



**ACADEMIC REGULATIONS, COURSE STRUCTURE &  
SYLLABI**

FOR

**M. TECH./ M.Sc. DOUBLE DEGREE MASTERS (DDP)  
PROGRAMME in**

**COMPUTER NETWORKS**

**(Under MoU with UNIVERSITY OF WESTMINSTER, London, UK)  
(WITH EFFECT FROM THE ACADEMIC YEAR 2010-2011)**

CONDUCTED BY

**School of Information Technology  
Jawaharlal Nehru Technological University Hyderabad  
Kukatpally, HYDERABAD, ANDHRA PRADESH  
INDIA - 500085**

**Academic Regulations for the Award of**  
**M. Tech. / M. Sc. Double Degree Masters (DDP) Programme in**  
**COMPUTER NETWORKS**  
**(Under MoU with UNIVERSITY OF WESTMINSTER, London, UK)**  
**(WITH EFFECT FROM THE ACADEMIC YEAR 2010-2011)**

M.Tech./M.Sc. (Double Degree Masters Program Under MoU with Cork Institute of Technology,Ireland is a 2-year self-financed Post-Graduate Double Degree Programme, jointly conducted by the Jawaharlal Nehru Technological University Hyderabad, Hyderabad (India), and Cork Institute of Technology, Ireland. The PG Degree (M.Tech.) of the Jawaharlal Nehru Technological University Hyderabad, shall be conferred on those who are admitted to the Programme and fulfill all the requirements for the Award of the Degrees.

**1. Eligibility for Admission:**

Admission to the above program shall be made subject to the eligibility, qualifications and specialization prescribed by the University/College from time to time. Admissions shall be made either on the basis of the merit rank obtained by the qualifying entrance test conducted by Jawaharlal Nehru Technological University Hyderabad (JNTUH) or on the basis of any other order of merit approved by the University from time to time.

**2. Course Work:**

- 2.1 A candidate after securing admission must pursue the prescribed course of study for four semesters duration (two academic years).
- 2.2 a) First Semester shall be conducted at JNTUH campus, II and III semesters at CIT (Cork Institute of Technology,Ireland) for obtaining M.Sc. Degree from Cork Institute of Technology,Ireland ,and IV semester at JNTUH, Hyderabad, for obtaining the M. Tech degree of JNTUH.

b) If the candidate wishes to register for IV semester at JNTUH, the registration of Project work for his M.Tech. needs to be done during III semester, from UoW, London, online.

- 2.3 The semester duration at JNTUH shall be of 20 weeks duration, including examinations.
- 2.4 A candidate admitted to a program should complete it within a period equal to twice the prescribed duration of the program from the date of admission.
- 2.5 A student, who fails to fulfill all the academic requirements for the award of the Degree within four academic years from the year of his admission, shall forfeit his seat in the above course.

- 2.6 (a) Each subject in I semester at JNTUH is assigned certain number of credits as specified below:

Theory Subjects	4 Periods per Week	4 Credits
Practical Subjects	3 to 4 Periods per Week	2 Credits
Seminar	3 periods per Week	

(Each period will be of 60 minutes duration)

(b) IV semester Project work (at JNTUH) 20 Credits

- 2.7 A candidate shall be deemed to have secured the credits assigned to a subject if he has put up at least 65% of attendance in each subject and aggregate in all subjects; and secured the minimum academic requirements in the subject.
- 2.8 In order to qualify for the award of the Post-Graduate Degree, the candidate shall successfully complete all his Theory/Lab. Subjects, Seminar, Project Work/Thesis/Dissertation etc. and earn all the prescribed credits at JNTUH and University of Westminster, as per the course structure specified.

### 3. Attendance:

- 3.1 The candidate shall put in a minimum of 75% aggregate attendance in all subjects put together in a semester. However, the candidate should also obtain subject wise minimum attendance of 65%

- 3.2 Condonation of shortage of attendance from 65% & above and less than 75% may be given by the College/School academic committee
- 3.3 Condonation of shortage of attendance shall be granted only on genuine and valid reasons, on representation by the candidate with supporting evidence, and by paying the stipulated condonation fee.
- 3.4 If the candidate does not satisfy the minimum aggregate attendance requirement or subject wise minimum attendance requirement (as specified in 3.1 and 3.2), the candidate will have to repeat all the subjects of the semester (or any other specified equivalent subjects), as and when offered. In such a case, the candidate has to pay the tuition fee for that semester.
- 3.5 The candidate shall be deemed to have eligibility to write the End semester examination in all subjects, if he has put in the required % of aggregate attendance and secured the minimum academic requirement in each subject. However, if the candidate has not paid the fee before the End semester examination or has any dues, he may not be issued hall ticket for writing the end semester examination.

