LJ University

University with a Difference

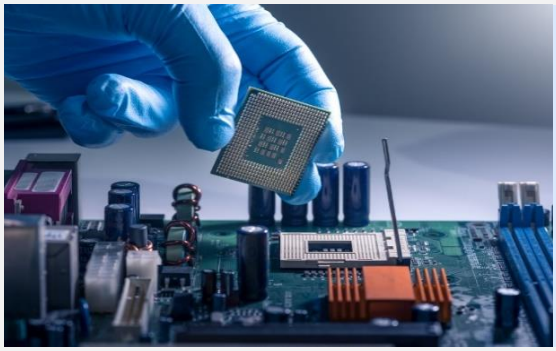
Diploma Engineering
Semester V

CE, IT, AIML, Cloud Computing & Big Data, Gaming & Animation

HANDBOOK

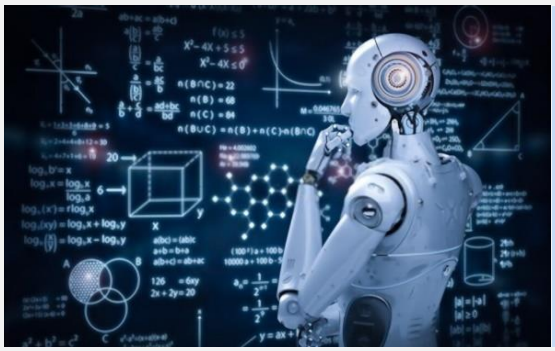
LJ Polytechnic

An Overview of Major Computer & Technology Disciplines



Computer Engineering is a branch of engineering that integrates several fields of computer science and electronic engineering required to develop computer hardware and software. Computer engineers design, test, implement and maintain computer software and hardware systems.

Information Technology (IT) is the use of computers to store or retrieve data and information. IT is typically used within the context of business operations as opposed to personal or entertainment technologies. You can find IT specialization in every branch of education, from IT & Software, Engineering, Aviation and Medicine to MBA and even Hospitality.



Artificial Intelligence (AI) is intelligence demonstrated by machines, as opposed to the natural intelligence displayed by humans or animals. AI applications include advanced web search engines, recommendation systems used by YouTube, Amazon and Netflix, Siri or Alexa, Tesla, and strategic game systems (such as chess and Go).

Cloud Computing & Big Data is the on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user. Big data is a field that treats ways to analyze, systematically extract information from, or otherwise, deal with data sets that are too large or complex to be dealt with by traditional data-processing application software.

Gaming & Animation is the process of developing/designing a game. The effort is undertaken by a developer, ranging from a single person to an international team dispersed across the globe. Animation is a method in which figures are manipulated to appear as moving images. Various tools available in the market today, ease out the tasks of game development and animation.

Disclaimer

This handbook is compiled to provide subject information to the students. Every effort has been made to avoid errors & omissions and ensure accuracy. Any error noted may be brought to the notice of the compiler, which shall be taken care of in the updated edition of this handbook. The sources of information/material are provided in the appendix.

The information contained in this handbook is strictly for education and learning purposes and not for any commercial use.

Furthermore, The University reserves the right to unilaterally and without notice make changes to this handbook at any time.




Evaluation Methodology

Theory Marks

PA: Progressive Assessment

Units' examinations will be conducted during the semester. Each unit examination is compulsory. Unit examination may be taken from objectives, short questions, long questions, etc.

Unit-1 Exam:	Maximum Marks 10
Unit-2 Exam:	Maximum Marks 10
Unit-3 Exam:	Maximum Marks 10
Unit-4 Exam:	Maximum Marks 10
	Total Marks 40

ESE: End Semester Exam

End semester examination will be conducted from all Five (5) units and it is compulsory. It may be taken in the form of objectives, short questions, long questions etc.

End Semester Exam: Maximum Marks 50

CA: Continuous Assessment

Continuous assessment will be evaluated from the activity assigned in the semester and the attendance of that particular subject.

Activity Assessment / Attendance: Maximum Marks 10

Practical Marks

PV: Practical Viva

Practical viva will be conducted through group task. Thereafter viva will be conducted individually based on the given task of the concerned subject.

