



# LJ University

University with a Difference

## Diploma Engineering Semester IV

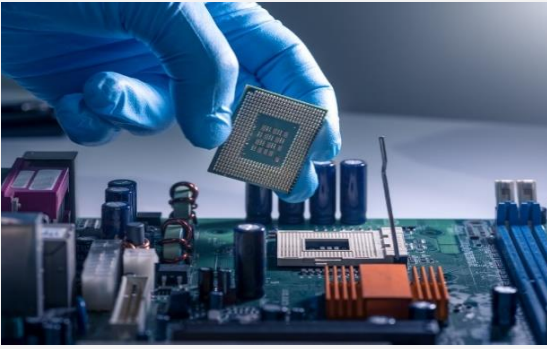


**CE, IT, AIML, Cloud Computing &  
Big Data, Gaming & Animation**

# 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. An information technology system (IT system) is generally an information system, a communications system.



**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 and 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

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<b>Total Marks</b>	<b>40</b>
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### **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
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### **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
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## 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
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### **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
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## 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 C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>, C<sub>4</sub>, C<sub>5</sub>..... And the numerical equivalent of grades obtained in those subjects are G<sub>1</sub>, G<sub>2</sub>, G<sub>3</sub>, G<sub>4</sub>, and G<sub>5</sub> respectively.

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

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	: First 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.

BLOOM'S TAXONOMY DIGITAL PLANNING VERBS					
REMEMBERING	UNDERSTANDING	APPLYING	ANALYZING	EVALUATING	CREATING
					
Copying Defining Finding Locating Quoting Listening Googling Repeating Retrieving Outlining Highlighting Memorizing Networking Searching Identifying Selecting Tabulating Duplicating Matching Bookmarking Bullet-pointing	Annotating Tweeting Associating Tagging Summarizing Relating Categorizing Paraphrasing Predicting Comparing Contrasting Commenting Journaling Interpreting Grouping Inferring Estimating Extending Gathering Exemplifying Expressing	Acting out Articulate Reenact Loading Choosing Determining Displaying Judging Executing Examining Implementing Sketching Experimenting Hacking Interviewing Painting Preparing Playing Integrating Presenting Charting	Calculating Categorizing Breaking Down Correlating Deconstructing Linking Mashing Mind-Mapping Organizing Appraising Advertising Dividing Deducing Distinguishing Illustrating Questioning Structuring Integrating Attributing Estimating Explaining	Arguing Validating Testing Scoring Assessing Criticizing Commenting Debating Defending Detecting Experimenting Grading Hypothesizing Measuring Moderating Posting Predicting Rating Reflecting Reviewing Editorializing	Blogging Building Animating Adapting Collaborating Composing Directing Devising Podcasting Wiki Building Writing Filming Programming Simulating Role Playing Solving Mixing Facilitating Managing Negotiating Leading



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## SOFTWARE ENGINEERING

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**LJ Polytechnic**

**Prepared and Compiled by  
CE & IT Department**

## Course

<b>Course Name</b>	Software Engineering					
<b>Course Type</b>	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			Theory Marks
L	T	P	Total Credit	ESE	CA	PA	Total	PV	TW	Total	
3	-	2	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	Software Development Process	1.1. Introduction 1.2. Basics of Software Engineering 1.3. Software Process 1.4. Software Development Life Cycle 1.5. Software Development Models	<ul style="list-style-type: none"> <li>Understanding of software and software engineering</li> <li>Software life cycle</li> <li>Various SDLC models and their use in project planning</li> </ul>	30	10
2	Requirements Analysis and Specification	2.1. Requirement Gathering and Analysis 2.2. Software Requirements Specification 2.3. Cohesion 2.4. Coupling	<ul style="list-style-type: none"> <li>Identify software requirement</li> <li>Analysis and design requirement</li> <li>Prepare software requirement specification documentation</li> </ul>	20	8
3	Software Design with UML	3.1. Design Process 3.2. Design Decisions Data Modeling 3.3. Function Orientated Software Design 3.4. Object Modeling using UML 3.5. Architectural Design Decisions	<ul style="list-style-type: none"> <li>Understanding of design process</li> <li>Basics of data modeling</li> <li>Various types of object modeling with UML</li> <li>Understanding of architectural design</li> </ul>	20	10
4	Software Project Management	4.1. Responsibilities of Software Project Manager 4.2. Metrics for Size Estimation 4.3. Project Estimation Techniques 4.4. Project Scheduling 4.5. Risk Management	<ul style="list-style-type: none"> <li>Awareness of project manager's responsibilities</li> <li>Prepare and manage the schedule for different software development activities</li> </ul>	20	8