#### **4. Evaluation:**

- (i) Theory Subjects are evaluated for 100 marks, and Practical/Laboratory Subjects are also evaluated for 100 marks.
- (ii) For theory subjects, the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examination. For the award of the 40 Internal (sessional) marks for theory subjects, there shall be 2 internal examinations during the Semester, one at the middle of the Semester and the other immediately after the completion of instructions; each of which shall be evaluated for 25 marks, and the better one out of these two internals shall be considered for awarding the 25 sessional marks. Out of the remaining 15 sessional marks, 5 marks are allocated for teacher's assessment (allotment is based on the performance of the student in the class) and 10 marks will be awarded based on the student's performance in the Assignments.
- (iii) For Practical/Laboratory subjects, there shall be a continuous evaluation during the Semester for 40 sessional marks and 60 End Examination marks. Of these 40 marks, 15

marks shall be awarded for day-to-day work and 25 marks to be awarded by conducting an internal laboratory test. The End Examination shall be conducted by the teacher concerned and another faculty member of the same Department, as suggested by the Head of Department.

- (iv) The candidate shall be deemed to have secured the minimum academic requirement in each subject, if he secures a minimum of 40% marks in end examination and minimum aggregate of 50% of the total marks in the end semester examination & internal evaluation taken together
- (v) In case if the candidate does not secure the minimum academic requirement in any subject (as specified in (v)), he has to reappear for the end semester examination in that subject , or re-register the same subject when next offered or re-register any other specified subject, as may be required. However, one more additional chance may be provided for each subject, for improving the internal marks provided that the internal marks secured by a candidate is less 50% and he failed in the end semester examination. In case of taking another chance for re-registration, the internal marks obtained in the previous attempt are nullified. In such cases of re-registration, the candidate has to pay the re-registration fee for each subject, as specified.
- (vi) The seminar of I semester at JNTUH is an audit course in which the performance of the student will be rated as SATISFACTORY/UNSATISFACTORY, and NO marks shall be awarded. However, the student has to show SATISFACTORY performance for the seminar. If the student performance is rated UNSATISFACTORY, he has to make the seminar presentation again to secure SATISFACTORY performance.

**(vii) Option for obtaining JNTUH M. Tech. Degree :**

If the candidate fulfills all the academic requirements in I, II and III semesters and earns all the required credits, he is eligible for the award of **M. Sc. Degree** at Cork Institute of Technology, Ireland. After successful completion of I semester (at JNTUH), II & III semesters (at CIT) only, the candidate is eligible for registering for his M.Tech. Project Work/Dissertation at JNTUH for obtaining M. Tech. Degree from JNTUH, Hyderabad;

and the initiation for this Project Work shall be done at the beginning of III semester through on-line (from Cork Institute of Technology,Ireland), with the acceptance from the concerned faculty members of the Departments (at CIT and JNTUH).

Every candidate shall be required to execute his M.Tech. Project Work and submit his Dissertation, after taking up a topic approved by the Project Review committee (PRC). The candidate has to decide his topic for his M.Tech. Project Work within the first four weeks of the commencement of III semester (at CIT), and can submit his PG Project Work Proposal to the PRC on-line, on whose approval he can register for the PG Project. The PRC shall be constituted at JNTUH by the Head of the Department, and shall consist of the Head of the Department, the Project Supervisor, and a senior faculty member of the Department. The PRC approved M.Tech. Project (which has been initiated in the beginning of the III semester at CIT), shall continue at JNTUH, Hyderabad, from the reporting date at JNTUH (after the completion of the III Semester at CIT), and shall be carried out in the entire IV semester duration.

