[MODULE- 1 ASSIGNMENT]

- ✓ **[Lab exercise] : Write a simple "Hello World" program in two different programming languages of your choice. Compare the structure and syntax.**
  - ❖ **C :**

⇨ #include<stdio.h>

⇨ Main()

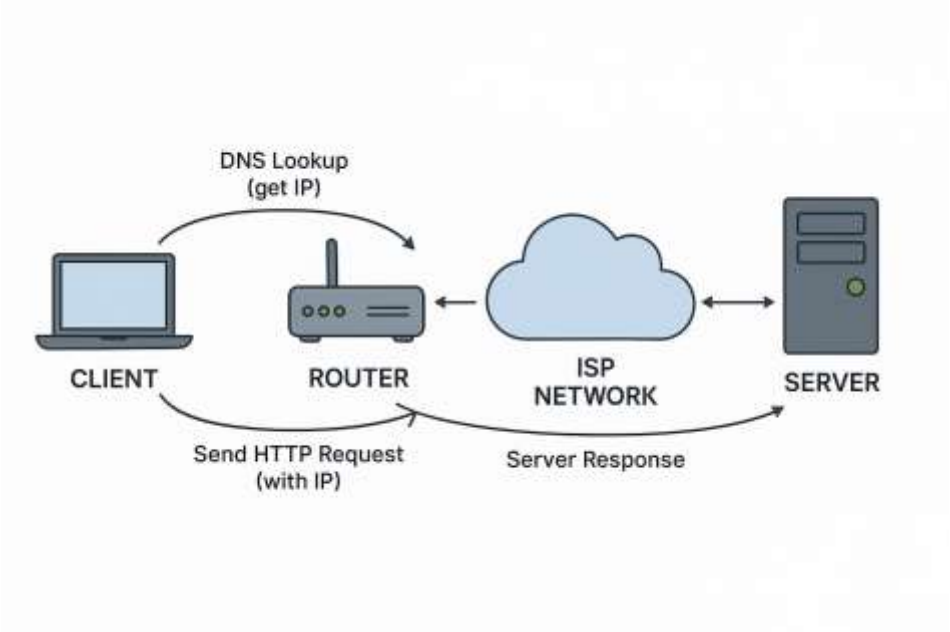
```
{
        printf("Hello World");
}
```

  - ❖ **PYTHON :**

⇨ Print("Hello World")

- **Python** is concise, user-friendly, and great for quick scripts.
- **C** is more verbose, requiring explicit structure and compilation, reflecting its low-level control and performance orientation.

- ✓ **[LAB EXERCISE]: Research and create a diagram of how data is transmitted from a client to a server over the internet.**



⇨ The diagram shows how multiple clients (like a laptop, phone, or desktop) connect to a server through the internet to send requests and receive responses, representing a basic client-server communication model.

✓ [LAB EXERCISE]: Research different types of internet connections (e.g., broadband, fiber,satellite)and list their pros and cons.

1. Dial-Up Internet:

: Pros:

- Very low cost
- Available almost everywhere with a landline

Cons:

- Extremely slow
- Ties up the phone line

2. DSL (Digital Subscriber Line)

Pros:

- Available in many areas
- Doesn't interfere with phone calls

Cons:

- Speed decreases with distance from the provider
- Slower than cable or fiber

3. Fiber Optic Internet

Pros

- Ultra-fast speeds
- Highly reliable and low latency

Cons:

- Expensive installation
- Limited availability, especially in rural areas

4. Satellite Internet

Pros:

- Available in remote and rural locations
- No need for physical cables

Cons:

- Weather can affect signal
- Data caps and higher cost

5. broadband

Pros:

- High-speed internet
- Supports multiple devices

Cons:

- Can be expensive
- Some plans have data limits

- ✓ **[LAB EXERCISE]: Identify and explain three common application security vulnerabilities. Suggest possible solutions.**

⇨ Three common application security vulnerabilities are SQL Injection, Cross-Site Scripting (XSS), and Broken Authentication.

1. SQL Injection

   An attacker inserts harmful SQL code into a form input (like login fields) to access or manipulate the database.

   Solution: Use prepared statements and validate input.

2. Cross-Site Scripting (XSS)

   An attacker injects Malicious scripts are injected into web pages to attack users.

   Solution: Sanitize input and escape output.

3. Broken Authentication

   Poorly designed login systems allow attackers to gain unauthorized access to user accounts.

   Solution: Use strong passwords, MFA, and secure sessions.