			<ul style="list-style-type: none"> <li>Understanding of project estimation techniques</li> </ul>		
5	<b>Software Coding and Testing</b>	5.1. Code Review Techniques 5.2. Software Documentation 5.3. Software Testing 5.4. Test Documentation	<ul style="list-style-type: none"> <li>In-depth knowledge of code review techniques</li> <li>Generate software documentation</li> <li>Prepare test cases and test the software</li> </ul>	10	6
				<b>Total Hours</b>	<b>42</b>

### 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	Software Development Process	10	40	40	10	-	10	-
2	Requirements Analysis and Specification	8	30	30	20	10	5	5
3	Software Design with UML	10	25	25	20	20	5	5
4	Software Project Management	8	30	30	20	10	5	5
5	Software Coding and Testing	6	30	30	20	10	5	5

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

### Textbooks

- 1) Fundamentals of Software Engineering, Rajib Mall, PHI Learning Private Limited, Third Edition

### Reference Books

- 1) The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.
- 2) Software Engineering a practitioner's approach, Roger S Pressman, McGraw Hill Higher Education, Seventh Edition

### Open Sources (Website, Video, Movie)

- 1) <http://www.rspa.com/spi/>
- 2) <https://nptel.ac.in/courses/106/105/106105182/>
- 3) <http://www.sei.cmu.edu/>

## **Introduction**

The software has become an integral & important part of any business or organization in the modern world. Due to this, software needs to be effective, efficient, and reliable. To accomplish this, the actual software development process needs to be planned & focused on. Software Engineering is the foundation for professional processes to be followed involving principles, techniques, and practices for software development. The course provides a framework for software professionals for building quality-assured software products. It enables students to blend the domain-specific knowledge with the programming skills to create quality software products.

## **Objectives**

- ✓ Be able to select a suitable software process model for software development.
- ✓ Prepare software requirement specifications.
- ✓ Identify and apply appropriate software architectures and patterns to carry out the high-level design of a system and be able to critically compare choices.
- ✓ Will have experience and/or awareness of testing problems and will be able to develop a simple testing report.

## **Learning Outcome**

This course is aimed to make students be able to decompose the given project in various phases of a lifecycle. Students will be able to choose appropriate process model depending on the user requirements. A special track is organized as a series of theory and laboratory sessions, hands-on practical workshops, various activities related to subject, assignments, and various evaluations throughout this course which empowers students to apply the knowledge, techniques, and skills in the development of a software product.



# Software Development Process

## Short Questions

<b>Q. No.</b>	<b>Sample Questions</b>	<b>Bloom's Taxonomy</b>
1.	Define software engineering.	Remember
2.	Define software.	Remember
3.	List umbrella activities.	Remember
4.	Which are the tools used in Software Development?	Remember
5.	List the phases of RAD model.	Remember
6.	List the phases which are considered as 'development phases' of waterfall model.	Remember
7.	What is feasibility study of software?	Understand
8.	Where we can use Prototyping model?	Remember
9.	List different software process framework activities.	Remember
10.	What is system software?	Understand
11.	What is software scope?	Understand

## Long Questions

<b>Q. No.</b>	<b>Sample Questions</b>	<b>Bloom's Taxonomy</b>
1.	Define SDLC. Explain SDLC with neat diagram.	Remember
2.	Explain iterative waterfall model.	Understand
3.	Explain Software Process Framework Activities.	Remember
4.	Explain software engineering layered approach with neat figure.	Understand
5.	Explain the need of Software Engineering.	Understand

## Essential Assignments

1. List & explain general characteristics of software.
2. Draw the diagram of traditional waterfall model & explain all the three feasibility studies of the same.
3. Draw and explain spiral model.
4. Draw & explain prototype model.