The PRC will monitor the progress of this Project Work through Two Seminar presentations - one during IV Semester, and one before the submission of the Dissertation. The student shall submit the Project Report/Dissertation at the end of IV Semester, and the same shall be evaluated by the PRC as SATISFACTORY or UNSATISFACTORY. In the case of UNSATISFACTORY declaration, the student shall resubmit the Project Report/Dissertation after carrying out the necessary modifications/additions in the Project Work, within the specified time as suggested by the PRC. The student can submit the Dissertation, only after completion of 21 weeks of the IV semester, after obtaining the approval from PRC. Extension of time, within the total permissible limit for the completion of the Degree, may be considered by the PRC, on sufficient valid grounds.

- (viii) The student shall be allowed to submit the PG Project Work/ Dissertation, only on the successful completion of all the prescribed PG Subjects (Theory and Laboratory) and Seminars. Once the student's Dissertation is approved by the PRC, the Dissertation will be

sent to an External Examiner nominated by the Principal/Director of the College/School, on whose approval, the student shall appear for the PG Project Viva-Voce Examination.

- (ix) The PG Project Work and Dissertation will be adjudicated by One External Examiner selected by the competent authority. If the report of the External Examiner is not favorable, the student shall revise and resubmit the Dissertation as per the recommendations of the External Examiner. If the report of the External Examiner is unfavorable again, then the Dissertation will be summarily rejected. In such a case, the candidate shall re-register for Project Work.
- (x) If the report of the External Examiner is favorable, then Viva-voce Examination shall be conducted by a Board, consisting of the Project Supervisor, Head of Dept., and the External Examiner who adjudicated the Project Work/Dissertation. The Board shall jointly report the student's performance in the PG Project Work as - (A) EXCELLENT, or (B) GOOD, or (C) SATISFACTORY, or (D) UNSATISFACTORY, as the case may be. In case, the student fails in the Viva-voce Exam., i.e., the UNSATISFACTORY (D) grade is awarded, he has to reappear for the Viva-voce Exam as per the recommendations of the Board. If he fails at the second Viva-voce Exam also, he will not be eligible for the award of the Degree.

## **5. VISA Requirements:**

The candidate has to satisfy the following academic requirements in I semester of the program in order to get eligibility for obtaining VISA to proceed to Cork Institute of Technology, Ireland for further continuing the program:

- (i) The candidate has to obtain minimum 65% attendance in I semester
- (ii) The candidate has to pass in all the subjects of the course work in I semester and obtain an aggregate of minimum 60%
- (iii) Students are responsible to show the required financial proofs to the migration authorities while applying for Confirmation of Acceptance (CAS) letter. Either JNTUH or CIT will not be responsible for the VISA rejections caused on the grounds of in-sufficient financial funds/statements in front of migration authorities.

## 6. Grading Procedure:

- (i) Marks will be awarded to indicate the performance of each student, in each Theory Subject or Practical Subject and a proportional letter grade shall be given.
- (ii) As a measure of the student's performance, a Grading System using the following letter grades and corresponding percentage of marks shall be followed:

<i>% of Marks Secured at JNTUH</i>	<i>Letter Grade Equivalent at CIT,Ireland</i>
Less than or equal to 100% but not less than 70%	A
Below 70% but not less than 65%	B
Below 65% but not less than 50%	C
Below 50%	F

## 5. Award of Degree or Class:

After a student satisfies all the requirements prescribed for the completion of the M.Tech. Degree and becomes eligible for the award of the Degree, he shall be placed in one of the following four classes:

Class Awarded at JNTUH	% of Marks Secured at JNTUH	Equivalence between UoW grade and JNTUH marks for the purpose of award of class  <b>CIT Grade<sup>#</sup> – JNTUH Marks</b>
FIRST CLASS with DISTINCTION	70% and above	<b>A ≥ 70%</b>
FIRST CLASS	Below 70%	



	but not less than 60%	<b>B ≥ 65%</b>
SECOND CLASS	Below 60% but not less than 50%	<b>C ≥ 50%</b> <b>F &lt; 50%</b>
FAIL	Below 50%	

**# Note:** If any unspecified symbol/character is given by Cork Institute of Technology,Ireland. as the CIT grade for any subject, the corresponding ratification for the appropriate specified grade shall be obtained from CIT, London, and the corresponding percentage marks will be awarded at JNTUH, after the necessary certification/approval from the Course Coordinator/HoD at JNTUH.