Practical Viva: Maximum Marks 30

TW: Term Work

Term work will be considered from the assignment and laboratory work done by the student during the semester of that particular subject.

Term Work: Maximum Marks 20

EVALUATION SCHEME

The performance of students is evaluated on the basis of continuous and semester-end examinations with letter grades O+++, O++, A++, B, etc. Which have numerical equivalents called grade points as indicated below:

Percentage		Grade Point	Grade	Class
95	100	10	O+++	First Class with Distinction
90	94	9.5	O++	
85	89	9	O+	
80	84	8.5	O	
75	79	8	A++	
70	74	7.5	A+	
65	69	7	A	First Class
60	64	6.5	B++	
55	59	6	B+	Higher Second Class
50	54	5.5	B	Second Class
45	49	5	C	
40	44	4.5	D	
35	39	4.0	E	Pass Class
less than 35		0	F	Fail

The performance of a student in a semester is indicated by a number called SPI (Semester Performance Index). The SPI is the weighted average of the grade points obtained in all the subjects taken by the student during the semester. Example: Suppose in a given semester a student has taken subjects having credits C1, C2, C3, C4, C5..... And the numerical equivalent of grades obtained in those subjects are G1, G2, G3, G4, and G5 respectively.

Then his/her $\text{SPI} = \frac{\text{Grade Points Earned}}{\text{Total Offered Credits}} = \frac{\sum_{i=1}^{n} Ci\ Gi}{\sum_{i=1}^{n} Ci}$

SPI will be calculated (after re-examination, if any) up to two decimal places on the basis of the final grades.

An overall assessment from the time the student entered the course is obtained by calculating PPI (Progressive Performance Index). The PPI is the weighted average of the grade points obtained in all the subjects taken by the student since he/she entered the course. It is calculated in the same manner as the SPI. The CGPA (Cumulative Grade Points Average) is the weighted average of the grade points obtained in all the subjects in the last six semesters of the course.

Detention:

Formula for conversion of equivalent percentage of PPI

An equation to find equivalence between PPI or CGPA may be obtained as follows:

Percentage Marks = (PPI or CGPA — 0.5) x 10. SPI or PPI or CGPA equivalent class shall be as follows:

Below 4.00 : Fail
4.00 – 4.49 : Pass Class
4.50 – 5.50 : Second Class
5.51 – 6.00 : Higher Second Class
6.01 – 7.49 : Firsrt Class
7.50 and above : First Class with Distinction