### Desirable Assignments

1. Justify: Software doesn't wear out.
2. Explain the need of Software Engineering.
3. Compare Application Software and System Software.

### Activities

1. Choose a project definition to prepare a documentation. Select a suitable Software Development Model for your definition. Draw and explain why you have selected the same.

### Learning Outcomes

- ❖ Students will understand what Software & Hardware is, and will also know how it should be.
- ❖ Students will get an overview about software development fundamentals.
- ❖ Students will learn different ways of developing a software.





# Requirements Analysis and Specification

## Short Questions

<b>Q. No.</b>	<b>Sample Questions</b>	<b>Bloom's Taxonomy</b>
1.	What is modularity?	Remember
2.	Define functional requirement.	Remember
3.	Define cohesion.	Remember
4.	Define coupling.	Remember
5.	What is common coupling?	Understand
6.	List needs of functional independence.	Remember
7.	Give full form of SRS.	Remember
8.	Why SRS is also known as black box?	Understand
9.	Who does requirement analysis?	Remember
10.	What is the purpose of requirement analysis?	Understand

## Long Questions

<b>Q. No.</b>	<b>Sample Questions</b>	<b>Bloom's Taxonomy</b>
1.	List out requirements for online movie ticket booking system for multiplex.	Remember
2.	Explain requirement gathering activities.	Understand
3.	What is the role of System Analyst?	Understand
4.	Explain contents of the SRS document.	Understand
5.	Compare functional and non-functional requirement of software.	Remember
6.	What are the benefits of SRS?	Understand

## Essential Assignments

1. Explain software requirement specification.
2. Explain characteristics of good SRS.
3. Explain cohesion with its classification.
4. Explain coupling with its classification.

### Desirable Assignments

1. Justify: High cohesion & low coupling is better for any software development.
2. List functional requirements for ATM banking system.
3. Draw data flow diagram for library management system.

### Activities

1. Prepare a document that contains all the requirements of software you have chosen before.
2. Prepare a document for different feasibility studies for the selected software project.

### Learning Outcomes

- ❖ Students will learn how information can be gathered or planning can be done before starting the development of Software.
- ❖ Students will understand the importance of SRS.
- ❖ Students will get to know about what is module and how they interact with each other.



# Software Design with UML

## Short Questions

<b>Q. No.</b>	<b>Sample Questions</b>	<b>Bloom's Taxonomy</b>
1.	Draw symbols used in DFD.	Remember
2.	What is the full form of ERD?	Remember
3.	Define data attributes.	Remember
4.	Define data objects.	Remember
5.	What are the applications of use case diagram?	Understand
6.	Draw an entity named student with its attributes.	Remember
7.	What is the full form of DFD?	Remember
8.	List advantages of DFD.	Remember
9.	List different design methodologies.	Remember
10.	What is DFD?	Understand
11.	List design activities.	Remember

## Long Questions

<b>Q. No.</b>	<b>Sample Questions</b>	<b>Bloom's Taxonomy</b>
1.	Write a short note on pipe and filter architecture.	Understand
2.	Explain Client Server Architecture with Diagram.	Understand
3.	What are advantages and disadvantages of DFD?	Understand
4.	Explain classification of design activities.	Understand
5.	Explain cardinality and modality.	Understand
6.	Explain use case diagram.	Understand

## Essential Assignments

1. What is design process? Explain design methodologies.
2. Draw & explain symbols of DFD.
3. Explain ERD with its symbols.
4. Draw & Explain symbols of activity diagram.

### Desirable Assignments

1. Draw DFD for institute management system.
2. Draw a use case diagram for online shopping web application.
3. Draw context level diagram for library management system.

### Activities

1. Prepare an E-R Diagram for the selected software project before.
2. Prepare a Data Dictionary for the same.
3. Prepare Data Flow Diagram for the selected project.

### Learning Outcomes

- ❖ Students will learn how they can start designing a software after getting the information about it.
- ❖ Students will learn different diagrams that will help in further software development process.
- ❖ Students will also learn what kind of information can be stored in Database for software to be developed.