#### **6. Transfer of Credits Policy between JNTUH and Cork Institute of Technology,Ireland:**

- a) JNTUH offers 20 credits for I semester for this joint M.Tech./M.Sc. Double Degree program, which will be transferred to CIT as 60 CIT credits at Cork Institute of Technology,Ireland.
- b) The 60 CITcredits offered at, Cork Institute of Technology,Ireland, for each of the II and III semesters are transferred to JNTUH, which will be equivalent to 20 credits at JNTUH.
- c) JNTUH offers 20 credits for IV semester Project Work/Dissertation (for M.Tech. Degree), which will not be transferred to UoW for M. Sc. Degree or any other purposes.

#### **7. Withholding of Results:**

If the student has not paid dues to University/College, or if any case of indiscipline is pending against him, the result of the candidate may be withheld and he will not be allowed to go into the next higher Semester. The Award of the Degree may also be withheld in such cases.

#### **8. Transitory Regulations:**

Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the Degree Programme, may be considered eligible for

readmission to the same or equivalent/substitute subjects as and when they are offered, subject to condition 2.4.

### **9. Alternative One-year PG Diploma option:**

9.1. The candidates after completion of I Semester at JNTUH, Hyderabad, need to proceed to CIT, Ireland for continuing the Course. In case of candidates, who are unable to proceed to Cork Institute of Technology, Ireland, with genuine reasons, may be permitted to opt for one year P.G. Diploma Programme in the concerned specialization at JNTUH, Hyderabad.

9.2. The one year P.G. Diploma Programme consists of one semester course work and one semester Project Work along with seminar. The one year P.G. Diploma shall be awarded on successful completion of two semesters, the I semester being the previous regular course work carried out earlier at JNTUH, and the II semester shall consist of the PG Diploma Project Work.

9.3. There shall be no refund of fee, in case if the candidate discontinues the Course.

### **10. General:**

- The Academic Regulations shall be read as a whole for the purpose of any interpretation.
- The University/College reserves the right of altering the Academic Regulations and/or Syllabus/Course Structure, as and when necessary. The modifications or amendments may be applicable to all the candidates on rolls, as specified by the University/College.
- Wherever the words 'he' or 'him' or 'his' occur in the above regulations, they will also include 'she' or 'her' or 'hers'.
- Wherever the word 'Subject' occurs in the above regulations, it implies the 'Theory Subject' and 'Practical Subject' or 'Lab.'.
- In case of any ambiguity or doubt in the interpretations of the above regulations, the decision of the Vice-Chancellor will be final.

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**COURSE STRUCTURE**

**a) I YEAR – I Semester at School of IT, JNTUH, Hyderabad:**

<b>Code</b>	<b>Subject</b>	<b>L</b>	<b>P</b>	<b>Credits</b>
CN110	Computer Networks	4	-	4
CN120	Network Programming	4	-	4
CN130	Distributed Systems	4	-	4
CN140	Building Networks, Routing and Security	4	-	4
CN150	Networking Programming Lab.	-	3	2
CN160	Building Networks, Routing and Security Lab.	-	3	2
	Seminar	-	3	-
	Total (4 Theory + 2 Labs + 1 Seminar)	16	9	<b>20</b>

**b) I YEAR – II Semester at UNIVERSITY OF WESTMINSTER, LONDON (UK):**

**(3x20=60 UoW Credits)**

- Network Configuration and Operation PLUS  
**Relevant Option Modules/ Electives (Any Two)**

- Network Security
- Network Modelling and Simulation
- Broadband Wireless Networks
- Cellular Wireless Networks
- Communication Principles

**[Subjects listed above are indicative]**

**c) II YEAR – I Semester at UNIVERSITY OF WESTMINSTER, LONDON (UK) :**

- Thesis Work (Phase – I) for the Award of M.Sc. Degree **(60 UoW Credits)**

**d) II YEAR – II Semester at JNTUH, Hyderabad**

**(Option for Students for obtaining M. Tech. Degree from JNTUH, Hyderabad) :**

- Thesis Work (Phase – II) **(20 JNTUH Credits)**

## COMPUTER NETWORKS

### UNIT I Review

**Computer Networks and the Internet:** What is the Internet, The Network edge, The Network core, Access Networks and Physical media, ISPs and Internet Backbones, Delay and Loss in Packet-Switched Networks, History of Computer Networking and the Internet – **(Chapter 1) of T1.**