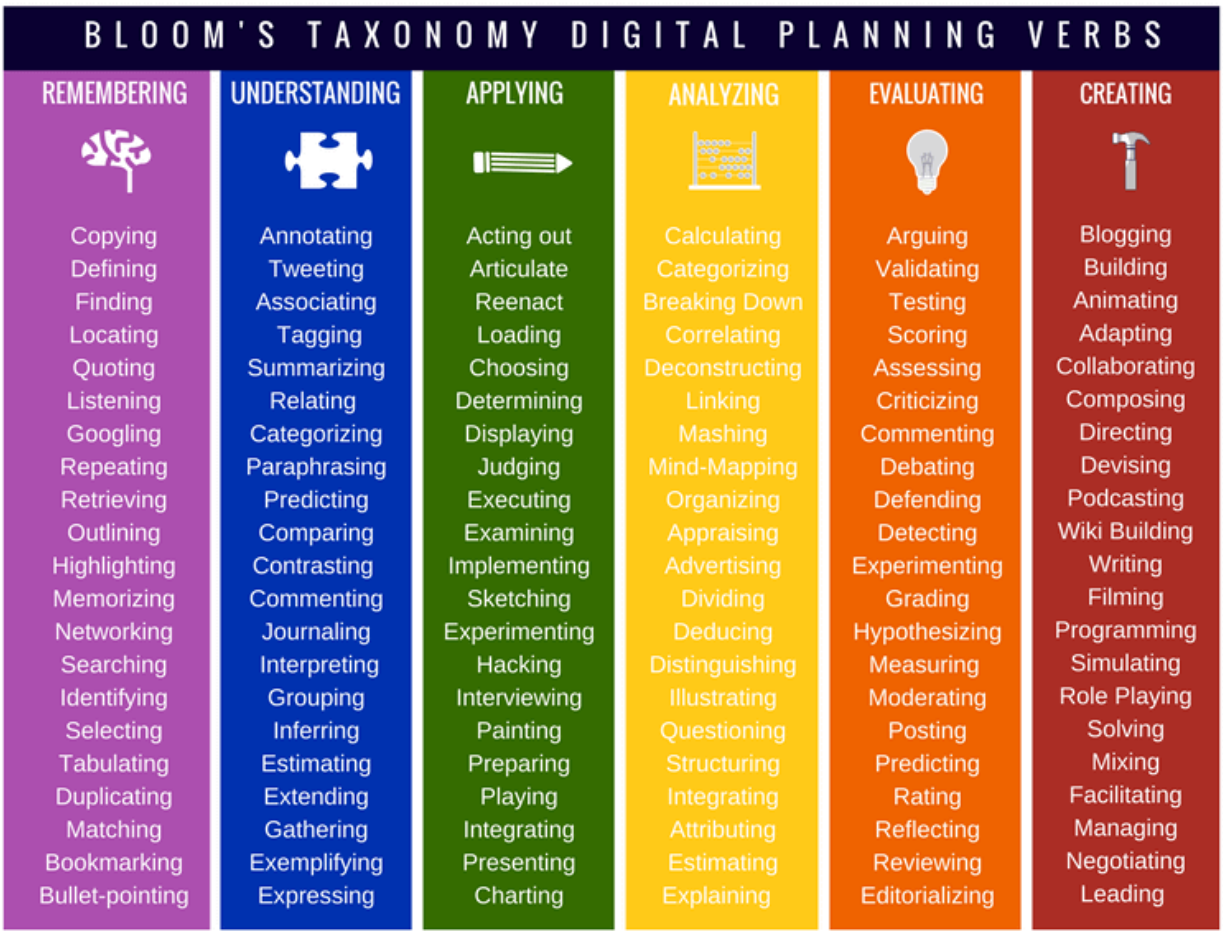
For all courses, where the duration of the course is more than 2 years, the degree shall be awarded to the students on the basis of CGPA of the last six semester's performance in the exams.

In case of the courses where duration is of two years, the degree shall be awarded to students based on PPI considering the performance in all four semesters.

About Bloom's Taxonomy

Bloom's Taxonomy is a classification of the different objectives and skills that educators set for their students (learning objectives). The taxonomy was proposed in 1956 by Benjamin Bloom, an educational psychologist at the University of Chicago. The terminology has been recently updated to include the following six levels of learning. These 6 levels can be used to structure the learning objectives, lessons, and assessments of your course.

1. **Remembering:** Retrieving, recognizing, and recalling relevant knowledge from long-term memory.
2. **Understanding:** Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.
3. **Applying:** Carrying out or using a procedure for executing, or implementing.
4. **Analyzing:** Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.
5. **Evaluating:** Making judgments based on criteria and standards through checking and critiquing.
6. **Creating:** Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing.



LJ University
University with a Difference

NETWORK SECURITY & MANAGEMENT

Department of Computer Engineering

LJ Polytechnic

Prepared and Compiled by CE & IT Department

Course

Course Title	Network Security & Management					
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses
BSC: Basic Science Courses
ESC: Engineering Science Courses
PCC: Program Core Courses
OEC: Open Elective Courses
PEC: Program Elective Courses

Teaching and Evaluation Scheme

Teaching Hours / Week				Evaluation Scheme							
				Theory Marks				Practical Marks			Total Marks
L	T	P	Total Credit	ESE	CA	PA	Total	PV	TW	Total	
2	-	4	4	50	10	40	100	30	20	50	150

Legends: ESE: End Semester Exam
CA: Continuous Assessment (Attendance + Activity)
PA: Progressive Assessment
PV: Practical Viva
TW: Term Work