# Software Project Management

## Short Questions

<b>Q. No.</b>	<b>Sample Questions</b>	<b>Bloom's Taxonomy</b>
1.	Give names of two famous empirical estimation techniques.	Remember
2.	Give examples of organic type of project development systems.	Remember
3.	What is the full form of LOC?	Remember
4.	What is the full form of FP?	Remember
5.	Define risk management.	Remember
6.	What is the full form of CPM?	Remember
7.	What is the full form of PERT?	Remember
8.	What is the full form of WBS?	Remember
9.	Define embedded systems.	Remember
10.	Define risk identification.	Remember
11.	Define Scheduling.	Remember

## Long Questions

<b>Q. No.</b>	<b>Sample Questions</b>	<b>Bloom's Taxonomy</b>
1.	Explain different types of risks involve in software development.	Understand
2.	Explain WBS.	Understand
3.	Write a short note on activity network.	Understand
4.	Explain FP.	Understand
5.	Explain PMC in brief.	Understand
6.	Explain GANTT chart?	Understand
7.	Write a short note on Risk Management.	Understand

## Essential Assignments

1. What are the responsibilities of Project Manager?
2. What do you mean by Project Size Estimation? Explain LOC.
3. Write short notes: 1) Empirical Estimation 2) Heuristic Estimation



4. What is Risk? Explain risk assessment.

### Desirable Assignments

1. Prepare an activity network for software development activities.
2. Assume that the size of an organic type software product has been estimated to be 2000 lines of source code. Assume that the average salary of software engineers be rs. 20,000/- per month. Determine the effort required to develop the software product & the nominal development.

### Activities

1. Prepare GANTT chart for software development activities.

### Learning Outcomes

- ❖ Students will get an idea how cost can be calculated for a software development.
- ❖ Students will learn how scheduling can be done for software development processes.
- ❖ Students will understand what kind of risks are in software development activities and how those risks can be managed.



# Software Coding & Testing

## Short Questions

<b>Q. No.</b>	<b>Sample Questions</b>	<b>Bloom's Taxonomy</b>
1.	State True or False: Structural testing is also called black box testing.	Remember
2.	Define black box testing.	Remember
3.	Define white box testing.	Remember
4.	What is test case?	Understand
5.	What is code review?	Understand
6.	Define software documentation.	Remember
7.	What is code walkthrough?	Remember
8.	What is validation?	Understand
9.	What is verification?	Understand
10.	Define unit testing.	Remember

## Long Questions

<b>Q. No.</b>	<b>Sample Questions</b>	<b>Bloom's Taxonomy</b>
1.	Explain software documentation.	Understand
2.	Explain code walkthrough.	Understand
3.	Write a short note on test documentation.	Understand
4.	Compare black box & white box testing.	Understand
5.	Differentiate verification & validation.	Remember

## Essential Assignments

1. Explain code inspection.
2. Draw & explain unit testing.
3. Explain black box testing.
4. Explain white box testing.

### Desirable Assignments

1. Prepare test document using black box testing method for any web application chosen by you.
2. Prepare test document using white box testing method for any web application chosen by you.
3. Prepare test document using unit testing for any web application chosen by you.

### Activities

1. Prepare test cases for any real time scenario.
2. Prepare a case study on code inspection method for any web application chosen by you.
3. Prepare a case study on code walkthrough method for any web application chosen by you.

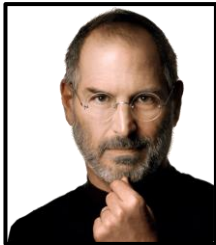
### Learning Outcomes

- ❖ Students will get an idea about different code review techniques.
- ❖ Students will learn what kind of software documentation can be done for different purposes.
- ❖ Students will be able to understand how testing can be done and how test cases can be prepared for any real time scenario.

# 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.**

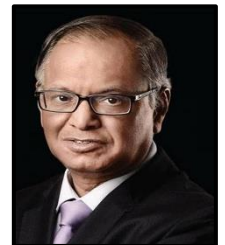


*"If you are changing the world, you are working on important things. You're excited to get up in the morning."*

**- 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.**

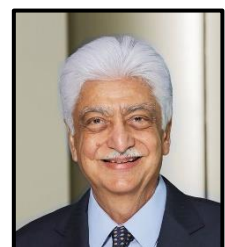


*"The only way to learn new programming language is by writing programs in it."*

**- 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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