**Foundation of Networking Models:** 5-layer TCP/IP Model, 7-Layer OSI Model, Internet Protocols and Addressing, Equal-Sized Packets Model: ATM - **(Chapter 2) of T2.**

### UNIT II

**The Link Layer and Local Area Networks:** Link Layer: Introduction and Services, Error-Detection and Error-Correction techniques, Multiple Access Protocols, Link Layer Addressing, Ethernet – **(Chapter 5) of T1**

**Routing and Internetworking:** Network-Layer Routing, Least-Cost-Path algorithms, Non-Least-Cost-Path algorithms, Intradomain Routing Protocols, Interdomain Routing Protocols, Congestion Control at Network Layer – **(Chapter 7) of T2**

### UNIT III

**Logical Addressing:** IPv4 Addresses, IPv6 Addresses - **Internet Protocol:** Internetworking, IPv4, IPv6, Transition from IPv4 to IPv6 – **(Chapter 19, 20) of T3**

**Transport and End-to-End Protocols:** Transport Layer, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Mobile Transport Protocols, TCP Congestion Control – **(Chapter 8) of T2**

**Application Layer:** Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, Domain Name System (DNS), P2P File Sharing – **(Chapter 2) of T1**

### UNIT IV

**Wireless Networks and Mobile IP:** Infrastructure of Wireless Networks, Wireless LAN Technologies, IEEE 802.11 Wireless Standard, Cellular Networks, Mobile IP, Wireless Mesh Networks (WMNs) - **Mobile Ad-Hoc Networks:** Overview of Wireless Ad-Hoc Networks, Routing in Ad-Hoc Networks – **Wireless Sensor Networks** and Protocol Structures - **(Chapter 6, 19, 20) of T2**

### UNIT V

**VPNs, Tunneling and Overlay Networks:** Virtual Private Networks (VPNs), Multiprotocol Label Switching (MPLS), Overlay Networks – **VoIP and Multimedia Networking:** Overview of IP Telephony – **(Chapters 16, 18) of T2**

**TEXT BOOKS:**

1. Computer Networking: A Top-Down Approach Featuring the Internet, *James F. Kurose, Keith W. Ross*, Third Edition, Pearson Education, 2007
2. Computer and Communication Networks, *Nader F. Mir*, Pearson Education, 2007
3. Data Communications and Networking, *Behrouz A. Forouzan*, Fourth Edition, Tata McGraw Hill, 2007

**REFERENCE BOOKS:**

1. An Engineering Approach to Computer Networking , *S.Keshav*, Pearson Education, 1997
2. Computer Networks: Principles,Technologies And Protocols For Network Design, *Natalia Olifer, Victor Olifer*, Wiley India, 2006.
3. Computer Networks, *Andrew S. Tanenbaum*, Fourth Edition, Prentice Hall.
4. Fundamentals of Business Data Communications, Jerry FitzGerald and Alan Dennis, Tenth Edition, Wiley, 2009.
5. Campus Network Design Fundamentals, *Diane Teare, Catherine Paquet*, Pearson Education (CISCO Press)

## NETWORK PROGRAMMING

### UNIT – I

Linux Utilities- File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities.

Bourne again shell(bash) - Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples.

Review of Java - Fundamentals of Java, Classes and Objects, Inheritance, Interfaces and Packages, Exception handling, Files, Multithreaded Programming.

### UNIT - II

Files- File Concept, File System Structure, Inodes, File Attributes, File types, Library functions, I/O in C, stream errors, kernel support for files, Low level file access - File structure related system calls(File APIs), file and directory management - Directory file APIs, Symbolic links & hard links.

Process- Process concept, Kernel support for process, process attributes, process control - process creation, waiting for a process, process termination, zombie process, orphan process, Process APIs, Multithreaded Programming - Differences between threads and processes, Thread structure and uses, POSIX Thread APIs, Creating Threads, Thread Attributes.

### UNIT - III

Signals- Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.