Contents

Unit No.	Topics	Sub-Topics	Learning Outcomes	% Weightage	Hours
1	**Introduction to Security Mechanisms**	1.1.Various security terms 1.2.Security Basics 1.3.Various types of computer and network attacks 1.4.Types of cryptography	• Understand Basic security. • To get knowledge about various attacks in Network. • To understand cryptography	20	4
2	**Cryptography in Network**	2.1.Introduction to Symmetric Encryption & Asymmetric Encryption 2.2.Substitution Techniques Encryption and Decryption using: Caesar's cipher, Playfair cipher, Shift cipher, Vigenere cipher, One Time Pad (Vernam cipher), Hill cipher 2.3.Transposition technique: Rail fence cipher 2.4.Asymmetric Encryption: Digital Signature	• To understand basics of cryptography • Understand about cryptography techniques • Knowledge of digital signature	20	6
3	**Network Security**	3.1.Working principle of FIREWALLs 3.2.Internet Protocol Security (IPsec) and its use in secure communication 3.3.Various types of	• Overview of IP security Understand different types of IDSs. • Understand the HIDS and NIDS.	15	6

		IDSs 3.4.Distinguish Hostbased IDS & Network-based IDS 3.5 HIDS and NIDS components 3.6 Advantages and disadvantages of HIDS, NIDS			
4	**Network Administration Protocols and Services**	4.1.Directory Service 4.2.Different Directories Access Protocols 4.3. Active Directory 4.4.VPN and its protocols 4.5.DHCP architecture, RARP and BOOTP 4.6.Introduction to DNS and its Objectives	• To know directory services • Understand directories Protocols. • Set-up and configure VPN • List VPN Protocols. • Understand IP Protocols. • To know List DNS objects.	25	6
5	**Network Planning and Implementation**	5.1.Network needs 5.2.Install and Configure Windows Server 5.3.Steps to create Domain controller 5.4.Adding file server and print server	• Design a small network • Preparing for installation and configuration server • Install ADDS Server. • Understand web base administration Process.	20	6
				Total Hours	**42**

Suggested Specification Table with Hours

Unit No.	Chapter Name	Teaching Hours	Distribution of Topics According to Bloom's Taxonomy					
			R %	U %	App %	C %	E %	An %
1	Introduction to Security Mechanisms	06	40	50	-	-	-	10
2	Cryptography in Network	10	20	30	5	-	40	5
3	Network Security	10	35	25	10	-	10	20
4	Network Administration Protocols and Services	06	10	40	5	5	20	20
5	Network Planning and Implementation	10	25	35	20	5	5	10

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

Textbooks

1) "Computer Security Basics by Deborah Russell G.T. Gangenisr," O'Reilly publication
2) "Networking A Beginner's Guide by Bruce Hallberg," Tata McGrow Hill publication.
3) "Cryptography and Network Security by William Stallings," Pearson Education, ThirdEdition

Reference Books

1) "The Complete Reference Networking by Craig Zacker", Tata McGrow Hill publication.
2) "Introduction to Networking by Bruce Hallberg", Tata McGrow Hill publication.
3) "Computer Networks by Andrew S. Tanenbaum", Prentice Hall India.
4) "Cryptography and Network Security Principles and Practices" by William Stallings, Pearson Publication Third Edition.

Open Sources (Website, Video, Movie)

1) https://www.md5summer.org/download.html
2) https://www.edx.org/learn/cryptography
3) https://www.coursera.org/learn/crypto
4) https://www.mygreatlearning.com/academy/courses/2839370/70951
5) https://learn.udacity.com/courses/ud199

Introduction

The current era of communication is based on internet and hence, networking is an essential part of it. Current advanced digital world needs a very keen knowledge on various security threats that are increasing day by day posing problems to data. To access remote programs, data and hardware resources, which are lying either on the same organization's computers or at other enterprises or public sources for resource sharing, e-commerce, use of social network etc. connecting the IT resources is the prime requirement of today. So, the threats that are harmful to individual computers will affect the whole organization's computer network as well, which may cause communication delay or lessen the network performance by affecting the server as well as the clients of the organization. This course aims at learning basic cryptography techniques and applying security mechanisms for operating systems as well as private and public network to protect them from various threats by introducing students to the fundamentals of network management, primarily for TCP/IP networks. The students of this course will be able to design, install, configure and experience hands-on management of typical network components.