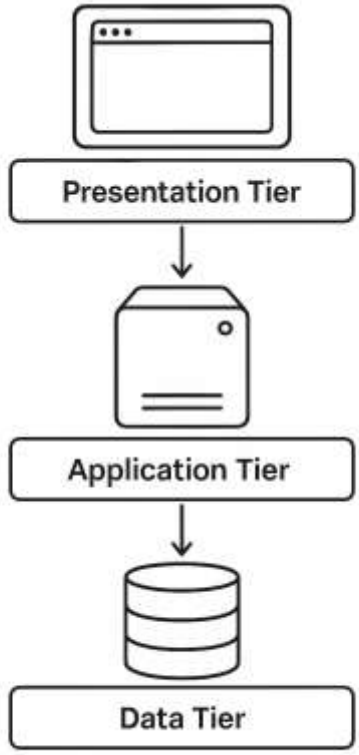
- ✓ **[LAB EXERCISE]: Identify and classify 5 applications you use daily as either system software Or application software**.

I use the following 5 applications daily:

1. **Google Chrome** – *Application Software* (for browsing the internet)
2. **Microsoft Word** – *Application Software* (for writing documents)
3. **WhatsApp** – *Application Software* (for messaging and calling)
4. **Windows OS** – *System Software* (runs the computer and manages hardware)
5. **Antivirus Software** – *System Software* (protects the system from threats)

These are classified based on whether they help users do tasks (application) or help the system run (system).

✓ **[LAB EXERCISE] : Design a basic three-tier software architecture diagram for a web application.**



A basic three-tier software architecture

⇨ **Presentation Tier** – The user interface (e.g., web browser) where users interact with the application.

⇨ **Application Tier** – The logic layer that processes user input, makes decisions, and handles operations.

⇨ **Data Tier** – The database layer where all application data is stored and managed.

⇨ [LAB EXERCISE]: Create a case study on the functionality of the presentation, business logic, and Data access layers of a given software system.

📚 **Case Study Example: Hospital Management System**

1. Presentation Layer (User Side)

This is what the user sees: pages to book appointments, view doctor schedules, or access reports.

Example: A patient logs into the hospital portal to book an appointment with a doctor.

2. Business Logic Layer (Processing Side)

This checks the rules: Is the doctor available? Is the patient registered?

Example: The system checks if the doctor is free at the selected time and if the patient's ID is valid.

3. Data Access Layer (Database Side)

This layer interacts with the database: stores appointments, retrieves patient records.

Example: The system saves the appointment details to the database and updates the doctor's schedule.

- ✓ **[LAB EXERCISE]: Explore different types of software environments (development, testing,production).Set up a basic environment in a virtual machine.**

- **Different Types of Software Environments**

1. **Development Environment**
    - This is where programmers write and create the software.
    - It has tools like code editors and debuggers.
    - It's flexible and changes often.
2. **Testing Environment**
    - After writing the software, it is moved here to check if everything works well.
    - Bugs are found and fixed in this environment.
    - It tries to copy the real-world setup but isn't live.
3. **Production Environment**
    - This is the real, live environment where the software is used by customers.
    - It is stable and reliable.
    - Changes here are made carefully to avoid breaking things.

- **How to Set Up a Basic Environment in a Virtual Machine (VM)**

1. **Choose a Virtual Machine software:**
   Examples: VirtualBox, VMware, or Hyper-V.

2. **Download an Operating System (OS):**
   For example, get an ISO file of Ubuntu (Linux) or Windows.
3. **Create a New Virtual Machine:**
   - Open the VM software.
   - Create a new VM and assign memory (RAM), disk space, and CPU cores.
   - Attach the OS ISO file to the VM.
4. **Start the Virtual Machine:**
   - Boot up the VM with the OS installer.
   - Follow the steps to install the OS inside the VM.
5. **Set Up Your Environment:**
   - Install software like code editors (e.g., VS Code), programming languages, or tools needed.
   - This can be your **development environment** inside the VM.
6. **Use Snapshots:**
   - Save the VM state so you can return to it if needed (useful for testing).

✓ [LAB EXERCISE]: Create a GitHub repository and document how to commit and push code changes.

✅ 1. Create a Repository on GitHub

1. Go to https://github.com and log in.
2. Click the + icon → New repository.
3. Enter a repository name (e.g., my-project), choose Public or Private.
4. *(Optional)* Check "Initialize with a README".
5. Click Create repository.

