

**Syllabus For Junior Programmer**

<b>Course Name</b>	Junior Programmer
<b>Sector</b>	IT-ITES
<b>Course Code</b>	ITE/2024/JUPR/424
<b>Level</b>	4
<b>Occupation</b>	Junior Programmer
<b>Job Description</b>	The Junior Programmer will have proficiency in installing various computer components, expertise in the basic functionalities of diverse Operating Systems, especially in the installation and configuration of both Windows and Linux Operating Systems. The role involves designing, implementing, and documenting solutions to significant computational problems, utilizing algorithmic and scientific reasoning. Additionally, the candidate will be responsible for creating and modifying database files, as well as generating reports. The role involves responding to customer queries through telephone, e-mail, or chat using the organization's established procedures.
<b>Course Duration</b>	Total Duration 450 Hrs (T-120 , P- 210, OJT-60 and ES-60)
<b>Trainees' Entry Qualification</b>	Class 12 <sup>th</sup> Pass
<b>Trainers Qualification</b>	B.Tech with computer science/IT with 1 year experience in the relevant field OR/ MCA with 2 years' experience in software development OR/ CITS with 1 year experience in the relevant field

**Structure of Course:**

<b>Module No.</b>	<b>Module name</b>	<b>Outcome</b>	<b>Theory (Hrs)</b>	<b>Practical (Hrs)</b>	<b>Total (Hrs) [Multiple of 30]</b>
1	<b>Occupational safety hazards</b>	Apply safe working practices	10	20	30
2	<b>Introduction to Computers</b>	Describe the fundamental concepts of computers along with the installation of different parts of computers	10	20	30
3	<b>Software and Languages</b>	Demonstrate the basic functionalities of different types of Operating Systems with the knowledge of installation and configuration of Windows / Linux Operating System	10	20	30
4	<b>Problem Solving and Program Design</b>	Execute problem-solving strategies and program designs approaches for effective solution	20	40	60

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
5	<b>Algorithm principles and programming</b>	Execute good programming style for solving different types of problems in any programming language	20	40	60
6	<b>Introduction to C Programming</b>	Assist to design, implement and document solutions to significant computational problems by applying algorithmic and scientific reasoning	30	30	60
7	<b>Database Systems concept</b>	Create and modify database files and generate reports	10	20	30
8	<b>Manage customer requirements &amp; handle their queries</b>	Respond to customer queries received via telephone, e-mail, or chat using the organization's procedure	10	20	30
9	<b>OJT</b>	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	--	60	60
10	<b>Employability Skill</b>	As per guided curriculum	60	--	60
<b>TOTAL:</b>			<b>180</b>	<b>270</b>	<b>450</b>

**SYLLABUS:****Module no. 1: Occupational safety hazards****Outcome:** Apply safe working practices**Theory Content:**

- Explain the scope of Computer Application Trade
- Identify safety rules and safety signs
- Identify types and working of fire extinguishers
- Introduction to special keys and numeric keys and their usage
- Introduction to computer system with the concept of hardware and software

**Practical Content:**

- Visit the Computer Application lab. of the institute and locate the electrical connections with the computer system setup
- Identify the safety symbols and hazard identification
- Practice safe methods of fire fighting in case of electrical fire
- Use of fire extinguishers

**Module No. 2: Introduction to Computers****Outcome:**

Describe the fundamental concepts of computers along with the installation of different parts of computers

**Theory Content:****Introduction to Computers**

- Evolution of computers
- Computer hardware generations
- Classification of Computers
- Basic Computer Organization
- Computer System : Hardware, Software, Data and People
- Applications of computers in modern society

**Describe Memory and Storage Systems**

- Cache Memory
- Primary memory: RAM,ROM
- Secondary memory: Hard disks, CD Rom, DVD Rom, USB Flash drive etc

**Explain Input and Output Devices**

- Input Devices: Keyboard, Pointing devices, Handheld devices, Optical devices etc
- Output Devices: Monitors, Projectors, Printers, Plotters etc
- Study of Motherboard, SMPS, HDD

**Practical Content:**

- Identify computer peripherals and internal parts (CPU, SMPS, RAM etc.) of a PC
- Remove and refit RAM, Processor etc.
- Identify cable connections inside a PC
- Identify the components of a motherboard
- Practice on Hard Disk Partitioning And formatting
- Identify various components of HDD and write their functions
- Install ,uninstall and make settings for the devices like keyboard, mouse, display etc
- Installing a printer and carry out self test
- Carry out replacement of toner cartridge of laser printer
- Change mechanical parts of laser/ inkjet printers
- Study the different expansion slots of a motherboard, set the NIC to expansion slot and to install the driver.