Objectives

- ✓ Acknowledging the role of network administration in current social web
- ✓ To help students to become a competent and confident user who can use the basic knowledge and skills to manage and administrate the computer network
- ✓ Prepare students for the upcoming and enhanced version of network threats and their competencies.
- ✓ Identifying the main differences between the administration and management of a network from various threats.

Subject's Learning Outcomes

They learn the importance of confidentiality, integrity, and availability in terms of security. To comprehend, recognize, and explain the various kinds of security systems, including firewalls, encryption, and passwords, and how they can be used to protect networks and data. Recognize the significance of security measures. Any organization that wants to safeguard its systems and information must put basic security measures in place. Be familiar with the jargon used when discussing encryption, decryption, and cryptography. Be aware of the various applications of private and public key cryptography, and comprehend encryption systems that use both private keys and public keys. Grasp how to use asymmetric encryption for digital signatures. The gained knowledge will include the various forms of internet security. Showcase different network security tools like IPSec and Firewall.

Introduction to Security Mechanisms

Short Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	Define Security Services.	Remember
2.	Explain the Security Mechanism.	Understand
3.	Define Cryptography.	Remember
4.	Define Encryption & Dencryption.	Remember
5.	List out types of Passive Attack.	Remember
6.	Define Confidentiality.	Remember

Long Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	Explain DoS and DDoS	Understand
2.	Explain different types of network attacks.	Understand
3.	Explain the Security Services of Cryptography.	Understand
4.	Explain types of Viruses.	Understand
5.	Explain Security Basics.	Understand
6.	Explain SQL Injection in details.	Understand

Essential Assignments

1. Explain Authentication terms of Security.
2. Define Passive attacks. Explain any one in brief.
3. Explain Replay Attacks.
4. Explain Phishing Attacks.
5. Difference between DoS and DDoS
6. Define Active Attacks. Explain any one in detail.

Desirable Assignments

1. Provide examples of real-world phishing attacks and explain how users can protect themselves.
2. What is a Distributed Denial of Service (DDoS) attack? Describe its characteristics, potential impact, and common mitigation strategies. Isn't the cloud more reliable, efficient and less expensive?
3. Discuss the concept of phishing attacks. How do they work, and what are some common techniques employed by attackers? Provide examples of real-world phishing attacks and explain how users can protect themselves.

Activities

1. Prepare Case Study report on Phishing Attack on a Financial Institution.

Learning Outcomes

- Understand the key security requirements of confidentiality, integrity, and availability.
- To understand and identify different types of security mechanisms, such as passwords, encryption, and firewalls, and explain how they can be used to secure networks and data.
- Understand the importance of security mechanisms.
- Implementing basic security measures is essential for any organization that wants to protect its information and systems.

2 Cryptography in Network

Short Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	What is Symmetric Key Cryptography?	Understand
2.	Explain the Key characteristics of Symmetric Encryption Algorithms.	Understand
3.	What is Plain text?	Understand
4.	Explain the Private Key and Public Key.	Understand
5.	Define Digital Signature.	Remember
6.	What is Asymmetric Key cryptography?	Understand

Long Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	Explain Symmetric Encryption in brief.	Understand
2.	Explain Asymmetric Encryption.	Understand
3.	Explain Caesar Cipher in brief.	Understand
4.	Explain the requirements of a Digital Signature.	Understand
5.	What is the difference between a Private Key and a Public key?	Understand

Essential Assignments

1. Find the Ciphertext for the following using Hill cipher. For given plaintext is: ATT and Key is:
   2 4 5
   9 2 1
   3 17 7.
2. Explain Symmetric Key Cryptography in detail
3. Explain Digital Certificate in brief.
4. Solve using Playfair Cipher: Key: "PRIMROSE", plaintext is: "hike the foothills".
5. Difference between DoS and DDoS
6. Write short note on One Time Pad with example.

Desirable Assignments

1. Explain the concept of Asymmetric Encryption and how it differs from Symmetric Encryption. Provide real-world examples where Asymmetric encryption is more suitable.
2. Describe the steps involved in the Digital Signature process using Asymmetric Encryption. How does the verification process work to confirm the authenticity of a Digitally signed document?