EXAMPLE :

```
git status

git add .

git commit -m "Initial project files"

git push origin main
```

- ✓ **[LAB EXERCISE]: Create a student account on GitHub and collaborate on a small project with a classmate.**

⇨ Create GitHub Student Account & Collaborate
⇨ Sign up at github.com using your student email.
⇨
⇨ Apply for Student Pack: education.github.com/pack
⇨
⇨ Create a repo: Click "+" → "New repository"
⇨
⇨ Go to Settings → Collaborators, add your classmate's GitHub username.
⇨

- ✓ **LAB EXERCISE: Create a list of software you use regularly and classify them into the Following categories: system, application, and utility software.**

Sure! Here's an example list of software classified into **system**, **application**, and **utility software**:

System Software

- **Windows 11** (Operating System)

Application Software

- **Microsoft Word** (Word processor)
- **Google Chrome** (Web browser)
- **Adobe Photoshop** (Image editor)

Utility Software

- **Disk Cleanup** (Tool to free up space)
- **CCleaner** – System Cleanup
- **Backup Software** – Data Backup

✓ **[LAB EXERCISE]: Follow a GIT tutorial to practice cloning, branching, and merging repositories.**

Task	Command Example
Clone	**git clone URL**
branch	**git checkout -b feature-name**
Merge	**git checkout main → git merge branch**

✓ **LAB EXERCISE: Write a report on the various types of application software and how they improve productivity.**

- Types of Application Software and Their Productivity Benefits

1. **Word Processing Software**

o Example: Microsoft Word, Google Docs

o Use: Writing documents, letters, reports

o Productivity: Speeds up writing with tools like auto-correct, templates, and collaboration.

2. Spreadsheet Software

o Example: Microsoft Excel, Google Sheets

o Use: Data analysis, financial planning, reports

o Productivity: Automates calculations and data organization; useful in business and accounting.

3. **Presentation Software**

o Example: Microsoft PowerPoint, Prezi

o Use: Creating visual slides for meetings or lectures

o Productivity: Enhances communication of ideas clearly and quickly.

4. **Database Management Software**

o Example: Oracle, MS Access, MySQL

o Use: Storing and managing large datasets

o Productivity: Ensures fast data access and organization for decision-making.

5. **Multimedia Software**

o Example: VLC Media Player, Adobe Premiere Pro

o Use: Creating and editing audio, video, and images

- Productivity: Supports creative tasks and professional media production.

6. **Communication Software**

- Example: Zoom, Microsoft Teams, Slack
- Use: Messaging, video conferencing, file sharing
- Productivity: Improves team collaboration and reduces time spent on meetings.

7. **Web Browsers**

- Example: Chrome, Firefox
- Use: Internet access for research and online tools
- Productivity: Quick access to information, tools, and cloud services.

✓ LAB EXERCISE: Perform a functional analysis for an online shopping system.

- **Functional Analysis – Online Shopping System**

1. User Roles:

- **Customer/User**
- **Admin**
- (Optional: Vendor/Seller if multi-vendor platform**)**

2. Functional Requirements:

Customer Functions:

- **User Registration/Login –** Create and access user account
- **Browse Products –** View items by category, brand, etc.
- **Search Products –** Search by name, price, rating, etc.
- **Add to Cart** – Add selected items to shopping cart
- **Place Order –** Checkout and complete purchase
- **Payment –** Online payment via card, UPI, or COD
- **Order History** – View past orders and status
- **Product Review/Rating –** Leave feedback

Admin Functions:

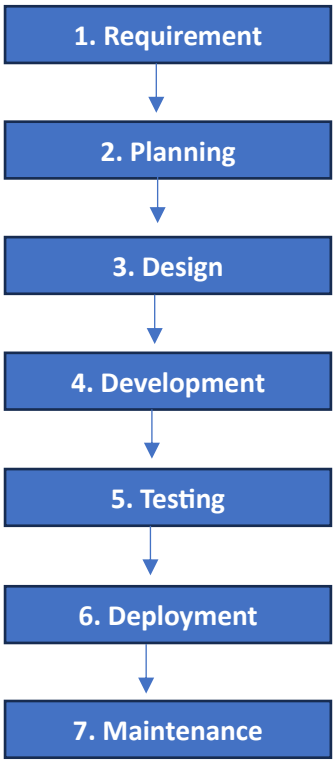
- **Manage Users –** Add/edit/remove user accounts
- **Manage Products –** Add/edit/delete product listings

- **Manage Categories –** Create or update product categories
- **View Orders –** See customer orders and statuses
- **Process Refunds/Returns –** Handle customer complaints
- **Report Generation –** Sales, revenue, and customer data

3. System Functional Modules:

- User Module
- Product Catalog Module
- Shopping Cart Module
- Order Management Module
- Payment Gateway Module
- Admin Dashboard Module

✓ **LAB EXERCISE: Create a flowchart representing the Software Development Life Cycle (SDLC).**



✓ [LAB EXERCISE]: Write a requirement specification for a simple library management system.