Interprocess Communication - Introduction to IPC, Pipes, FIFOs, message queues, semaphores and shared memory.

Message Queues- Kernel support for messages, Unix system V APIs for messages, client/server example.

Semaphores-Kernel support for semaphores, Unix system V APIs for semaphores.

Shared Memory- Kernel support for shared memory, Unix system V APIs for shared memory.

### UNIT - IV

Network IPC - Introduction to Unix Sockets, Address formats, Socket system calls for Connection Oriented - Communication -Socket, bind, listen, accept, send, recv, Socket system calls for

Connectionless-Communication-socket,connect,sendto,recvfrom,Example-Client/ServerPrograms,  
Socket options - setsockopt , getsockopt , fcntl.

### UNIT-V

Network Programming in Java-Network basics, TCP sockets, UDP sockets(datagram sockets),Server programs that can handle one connection at a time and multiple connections(using multithreaded server),Remote Method Invocation(Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

### TEXT BOOKS:

1. Unix System Programming using C++, T.Chan, PHI.(Units II,III,IV)
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.(Unit I)
3. An Introduction to Network Programming with Java,Jan Graba, Springer,rp 2010.(Unit V)
4. Unix Network Programming ,W.R. Stevens, PHI/Pearson Education.(Units II,III,IV)
5. Java Network Programming,3<sup>rd</sup> edition, E.R Harold, SPD, O'Reilly.(Unit V)
6. The complete Reference Java 7<sup>th</sup> Edition , Herbert Schildt, TMH.(Part of Unit I)

### REFERENCE BOOKS:

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the Unix environment, 2<sup>nd</sup> Edition, W.R.Stevens, Pearson Education.
3. Unix for programmers and users, 3<sup>rd</sup> Edition, Graham Glass, King Ables, Pearson Education.
4. Beginning Linux Programming, 4<sup>th</sup> Edition, N.Matthew, R.Stones,Wrox, Wiley India Edition.
5. Unix Network Programming The Sockets Networking API,Vol.-I,W.R.Stevens,Bill Fenner,A.M.Rudoff,Pearson Education.
6. Unix Internals,U.Vahalia,Pearson Education.
7. Unix shell Programming,S.G.Kochan and P.Wood,3<sup>rd</sup> edition,Pearson Education.



## DISTRIBUTED SYSTEMS

### UNIT I

Characterization of Distributed Systems- Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models- Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication,

Distributed objects and Remote Invocation-Introduction,Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

### UNIT II

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems- Introduction, File Service architecture, case study- SUN network file systems.

Name Services-Introduction, Name Services and the Domain Name System, Case study of the Global Name Service, Case study of the X.500 Directory Service.

### UNIT III

Peer to Peer Systems-Introduction,Napster and its legacy, Peer to Peer middleware,Routing overlays,Overlay case studies-Pastry,Tapestry, Application case studies-Squirrel,OceanStore.

Time and Global States-Introduction,Clocks,events and Process states, Synchronizing physical clocks,logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement - Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

### UNIT IV

Transactions and Concurrency control-Introduction,Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control.Distributed Transactions-Introduction,Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery,Replication-Introduction,System model and group communication, Fault tolerant services, Transactions with replicated data.

### UNIT V

Security-Introduction,Overview of Security techniques, Cryptographic algorithms,Digital signatures, Case studies-Kerberos,TLS,802.11 WiFi.

Distributed shared memory, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, Other consistency models, CORBA case study- Introduction, CORBA RMI, CORBA Services.

**TEXT BOOKS:**

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S. Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

**REFERENCE BOOKS:**

1. Distributed Computing, S. Mahajan and S. Shah, Oxford University Press.
2. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI.
3. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, Tata McGraw-Hill Edition.
4. Reliable Distributed Systems, K.P. Birman, Springer.
5. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
6. Distributed Operating Systems and Algorithm Analysis, R. Chow, T. Johnson, Pearson.
7. Distributed Operating Systems, A.S. Tanenbaum, Pearson education.