Activities

1. Prepare Case Study report on Secure Document Signing for a Legal Firm

Learning Outcomes

- Understand the terminology used when talking about encryption, decryption, and cryptography
- Understand encryption systems that use private keys and public keys
- Use public key encryption for your communication be informed of the different uses of private and public key cryptography
- Understand how to work digital signatures using asymmetric encryption

Network Security

Short Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	What is Firewall?	Understand
2.	Wg rite down any two characteristics of a Firewall.	Understand
3.	Write down the limitations of the Firewall.	Understand
4.	Write the full form of IPsec.	Remember
5.	Write down the advantages of Packet Filtering Firewall.	Understand
6.	Write down functions on Packet Filtering Firewall.	Understand

Long Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	Explain the scope of the Firewall	Understand
2.	Explain Packet Filtering Firewall.	Understand
3.	Describe HIDS and NIDS components.	Understand
4.	Explain various services of IPSec.	Understand
5.	Explain Security Basics.	Understand

Essential Assignments

1. Write down types of Firewalls and explain any one in brief.
2. Write short note on IPSec.
3. Explain Logical components of IDS.
4. Explain Intrusion Detection System in brief.
5. Explain transport mode and tunneling mode.
6. Explain Kerberos.
7. Give difference between Tunnel Mode and Transport Mode.

Desirable Assignments

1. Define IPsec (Internet Protocol Security) and explain its role in securing network communications. Discuss the main objectives and components of IPsec.
2. Install and configure a few features of the Firewall for Network Security

Activities

1. Prepare a Case Study report on Implementing a Firewall Solution for a Small Business.
2. Configure firewall of (Win XP/ Win 7).

Learning Outcomes

- Knowledge about types of internet security will be gained.
- Demonstrate various network security applications, Firewalls, and IDS.
- Knowledge about IP-Security will be gained

4 Network Administration Protocols and Services

Practical List

1. Perform installation of Windows Server 2012 R2 on VMware.
2. Configure Windows Server 2012 R2 on VMware.
3. Perform installation of Windows 7 or Windows 10 Operating System on VMware.
4. Configure Windows 7 or Windows 10 Operating System on VMware
5. Install and Configure DHCP on Server 2012.

Short Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	What is a Directory Service in the context of Network Security?	Understand
2.	List of Directory.	Remember
3.	Explain Forest, Tree and Root.	Remember
4.	Explain VPN.	Remember
5.	List the VPN protocols	Remember
6.	What is the function of RARP?	Remember
7.	Define BOOTP.	Remember
8.	Define DHCP protocol.	Remember

Long Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	Explain all Directories with a description.	Understand
2.	Explain VPN protocols describe all protocols	Understand
3.	Explain DHCP Architecture.	Understand
4.	Explain DNS and its objectives.	Understand
5.	Explain RARP and advantages disadvantages of RARP.	Understand

Essential Assignments

1. Explain X.500 Directory access protocol with a diagram.
2. Explain LDAP Directory protocols with a diagram.
3. Explain the RARP protocol with a diagram.
4. Explain the BOOTP protocol with a diagram.
5. Describe DHCP protocol.
6. What are the different types of VPNs?

Desirable Assignments

1. How do you configure and manage DNS servers?
2. How does DHCP lease renewal work?
3. What are the differences between BOOTP and DHCP?

Activities

1. Install Linux Operating System on VMware.
2. Configure Linux Operating System on VMware.

Learning Outcomes

- Understanding Network protocols and services enables administrators to configure, manage and optimize Network resources.
- Knowledge of all Directory services.
- Knowledge of how to work the DHCP server.
- Understand for DNS server.
- Understand how to work Virtual Private Networks in different locations.

5 Network Planning and Implementation

Practical List

1. Installing Active Directory Using Server Manager on windows server
2. Promoting Server to Domain Controller.
3. Creating Active Directory Objects.
4. Configure the following services on the windows server:

   a) Create New Users & assign privileges/ permission.

   b) Modify/ Delete/Deactivate Users and groups.
5. Install and Configure DNS on Server 2012
6. Setting up and configuring the Local Print Device.
7. Setting up and configuring Network Print Devices.
8. Implementing Group Policy in Windows Server 2012 R2.
9. Install and Configure a Backup Server on Windows Server.
10. Demonstrate traffic analysis of different network protocols using a tool. i.e. Wireshark. (At least one of them should be recorded and included in term work.)