**Module 3: Software and Languages****Outcome**

Demonstrate the basic functionalities of different types of Operating Systems with the knowledge of installation and configuration of Windows / Linux Operating System

**Theory Content:**

- Explain the Functions of software
- Identify different types of software
  - System Software : Operating System, Utility Programs, Device Drivers, Language Translator, Linker, Loader
  - Application Software: General purpose and Application purpose software

**Operating System**

- Definition and Functions of OS

- Identify various types of OS
- Discuss System Operations: Booting, Buffering, Virtual Memory, Directory, and File Structure
- Explain DOS commands and their uses
- Demonstrate MS Windows OS
- Introduction to UNIX Commands and its uses

#### Troubleshooting

- Describe troubleshooting and types of troubleshooting
- Steps of troubleshooting.

#### **Practical Content:**

- Practice on Windows interface and navigating windows
- Practice on managing files and folders using drives
- Customize desktop settings and manage user accounts
- Practice Hard Disk partitioning
- Identify various components of HDD and write their functions
- Print and scan documents using different commands
- Install necessary application software for windows i.e. office package, PDF reader Media player etc.
- Install Drivers for printer, scanner, webcam etc.
- Manage files and folders using basic DOS commands for directory listing
- Use DOS commands
- Install and configuration of Microsoft Windows latest OS (Windows 7/8/10)
- Install Linux with necessary software for Linux
- Use basic Linux commands
- Work with basic troubleshooting techniques
- Different types of problems and make solutions (e.g. application running slowly and frozen, computer is frozen, mouse/keyboard has stopped working, screen is blank etc.)

### **Module No. 4: Problem Solving and Program Design**

#### **Outcome:**

Execute problem-solving strategies and program designs approaches for effective solution

#### **Theory Content**

- Define program
- Concept of problem solving in computer programming
- Problem solving cycle-analyzing a problem, designing algorithm, implementation through coding, testing the solution
- Asymptotic approach to define a problems with example
  - provide input or some data
  - processing a list of actions
  - Output or end result required
- Steps of problem solving in programming with example
- Program design
  - Problem analysis
  - Outline the program structure
  - Algorithm development
  - Selection of control structure : if-else, switch case, loop

#### **Practical Content**

- Practice the following experiments for problem solving and program design:

- Experiment 1 : Convert Miles to Kilometers ( Solution : 1. Write problem statement 2. Write Problem input, 3. problem output, 4. Use relevant formula etc.)
- Experiment 2 : Convert temperature from Centigrade to Fahrenheit and vice-versa.
- Experiment 3 : Check whether a given integer is even or odd
- Experiment 4 : Find the roots (real or imaginary) of a quadratic equation
- Experiment 5 : Find the factorial of a given integer
- Experiment 6 : Find sum of digits of a given integer (e.g input 672 , output  $6+7+2 = 15$  etc.)
- Experiment 7 : Prime number checking of any positive integer
- Experiment 8 : Sort a list of numbers (ascending or descending)
- Experiment 9 : Procedure of searching (linear ) a number from a list of numbers
- Experiment 10 : Binary search method

### **Module No. 5: Algorithm principles and programming**

#### **Outcome**

Execute good programming style for solving different types of problems in any programming language

#### **Theory Content**

- Define algorithm and characteristics of algorithm
- Define flowchart different symbols with example
- Different approaches of algorithm structures with example
  - Sequential structures
  - Control Structures
  - Loop structures
- Elaborate Data structures
- Describe array and its uses with example
- Implement stack and queue using array
- Identify important problem types -Sorting , Searching, String processing
- Define order of algorithm
  - Big O-notation
  - Big Omega-notation
- Different types of time complexity of the algorithm
  - Best case analysis
  - average case analysis
  - Worst case analysis
- Define the concept recursive call
  - Generate fibonacci numbers using recursive call
  - Calculate factorial of a number  $N ( N! )$
- Describe Sorting : Bubble sort, selection sort, insertion sort with complexity
- Describe searching with example : Linear and binary search
- Write algorithm for implementing stack and queue using array

#### **Practical content**

Write the algorithm and draw flowchart for the following experiments for program design:

- Experiment 1 : Find the average of 5 numbers
- Experiment 2 : Find the largest of three numbers
- Experiment 3 : Convert temperature from Centigrade to Fahrenheit and vice-versa.
- Experiment 4 : Check whether a given integer is even or odd
- Experiment 5 : Find the roots (real or imaginary) of a quadratic equation
- Experiment 6 : Find the factorial of a given integer
- Experiment 7 : Find sum of digits of a given integer (e.g input 672 , output  $6+7+2 = 15$  etc.)
- Experiment 8: Prime number checking of any positive integer
- Experiment 9 : Sort a list of numbers (ascending or descending)
- Experiment 10 : Procedure of searching (linear ) a number from a list of numbers