=> Library Management System – Requirement Specification

1. Purpose:
   To automate book management, issue, return, and member handling in a library.
2. Users:
- Admin/Librarian: Manage books and members
- Students/Members: Search and view books

3. Main Features:
- Login system for admin
- Add/edit/delete books
- Register/edit/remove members
- Issue and return books
- Search books by title/author
- Generate reports

4. System Requirements:
- Simple user interface
- Fast access and search
- Role-based access for security

5. Assumptions:
- Unique ID for each book
- Max 3 books issued per user
- 15-day return period

✓ LAB EXERCISE: Perform a functional analysis for an online shopping system.

- **Functional Analysis – Online Shopping System**

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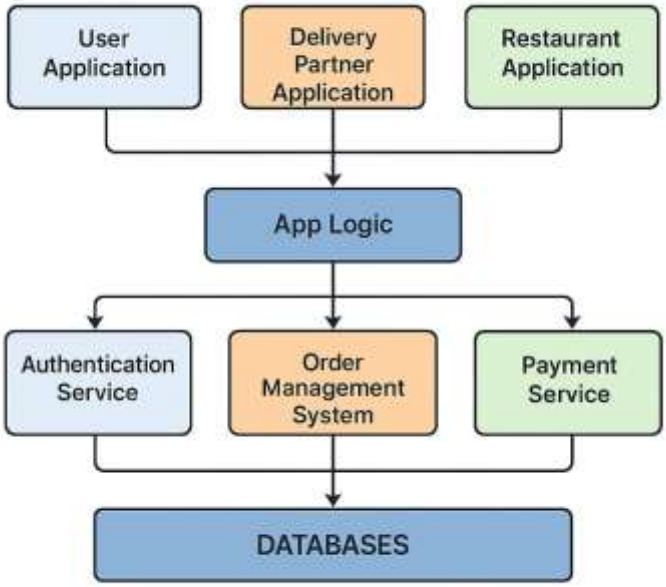
System Design

LAB EXERCISE: Design a basic system architecture for a food delivery app.



Basic System Architecture

1. Applications (Top Layer):

- User Application – For customers to place orders.
- Delivery Partner Application – For delivery agents to view and deliver orders.
- Restaurant Application – For restaurants to receive and manage orders.

2. App Logic (Middle Layer):

- The main control unit of the system.
- Connects all the applications to the backend services.

3. Services (Supporting Systems):

- Authentication Service – Manages user login and security.
- Order Management System – Handles order processing, updates, and tracking.
- Payment Service – Processes online payments safely.

1. **Databases (Bottom Layer):**

- Stores all data like user profiles, menu items, orders, payments, and history.

✓ **[LAB EXERCISE]: Develop test cases for a simple calculator program.**

1. Functional Test Cases

Test Case ID	Description	Input	Expected Output
TC001	Addition of two positive numbers	5 + 3	8
TC002	Addition of positive and negative number	7 + (-2)	5
TC003	Subtraction of two numbers	10 - 4	6
TC004	Multiplication of two numbers	6 * 3	18
TC005	Division of two numbers	12 / 4	3
TC006	Division resulting in a float	7 / 2	3.5
TC007	Multiplying by zero	15 * 0	0
TC08	Division by zero	5 / 0	Error or "Cannot divide by zero"

2. Boundary Test Cases:

TestCase ID	Description	Input	Expected Output
TC011	Maximum integer addition	2147483647 + 1	Overflow or Error
TC012	Minimum integer subtraction	-2147483648 - 1	Underflow or Error
TC013	Very small float multiplication	0.0000001 * 0.0000001	1e-14
TC014	Large float division	1e10 / 2	5e9

3. Invalid Input Test Cases:

Test Case ID	Description	Input	Expected Output
TC015	Non-numeric input	"a" + 5	Error: Invalid input
TC016	Empty input	""	Error: Input required
TC017	Symbol instead of number	$# + 10	Error: Invalid input
TC018	Division by string	10 / "two"	Error: Invalid input
TC019	Multiple operators	2 ++ 3	Error: Syntax error

4. Chained Operations (if supported):

Test Case ID	Description	Input	Expected Output
TC020	Chain addition and multiplication	2 + 3 * 4	14 (if operator precedence)
TC021	Chain with parentheses	(2 + 3) * 4	20
TC022	Mix of operations	10 - 2 + 5	13

✓ [LAB EXERCISE]: Document a real-world case where a software application required.