## BUILDING NETWORKS: ROUTING AND SECURITY

*(Note: The subject covers both the theoretical and practical aspects of CCNA course)*

*(Prerequisite: Basics of computer networks)*

### **Theoretical Topics Covered:**

Router and IOS Basics, Router startup and configuration , Routing Protocols , Access Lists, PPP and Frame Relay, Switching Concepts, VLANs, Network Security

### **Practical Topics Covered**

*Introduction to Networks, TCP/IP, IP Addressing, Router and IOS Basics, Router Startup and Configuration, Routing Protocols , Advanced Routing Protocols, Network Services, Access Lists, PPP and Frame Relay, Basic switching and Switch configuration, Advanced Switching Concepts, Network Security*

### TEXT BOOKS:

1. Accessing the WAN, CCNA Exploration, Bob Vachon , Pearson Cisco Press
2. Network Fundamentals, CCNA Exploration, Mark Dye, Pearson Cisco Press
3. Routing Protocols & Concepts, CCNA Exploration, Rick Graziani, Pearson  
Cisco Press
4. LAN Switching & Wireless, CCNA Exploration, Wayne Lewis, Pearson  
Cisco Press
5. CCNA Study Guide(Exam 640-802), Cannon, Caudle, Chiarella, Cengage  
Learning.
6. CCNA Study Guide(Exam 640-802), Richard Deal, TMH

## NETWORK PROGRAMMING LAB

### List of Sample Problems:

1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
2. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
3. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
4. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.
5. Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
- \*6. Write a shell script that accepts any number of arguments and prints them in the reverse order.
7. Write a shell script that determines the period for which a specified user is working on the system.
8. Write a shell script to list all of the directory files in a directory.
9. Write an interactive file-handling shell program- Let it offer the user the choice of copying, removing or linking files. Once the user has made a choice, have the program ask him for the necessary information such as the file name, new name and so on.
10. Write a shell script to find factorial of a given integer.
11. Write a shell script to find the G.C.D. of two integers.
12. Write a shell script to generate a multiplication table.
13. Write a shell script that copies multiple files to a directory.
14. Write a shell script that counts the number of lines and words present in a given file.
15. Write a shell script that displays the list of all files in the given directory.
- \*16. Write a shell script (small calculator) that adds, subtracts, multiplies and divides the given two integers. There are two division options: one returns the quotient and the other returns remainder. The script requires 3 arguments: The operation to be used and two integer numbers. The options are add (-a), subtract (-s), multiply (-m), quotient (-c) and remainder (-r).
- \*17. Write a shell script to reverse the rows and columns of a matrix.
- \*18. Write a sed command that deletes the first character in each line in a file.
- \*19. Write sed command that deletes the character before the last character in each line a file.
- \*20. Write a sed command that swaps the first and second words in each line of a file.
- \*21. Write an awk script that reads a file of which each line has 5 fields – ID, NAME, MARKS1, MARKS2, MARKS3 and finds out the average for each student. Print out the average marks with appropriate messages.
- \*22. Write an awk script to find the factorial of a user supplied number.
- \*23. Is –l command produces long listing of files. Write an awk script 1)to print the selected fields (Ex:size and name of the files) from the file listing. 2) to print the size of all files and number of files.
- \*24. Write an awk script to count the number of lines in a file that do not contain vowels.
- \*25. Write an awk script to find the number of characters, words and lines in a file.
- \*26. Write a perl script to find the average of a set of numbers using a function.