Experiment 11 : Binary search method

Experiment 12 : Implement stack and queue operations

Experiment 13 : Find the largest and smallest numbers among N numbers

Experiment 14 : Algorithm for finding the sum of following series:

- (a)  $1+2+3+ \dots +150$
- (b)  $3+5+7+9+ \dots +245$
- (c)  $5+10+15+ \dots + 175$
- (d)  $7+14+21+ \dots$  upto n numbers

### Module No. 6: Introduction to C Programming

#### Outcome:

Assist to design, implement and document solutions to significant computational problems by applying algorithmic and scientific reasoning

#### Theory Content:

- Introductory concept of programming : Algorithm and Flowchart
- Introduction to C language along with its structure
- Demonstrate Character set, Keywords, Constants, Variables, Data Types in C
- Discuss Operators in C
- Identify different types of Statements in C: Assignment Statement, Input/Output statement, Control statement, Loop or Jump control statements
- Define Arrays and Strings
- Explain different functions (User defined and common library functions)
- basic concept of Pointer

#### Practical Content:

- Practice the basic syntax used in C commands, variables – assigning values to C variables (numeric, string etc.)
- Execute Simple program by assignment and Input/Output statements
- Program of Flow of Control Structures – If , if-else, switch-case etc
- Program using Operators- Unary, binary, numeric and logical operators etc.
- Program using string processing – Length, Converting to all upper or lower case, substring
- Program using Loop structures – for loop, while loop , do-while loop etc.
- Program using arrays and string
- Functions – creating and calling functions, call by value and call by reference, sending parameters to a function, receiving parameters out of a function etc.
- Program using structure and Union
- Program using basic concept of pointers

### Module No. 7: Database Systems concept

#### Outcome

Create and modify database files and generate reports

#### Theory Content:

- **Introduction** : File-oriented approach and Database-oriented approach
- **Database system Concept** : Data Abstraction - Physical, Logical and view level Abstraction, Instances and Schema, Data Independence, Database Languages - DDL, DML, DCL, Various Data Models - ER Model, Hierarchical Model, Network Model, Relational Model, Data Dictionary, Metadata, Database Administrator (Definition and Functions), Database User.
- **Data Modeling**: Concept of Entities, Entity sets, Concept of Relations, Attributes, Tuples, Degree, Cardinality. Concept of Relationship and Relationship sets. Concept of Keys - Key, Superkey, Candidate key, Primary key, Alternate key, Foreign key.
- **Introduction to SQL** : CREATE TABLE and ALTER TABLE Statements, INSERT, DELETE and UPDATE

Commands.

- Aggregate Functions, DATE and TIME Functions.
- Simple SELECT Queries (SELECT, FROM, WHERE, DISTINCT, AND, OR, IN, NOT IN, BETWEEN, LIKE, ORDER BY, HAVING, GROUP BY)

**Practical Content:**

**MS-ACCESS**

- Create a new database with MS-ACCESS
- Open existing database
- Create table in Data Sheet and design view
- Enter data and edit data
- Validate Data and verify access
- Develop customized form for data entry
- Develop queries
- Generate reports

**My SQL**

- Install of My SQL
- Create table using SQL
- Alter Table
- Insert data in a table using INSERT Command in SQL
- View data (SQL-SELECT)
- Update data in a table (SQL-UPDATE command)
- Delete rows of data (DELETE command)
- View the structure of an already existing table
- Use of DATE functions
- Create database design
- Practice on simple queries using SQL commands

**Module 8 : Manage customer requirements & handle their queries**

**Outcome**

Respond to customer queries received via telephone, e-mail, or chat using the organization's procedure

**Theory Content:**

- Define work activities and its requirements.
- Introduction to deal with customer and greet the customer
- Define organization's policies, guidelines and service level agreements dealing with customers
- State the Importance and classify of customer's queries
- Describe standard tools templates and scripts for dealing with customers
- Explain the need of working effectively in team.
- Identify resource needed for your work.
- Identify different types of customer queries and how to resolve them
- Identify different styles and approaches when working with customers
- Discuss techniques for conveying commitment
- Discuss role and responsibilities in carrying out your work.
- Prioritize workload according to urgency and importance
- Demonstrate Importance of having a tidy work area
- Describe Core and generic skills to work effectively.

