Futures | a1,b1,b3,c1, c2,d1,d3,e1 |
| ARP and RARP | Assessing Risk | Who's Ready for Crisis | Assessing Crisis Preparedness | Private Companies: Different Risks | Warning Signals | Who Owns the Radar | Communications Channels | Risk Associated with the Product | 3 | a1,b2,b3,c1, d1,d3,d4,e1,e2 |
| Internet Control Message Protocol | ICMP Message Types | ICMP Address Mask Request and Reply | ICMP Timestamp Request and Reply | ICMP Port Unreachable Error | Processing of ICMP Messages | 3 | a1,b1,b2,c2, d1,d3 |
| Ping and Traceroute Programs | Ping Program | IP Record Route Option | IP Timestamp Option | Traceroute Program operation | LAN output | WAN output | IP Source Routing Option | 3 | a1,b1,b3,c1, c2,3,d4,e2 |
| IP Routing | Routing Principles | ICMP Host and Network Unreachable Errors | To Forward or Not to Forward | 3 | a1,b1,b3,c1, c2,d1,d2,d4 |</p>
<table>
<thead>
<tr>
<th>Protocol</th>
<th>Topics</th>
<th>Notes</th>
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<tr>
<td><strong>UDP: User Datagram Protocol</strong></td>
<td>- ICMP Redirect Errors &lt;br&gt;- ICMP Router Discovery Messages</td>
<td>a1,b1,b2, c1,d1,d3,d4</td>
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<tr>
<td><strong>TCP: Transmission Control Protocol</strong></td>
<td>- UDP Header &lt;br&gt;- UDP Checksum &lt;br&gt;- IP Fragmentation &lt;br&gt;- ICMP Unreachable Error &lt;br&gt;- Determining the Path MTU Using Traceroute &lt;br&gt;- Path MTU Discovery with UDP &lt;br&gt;- Interaction Between UDP and ARP &lt;br&gt;- Maximum UDP Datagram Size &lt;br&gt;- UDP Server Design</td>
<td>3</td>
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<tr>
<td><strong>TCP Connection Establishment and Termination</strong></td>
<td>- TCP Services &lt;br&gt;- TCP Header &lt;br&gt;- Timeout of Connection Establishment &lt;br&gt;- Maximum Segment Size &lt;br&gt;- TCP Half-Close &lt;br&gt;- TCP State Transition Diagram &lt;br&gt;- Reset Segments &lt;br&gt;- Simultaneous Open &lt;br&gt;- Simultaneous Close &lt;br&gt;- TCP Options &lt;br&gt;- TCP Server Design</td>
<td>a1,b1,b3,c1, d1,d3,d4</td>
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<td><strong>TCP Interactive Data Flow</strong></td>
<td>- TCP Interactive Data Flow &lt;br&gt;- Interactive Input &lt;br&gt;- Delayed Acknowledgements &lt;br&gt;- Nagle Algorithm &lt;br&gt;- Windows Size Advertisements</td>
<td>c2,d1,d3</td>
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<td><strong>TCP Bulk Data Flow</strong></td>
<td>- Normal Data Flow &lt;br&gt;- Sliding Windows &lt;br&gt;- Window Size &lt;br&gt;- PUSH Flag &lt;br&gt;- Slow Start &lt;br&gt;- Bulk Data Throughput &lt;br&gt;- Urgent Mode</td>
<td>a1,b1,b3,c1, c2,d1,d2,d4</td>
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<tr>
<td><strong>TCP Timeout and Retransmission</strong></td>
<td>- Simple Timeout and Retransmission Example &lt;br&gt;- Round-Trip Time Measurement</td>
<td>a1,b1,b3,c1, c2,d1,d3</td>
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4- Teaching and Learning Methods:

- Lectures
- Tutorials
- Class discussions
- Internet searches

5- Assessment:

a) Student Assessment Methods:

- Assignments
- Midterm written exam
- Oral exam
- Practical exam
- Final written exam

b) Assessment Schedule and Weighting:

- Four assignments with a rate one assignment every 2 weeks (8%)
- One written mid-term exam at the sixth week of the semester (8%)
- One oral and practical exam at the end of the semester (17%)
- Final written exam (67%)

6- List of Recommended Textbooks:

- TCP/IP Network Administration by Craig Hunt, O’Reilly & Associates, Inc.
- Stallings, W 2004, Data and computer communications, 7th edn, Pearson/Prentice Hall, Upper Saddle River, NJ.

7- Facilities Required for Teaching and Learning:
   a) Vital Facilities:
      - Computer lab with LAN installed.
      - Software programs for network simulation and analysis
      - Data show device.
   
   b) Lecturing Facilities:
      - Overhead Projector, Data show device.

8- Attitudes:
At the end of the course, the students are expected to:
   1- Have a positive attitude towards the aim of the course.
   2- Like analyzing with software tools and packages in computer networks and data transmission.
   3- Be satisfied with the important points of the course contents.

**Course lecturer /Coordinator:**

**Head of the Department:** Prof. Dr. Hamed Nassar.