Short Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	Why do we need Computer Networks?	Understand
2.	What are the Hardware and Software requirements for Installing a Windows Server?	Remember
3.	What is Printer sever.	Remember
4.	Explain the File server.	Understand
5.	Explain Group Policies.	Understand
6.	Explain Server Backup.	Understand

Long Questions

Q. No.	Sample Questions	Bloom's Taxonomy
1.	What are the main types of Network needs in an organization?	Understand
2.	What is a File Server and what are its benefits?	Understand
3.	Implement installation and configuration for Window server 2012 in VMware.	Apply
4.	Implement ADDS and create a Domain Server in VMware.	Apply
5.	Implement File Server in VMware	Apply
6.	How do you configure and manage a Print Server?	Apply

Essential Assignments

1. Write down the steps for configuration for Window Server 2012.
2. Write steps to install a File server.
3. Write down the steps for installation for ADDS server.
4. Write steps to install a Network Printer server.

Desirable Assignments

1. Create a DHCP server and implement it in the network.
2. Write down open DNS and implement anyone who assigns a static IP address to the server.
3. Managing domain resources such as Printers, Files, and Folders.

Activities

1. How to Join client computers to the Domain write down steps.
2. Create a user account Linux Operating System on VMware
3. Configure static IP in window Operating System

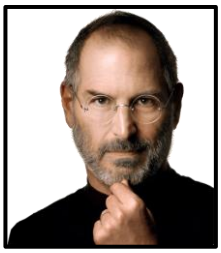
Learning Outcomes

- Understanding Network protocols and services enables administrators to configure, manage and optimize Network resources.
- Knowledge of all Directory services. and how to work DHCP server.
- Understand for DNS server andhow to work Virtual Private Networks in different locations.

Quotes from Pioneers

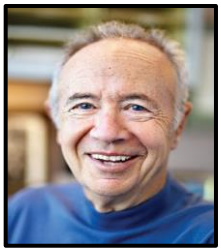
"The advance of technology is based on making it fit in so that you do not really even notice it, so it is part of everyday life."

- Bill Gates, Co-Founder, Microsoft.



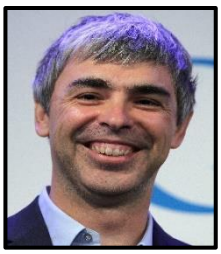
"Have the courage to follow your heart and intuition. They somehow already know what you truly want to become. Everything else is secondary."

- Steve Jobs, Co-Founder, Apple Inc.



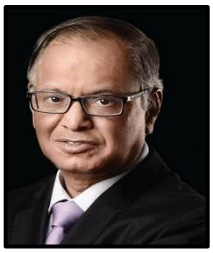
"Success breeds complacency. Complacency breeds failure. Only the paranoid survives."

- Andy Grove, Former Chairman & CEO, Intel.



"If you are changing the world, you are working on important things. You're excited to get up in the morning."

- Larry Page, Co-Founder, Google & Alphabet Inc.

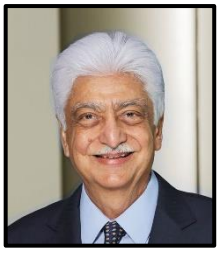


"Progress is often equal to the difference between mind and mindset."

- N. R. Narayana Murthy, Chairman Emeritus, Infosys.

"The only way to learn new programming language is by writing programs in it."

- Dennis Ritchie, Co-Creator of C Programming.



"Success is achieved twice. Once in the mind and the second time in the real world."

- Azim Premji, Founder Chairman, Wipro.

"The digital world has power because it has dynamic information, but it's important that we stay human instead of being another machine sitting in front of a machine."

- Pranav Mistry, President & CEO of STAR Labs.

LJ Polytechnic

Offers Diploma in

- Artificial Intelligence & Machine Learning
- Electronics & Communication Engineering
- Cloud Computing & Big Data
- Architectural Assistantship
- Automation & Robotics
- Gaming & Animation
- Automobile Engineering
- Mechanical Engineering
- Information Technology
- Computer Engineering
- Electrical Engineering
- Civil Engineering

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