**Practical content**

- Plan and organize work to achieve targets.
- Observe Organization's management tools and systems for recording, resolving customer queries
- Know customer relationship management (CRM) tools and systems and how to use these
- Use standard tools templates and scripts for dealing with customers
- Practice Different styles and approaches when working with customers
- Practice different questioning techniques for understanding customer queries
- Communicate with others in writing
- Listen effectively and orally communicate information accurately
- Learn to build and maintain positive and effective relationships with customers
- Apply problem solving approaches in different situations
- Provide relevant information to others.
- Establish and agree work requirements with appropriate people.
- Work effectively in a team environment.
- Keep work area clean and tidy.
- Utilize resources correctly and effectively.

**Module 9 : OJT**

**Outcome:** Work in real job situation with special emphasis on basic safety and hazards in this domain

**Practical Content:**

Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for **60 Hours**.)

**Module 10: Employability Skills (60 Hrs)****Key Learning Outcomes****Introduction to Employability Skills**

Duration: 1.5 Hours

After completing this programme, participants will be able to:

1. Discuss the Employability Skills required for jobs in various industries
2. List different learning and employability related GOI and private portals and their usage

**Constitutional values - Citizenship**

Duration: 1.5 Hours

3. Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
4. Show how to practice different environmentally sustainable practices.

**Becoming a Professional in the 21st Century**

Duration: 2.5 Hours

5. Discuss importance of relevant 21st century skills.
6. Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.
7. Describe the benefits of continuous learning.

**Basic English Skills**

Duration: 10 Hours

8. Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
9. Read and interpret text written in basic English



10. Write a short note/paragraph / letter/e -mail using basic English

**Career Development & Goal Setting**

Duration: 2 Hours

11. Create a career development plan with well-defined short- and long-term goals

**Communication Skills**

Duration: 5 Hours

12. Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.

13. Explain the importance of active listening for effective communication

14. Discuss the significance of working collaboratively with others in a team

**Diversity & Inclusion**

Duration: 2.5 Hours

15. Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD

16. Discuss the significance of escalating sexual harassment issues as per POSH act.

**Financial and Legal Literacy**

Duration: 5 Hours

17. Outline the importance of selecting the right financial institution, product, and service

18. Demonstrate how to carry out offline and online financial transactions, safely and securely

19. List the common components of salary and compute income, expenditure, taxes, investments etc.

20. Discuss the legal rights, laws, and aids

**Essential Digital Skills**

Duration: 10 Hours

21. Describe the role of digital technology in today's life

22. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely

23. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely

24. Create sample word documents, excel sheets and presentations using basic features

25. utilize virtual collaboration tools to work effectively

**Entrepreneurship**

Duration: 7 Hours

26. Explain the types of entrepreneurship and enterprises

27. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan

28. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement

29. Create a sample business plan, for the selected business opportunity

**Customer Service**

Duration: 5 Hours

30. Describe the significance of analyzing different types and needs of customers

31. Explain the significance of identifying customer needs and responding to them in a professional manner.

32. Discuss the significance of maintaining hygiene and dressing appropriately

**Getting Ready for apprenticeship & Jobs**

Duration: 8 Hours

33. Create a professional Curriculum Vitae (CV)

34. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively

35. Discuss the significance of maintaining hygiene and confidence during an interview

36. Perform a mock interview

37. List the steps for searching and registering for apprenticeship opportunities

**Learning Outcome – Assessment Criteria**

Module No.	Outcome	Assessment Criteria
1	Apply safe working practices	<p><b>After completion of this module students will be able to:</b></p> <p>1.1 Recognize hazards in the laboratory  1.2 Respond appropriately to safety rules, signs and other safety instructions  1.3 Take action to minimise or eliminate any risks to health and safety.  1.4 Demonstrate knowledge of safety rules and risk assessments for tests and examinations  1.5 Manage work safely.</p>
2	Describe the fundamental concepts of computers along with the installation of different parts of computers	<p><b>After completion of this module students will be able to:</b></p> <p>2.1 Describe generation of computers  2.2 Classify of computers  2.3 Describe input, output and storage devices used to present the processed data  2.4 Identify various components of HDD and write their functions  2.5 Perform hard Disk Partitioning And formatting</p>
3	Demonstrate the basic functionalities of different types of Operating Systems with the knowledge of installation and configuration of Windows / Linux Operating System.	<p><b>After completion of this module students will be able to:</b></p> <p>3.1 Illustrate Functions of software  3.2 Classify software along with their functions  3.3 Work with Windows OS, Linux etc.  3.4 Classify computer languages  3.5 Install necessary application software for windows i.e. office package, PDF reader, Media player etc.  3.6 Install Drivers for printer, scanner, webcam etc.</p>
4	Execute problem-solving strategies and program designs approaches for effective solution	<p>4.1 Describe the concept of problem solving in computer programming  4.2 Execute Problem solving cycle step  4.3 Illustrate asymptotic problem definitions.  4.4 Describe Program design( Analysis, program structure, algorithm development)  4.5 Perform practical problem-solving experiments.</p>
5	Execute good programming style for solving different types of problems in any programming language	<p>5.1 Define algorithm and its characteristics  5.2 Assist to draw flowchart for programming  5.3 Describe different approaches of structures (sequential, control and loop) of algorithm  5.4 Define array and its uses  5.5 Demonstrate stack and queue using array  5.6 Describe sorting and searching methods  5.7 Define complexity of the algorithm</p>
6	Assist to design, implement and document solutions to significant computational	<p><b>After completion of this module students will be able to:</b></p> <p>6.1 Define introductory concept of programming</p>