- \* 27. Write a perl script to find the number of characters and words in a given sentence. to print the sentence after reversing it.
- \* 28. Write a perl program that prompts for and reads a string and a number (on separate lines of input) and prints out the string the number of times indicated by the number on separate lines.
- \* 29. Write a perl program that reads a series of words (with one word per line) until end of input, then prints a summary of how many times each word was seen.
- \* 30. Write a perl program that prints each line of its input that contains a period(.), ignoring other lines of input. Try it on small text file.
- \* 31. Write a perl program that makes a modified copy of a text file. In the copy, every string Fred (case insensitive) should be replaced with Larry. (So, "Manfred Mann" should become "MannLarry Mann"). The input file name should be given on the command line, and the output file name should be the corresponding file name ending with ".out".
- \* 32. Write a perl program that takes a list of files named on the command line and reports for each one whether it is readable, writable, executable, or doesn't exist.
- \* 33. Write a perl program that works like rm, deleting any files named on the command line.
- \* 34. Write a perl program that works like mv, renaming the first command line argument to the second command line argument.
- \* 35. Write a perl program to find any symbolic links in the current directory and print out their values.
- \* 36. Write a perl program to read in a list of numbers and sort them.
- \* 37. Write a perl program that looks through a given string for every occurrence of a given substring, printing out the positions where the substring is found.
- \* 38. Write a perl program that changes to some particular directory, like the systems' root directory, and executes the ls -l command to get a long format directory listing in that directory.
- 39. Write a C program that makes a copy of a file using standard I/O and system calls.
- 40. Write a C program that counts the number of blanks in a text file Using standard I/O Using system calls.
- 41. Implement in C the following Unix commands using system calls  
A) cat            B) ls            C) mv
- 42. Write a C program that takes one or more file/directory names as command line input and reports the following information on the file.  
A) File type.                            B) Number of links.  
C) Time of last access. D) Read, Write and Execute permissions.
- 43. Write a C program to emulate the Unix ls -l command.
- 44. Write a C program that creates a directory, puts a file into it, and then removes it.
- 45. Write a C program that searches for a file in a directory and reports whether the file is present in the directory or not.
- 46. Write a C program to list for every file in a directory, its inode number and file name.
- 47. Write a C program that creates a file containing hole which is occupying some space but having nothing.
- 48. Write a C program that demonstrates redirection of standard output to a file.Ex: ls > f1.
- 49. Write a C program to create a child process and allow the parent to display "parent" and the child to display "child" on the screen.
- 50. Write a C program to create a Zombie process.
- 51. Write a C program that illustrates how an orphan is created.
- 52. Write a C program that creates a child process to execute a command. The command to

- be executed is passed on the command line.
53. Write a C program that accepts two small numbers as arguments and then sums the two numbers in a child process. The sum should be returned by child to the parent as its exit status and the parent should print the sum.
  54. Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex:- `ls -l | sort`
  55. Write C programs that illustrate communication between two unrelated processes using named pipe.
  56. Write a C program in which a parent writes a message to a pipe and the child reads the message.
  57. Write a C program that illustrates suspending and resuming processes using signals.
  - \*58. Write a C program that displays the real time of a day every 60 seconds, 10 times.
  - \*59. Write a C program that runs a command that is input by the user and prints the exit status if the command completes in 5 seconds. If it doesn't, then the parent uses kill to send a SIGTERM signal to kill the child process.
  60. Write a C program that illustrates file-locking using semaphores.
  61. Write a C program that implements a producer-consumer system with two processes. (Using semaphores).
  62. Write client and server programs (using C ) for
    - i) interaction between server and client processes using Unix Domain Sockets.
    - ii) Interaction between server and client processes using Internet Domain Sockets.
  63. Write a C program (sender.c) to create a message queue with read and write permissions to write 3 messages to it with different priority numbers.
  64. Write a C program (receiver.c) that receives the messages (from the above message queue as specified in 63 and displays them.
  65. Write C program that illustrates two processes communicating via shared memory.
  66. Write Java programs (Server and Client) for the following:

The Server receives the message sent by the client and then retransmits the same message to the client.(Use Sockets)
  67. Write a Socket-based Java program that implements a simple client/server application. When Server receives a message from a client,it simply converts the message into all lower case letters and sends back the same to the client.The client displays the message on the console.
  68. Write a Java program to connect to a database and retrieve all the data.
  69. Write a Java Program for the following:

The Client sends a datagram to the Server.The Server receives the datagram and generates another datagram in response to it.
  70. Write a Server program that will receive the filename from the client, retrieve it and send the contents of file to the client.
  71. Write a Java program to implement an RMI Client/Server application.
  72. Write an UDP-based Client-side applet to send the side of a Square to the server. Write the Server-side applet such that it receives the side, computes the area and finally returns to the client.

73. Write a Java program that copies a file using RMI.
74. Write a multithreaded server which will pass whatever message line it will receive from a client to all the other clients that are connected. Write a client program to connect to this Server, which sends its lines and receives the lines sent by the other clients.
75. Write a remote calculator program that adds, subtracts, and multiplies two numbers. These operations should be invoked remotely by a client method.
76. Create an UDP echo Client/Server application, wherein whatever is written to a UDP server is written back to the client.

**Note: \* These problems are not included.**

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