

Subject Description Form

Subject Code	COMP416
Subject Title	Internetworking Protocols and Software
Credit Value	3
Level	4
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: COMP312 (Nil for 61025) Co-requisite/Exclusion: Nil
Objectives	<ul style="list-style-type: none">• Acquire foundational understanding on the concept of Internetworking in terms of the technologies and techniques that drive Internet;• Deepen understanding of advanced concepts of TCP/IP protocol suite and its architecture;• Earn practical exposure of TCP/IP operations in the form of realistic and practical experiments.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <p><i>Professional/academic knowledge and skills</i></p> <p>(a) identify and explain the essential components that drive internetworking (students would be equipped with the knowledge to explain the relationships between the components and how they affect one another);</p> <p>(b) understand the important issues encompassing internetworking and how these issues affect the evolution of Internet and its applications;</p> <p>(c) understand the complete architecture of Internetworking and the operations of underlying protocols and software;</p> <p>(d) rapidly learn new techniques and to align new technologies to existing Internetworking infrastructure;</p> <p>(e) equipped with practical knowledge on configuring and monitoring network operations using Internet tools and software;</p> <p>(f) develop networking software that demonstrates their understanding of the concepts taught in the class</p> <p><i>Attributes for all-roundedness</i></p> <p>(g) understand and solve internetworking problems in a systematic and principled approach;</p> <p>(h) develop practical software and present results in the form of technical report;</p>

(i) work effectively as a team member.

Alignment of Programme Outcomes:

Programme Outcome 1: This subject contributes to having students practice their writing skills with assignments and project report.

Programme Outcome 3: This subject contributes to motivate students to understand the system integration design through project.

Programme Outcome 4: This subject contributes to developing students' critical thinking through assignments and project on solving problems.

Programme Outcome 5: This subject contributes to problem solving with programming skills through assignments and project with proper design and implementation.

Programme Outcome 6: This subject contributes to develop students with industrial technologies through assignments.

Programme Outcome 7: This subject contributes to team work with group-based project for students to practice team spirit.

**Subject Synopsis/
Indicative Syllabus**

Topic
<p>1. TCP/IP protocol suite Hierarchical address routing; connecting LAN and WAN technologies; IP classful addressing: IP classes, special IP addresses, subnet addressing, multihome addresses; address resolution protocol and RARP.</p>
<p>2. Advanced addressing and IP Supernetting; assigning address blocks; classless addressing; slash notation; IP packet format; ICMP error reporting.</p>
<p>3. Transport protocol Transport services and protocols; protocol mechanisms including error, flow and congestion control; transport addressing; connection control; connection termination; credit-based flow control; silly window syndrome: Nagle's algorithm; TCP timers: setting timeouts; TCP congestion control: slow-start, multiplicative decrease and additive increase; TCP packet format; TCP state transitions; User Datagram Protocol.</p>
<p>4. Internet routing Direct versus indirect internet routing; routing methods; routing decisions; interior gateway routing versus exterior gateway routing; routing protocols: RIP versus OSPF, BGP, autonomous systems; OSPF routing mechanisms: area border routers, Dijkstra's algorithm; link state routing.</p>
<p>5. SNMP Simple Network Management Protocol: Management Information Base (MIB); Structure of Management Information (SMI); SNMP protocol; setting traps.</p>
<p>6. Internet multicast N-to-N unicast; proxy and Internet multicast; hardware multicast; Internet Group Management Protocol (IGMP); Distance Vector Multicast Protocol (DVMP); Core Base Tree (CBT) multicast; MOSPF; Protocol Independent Multicast (PIM); reliable multicast.</p>

	<p>7. Internet services BOOTP versus DHCP; Domain Name Services (DNS); Inverse Domain Mapping; SMTP; POP3; IMAP4; private networks and security: Virtual Private Networks (VPN); intranet versus extranet; private network addressing; IP Security (IPSec); Authentication Header mode versus Encapsulating Security Payload (ESP); Network Address Translation (NAT).</p> <p>8. Mobile Internet Mobile IP; home agent; foreign agent; agent discovery protocol; triangle routing; mobile transport protocol: TCP over wireless, Indirect TCP (I-TCP), Snoop TCP; Realtime Transport Protocol (RTP).</p>																																																																																			
<p>Teaching/Learning Methodology</p>	<p>The course includes 13 lectures, . The lecture gives the basic knowledge on the Internet protocols. The knowledge is tested through quizzes, assignments and project.</p>																																																																																			
<p>Assessment Methods in Alignment with Intended Learning Outcomes</p>	<table border="1" data-bbox="427 808 1453 1384"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="9">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>C</th> <th>d</th> <th>e</th> <th>f</th> <th>g</th> <th>h</th> <th>i</th> </tr> </thead> <tbody> <tr> <td>1. Quizzes</td> <td rowspan="3">55%</td> <td></td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>2. Assignments</td> <td>✓</td> <td></td> <td>✓</td> <td></td> <td></td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> </tr> <tr> <td>3. Project</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>5. Examination</td> <td>45%</td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total</td> <td>100 %</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>The assessment includes quizzes and assignments which test if students understand the basic materials of the course.</p> <p>Project is a group project, it allows students to learn how to do team work and also deeply understand the routing protocols.</p> <p>Final exam is comprehensive. It tests the knowledge of the whole course.</p>											Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)									a	b	C	d	e	f	g	h	i	1. Quizzes	55%		✓		✓	✓			✓		2. Assignments	✓		✓			✓	✓		✓	3. Project	✓	✓	✓	✓		✓	✓	✓	✓	5. Examination	45%		✓	✓	✓		✓				Total	100 %									
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	Total student study effort	89 Hrs.
Reading List and References	<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Behrouz A. Forouzan, "TCP/IP Protocol Suite", 2nd Edition, McGraw Hill. <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Douglas Comer, "Internetworking with TCP/IP: Principles, Protocols, and Architectures", 4th edition, Prentice Hall. 2. W. Richard Stevens, "TCP/IP Illustrated, Vol 1", Addison Wesley. 3. Andrew Tanenbaum, "Computer Networks", Prentice Hall. 4. Articles from IEEE/ACM Transactions on Networking, IEEE Internet Computing, The Internet Protocol Journal, ACM Communications Magazine. 	