Module No.	Outcome	Assessment Criteria
	problems by applying algorithmic and scientific reasoning	using algorithm and flowchart 6.2 Describe variables, data types & operators of C 6.3 Identify and select different types of statements of C (input/output, Control and loop statements 6.4 Demonstrate use of arrays and strings 6.5 Describe structures and pointers of C
7	Create and modify database files and generate reports	<b>After completion of this module students will be able to:</b> 7.1 Create & edit, a new database using MS Access. 7.2 Assist to develop queries and reports. 7.3 Create and modify tables in SQL 7.4 Practice on necessary simple queries using SQL commands
8	Respond to customer queries received via telephone, e-mail, or chat using the organization's procedure	<b>After completion of this module students will be able to:</b> 8.1. Treat and handle customer with empathy, professionalism and fostering positive interaction to enhanced overall satisfaction. 8.2. Define organization's policies, guidelines and service level agreements dealing with customers 8.3. Classify of customer's queries 8.4. Different types of customer queries 8.5. Different styles and approaches when working with customers 8.6 Apply Techniques for conveying commitment 8.7 Define Core and generic skills for dealing with customers 8.8 Define work activities and its requirements. 8.9 Discuss the output of your work. 8.10 Explain importance of having a tidy work area 8.11 Illustrate the need of working effectively in team. 8.12 Explain the purpose of keeping updated with the progress of the work
9	OJT	Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for 60 Hours.)
10	Employability Skill	As per guided curriculum

**List of Tools, Equipment & materials needed for 30 Trainees (Practical)**

SI No	Items Name	Specification	Qty
1	Desktop PC	Desktop Computer (Core i5/ Core i7 processor) with the computer setup and different types of system Software and application software	30
2	Laptop	4 <sup>th</sup> Gen Ci5 or higher Processor, 4GB RAM, 1TB Hard Disk, Win8/latest reloaded Licensed OS, 2GB Graphic Card, DVD Writer, Standard ports and connectors.	1
3	Wi-Fi Router	With wireless connectivity	1
4	Structured Cabling in Lab	To enable working with wired networks for practical	As required
5	Switch	16 port	1
6	Internet connectivity	Broadband connection with min. 2 mbps speed	As required
7	Laser Printer	Standard	1
8	Micro Phone Cum Head Phone	Wired	5
9	LCD Projector	3000 lumens or higher	1
10	Projector Screen	Matte(antiglare) screen roll type	1
11	External Hard Disk	1 TB	1
12	Network Rack	4U for 24 port	1
13	Screw Driver Set	Standard	1
14	Patch Panel	24 port	1
15	LAN Tester	LAN Tester	1

**Marks Distribution**

Outcome	Outcome Code	Total Th marks	Total Pr marks	Total OJT marks
Apply safe working practices	ITE/2125/OC1	10	70	0
Describe the fundamental concepts of computers along with the installation of different parts of computers	ITE/2125/OC2	20	70	0
Demonstrate the basic functionalities of different types of Operating Systems with the knowledge of installation and configuration of Windows / Linux Operating System	ITE/2125/OC3	20	70	0
Execute problem-solving strategies and program designs approaches for effective solution	ITE/2125/OC4	20	110	0
Execute good programming style for solving different types of problems in any programming language	ITE/2125/OC5	20	110	0
Assist to design, implement and document solutions to significant computational problems by applying algorithmic and scientific reasoning	ITE/2125/OC6	30	80	0
Create and modify database files and generate reports	ITE/2125/OC7	10	70	0
Respond to customer queries received via telephone, e-mail, or chat using the organization's procedure	ITE/2125/OC8	20	70	0
Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	ITE/2125/OC9	0	0	150
Employability Skills – 60 Hrs	DGT/VSQ/N0102	50	0	0

