■ Node.js Notes for Beginners

■ What is Node.js?

Node.js is a runtime environment that allows you to run JavaScript outside the browser. It is built on Chrome's V8 engine and enables developers to write server-side applications in JavaScript.

■ Key Features of Node.js

1. Asynchronous & Event-driven – Handles multiple requests without blocking.
2. Non-blocking I/O – Uses callbacks & promises to manage I/O operations.
3. Single-threaded, but scalable – Uses an event loop instead of multiple threads.
4. Cross-platform – Runs on Windows, Mac, Linux.
5. NPM (Node Package Manager) – Huge library of pre-built packages.

■■ Installing Node.js

1. Download from https://nodejs.org
2. Check installation using:

```
node -v
npm -v
```

■■■ First Node.js Program

```
console.log('Hello, Node.js!');
```

Run using: `node app.js`

■ Node.js Modules

Types of modules:
1. Core Modules (fs, http, path, os).
2. Local Modules (your own files).
3. Third-party Modules (via npm, e.g., express, mongoose).

Example with fs:
```
const fs = require('fs');
fs.writeFileSync('hello.txt', 'Welcome to Node.js!');
const data = fs.readFileSync('hello.txt','utf-8');
console.log(data);
```

■ Creating a Simple Web Server

```
const http = require('http');
const server = http.createServer((req, res) => {
```

```
  res.writeHead(200, { 'Content-Type': 'text/plain' });
  res.end('Hello from Node.js Server!');
});
server.listen(3000, () => console.log('Server running...'));
```

■ Using NPM

Initialize project:
```
npm init -y
```

Install Express:
```
npm install express
```

Express Example:
```
const express = require('express');
const app = express();
app.get('/', (req, res) => res.send('Hello Express!'));
app.listen(3000, () => console.log('Server started'));
```

■■ Event Loop & Callbacks

```
console.log('First');
setTimeout(() => console.log('Second'), 2000);
console.log('Third');
```

Output:
First
Third
Second (after 2s)

■■ File System Example

```
const fs = require('fs');
fs.readFile('hello.txt','utf-8',(err,data)=>{
  if(err) throw err;
  console.log(data);
});
```

■■ Why Learn Node.js?

■ Same language (JavaScript) on frontend & backend.
■ Huge community & npm ecosystem.
■ Great for APIs, real-time apps, and startups.

■ Summary

Node.js lets you run JavaScript on the server.
Learn core modules (fs, http, path, os) first.

Practice web server creation.
Explore npm packages like Express.
Understand event loop and async behavior.

■ Node.js Flowchart