⇨ **Critical maintenance.**

Case Study: Facebook Outage – October 2021

Background:
On October 4, 2021, Facebook, WhatsApp, and Instagram experienced a global outage lasting over 6 hours. The disruption was caused by a router misconfiguration during routine maintenance.

Issue:
The misconfiguration disrupted network traffic, disconnecting data centers . Even Facebook's internal tools failed, significantly delaying recovery efforts.

Impact:

- Worldwide service outage
- Over $60 million in lost ad revenue
- Facebook's stock dropped by 5%

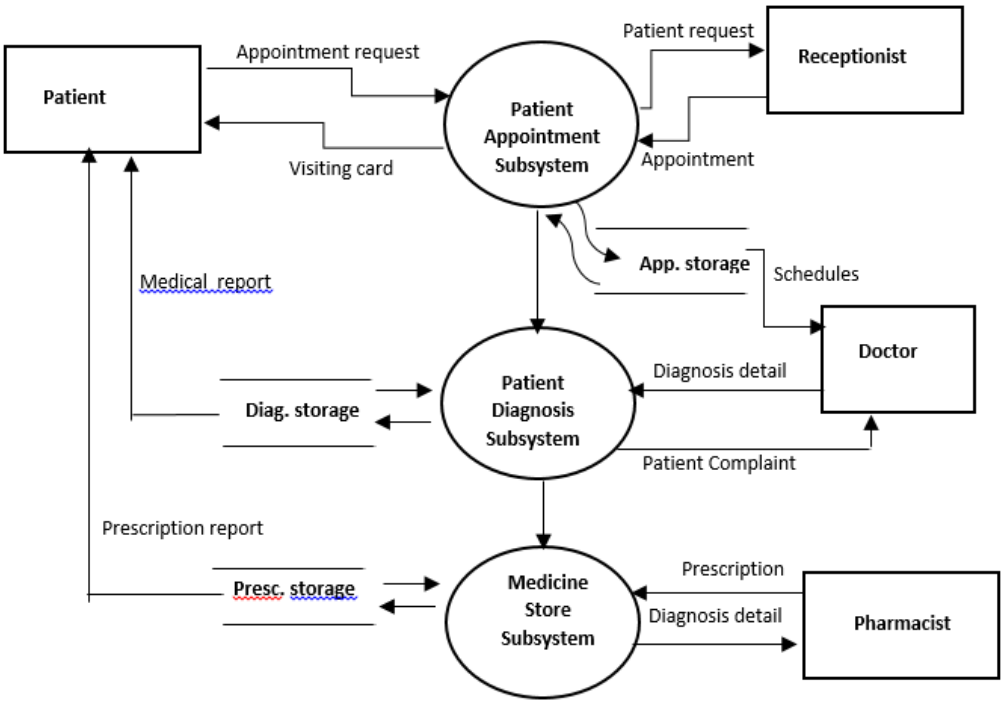
Action Taken:

- Engineers manually accessed data centers to regain control
- Systems were gradually restarted
- Recovery tools and protocols were updated for future resilience

Lessons Learned:

- Backup access methods are critical
- Automated rollback mechanisms for configuration changes improve safety
- Regular disaster recovery drills are essential

- **[LAB EXERCISE]: Create a DFD for a hospital management system.**



- ✓ **LAB EXERCISE: Build a simple desktop calculator application using a GUI library.**

```
#include <stdio.h>

int main() {
    double num1, num2, result;
    char op;

    printf("Simple Calculator\n");
    printf("Enter expression (e.g., 3 + 4): ");
    scanf("%lf %c %lf", &num1, &op, &num2);

    switch (op) {
        case '+':
            result = num1 + num2;
            printf("Result: %.2lf\n", result);
```

```
            break;
        case '-':
            result = num1 - num2;
            printf("Result: %.2lf\n", result);
            break;
        case '*':
            result = num1 * num2;
            printf("Result: %.2lf\n", result);
            break;
        case '/':
            if (num2 == 0) {
                printf("Error: Division by zero\n");
            } else {
                result = num1 / num2;
                printf("Result: %.2lf\n", result);
            }
            break;
        default:
            printf("Error: Invalid operator\n");
    }

    return 0;
}
```

- ✓ **[LAB EXERCISE]: Draw a flowchart representing the logic of a basic online registration system.**