**BOM-BILL OF MATERIAL**

**FOR NAAN MUDHAVAN REPORT**

**LIST OF MATERIALS**

**BILL OF MATERIALS (BOM) – IoT Node with Voltage Management System**

**1. Core Microcontroller & Processing**

| **Component** | **Part Number** | **Package** | **Qty** | **Specification / Notes** |
| --- | --- | --- | --- | --- |
| Main MCU | ESP32-WROOM-32 | QFN48 | 1 | Wi-Fi + Bluetooth, 4MB Flash |
| Backup MCU | STM32F103C8T6 | LQFP48 | 1 | ARM Cortex-M3 |
| RTC | DS3231 | SOIC-16 | 1 | Real-time clock, battery backup |
| EEPROM | 24C32 | SOIC-8 | 1 | 32Kbit I2C memory |

**2. Power Management & Protection**

| **Component** | **Part Number** | **Package** | **Qty** | **Specification / Notes** |
| --- | --- | --- | --- | --- |
| Buck Converter | MP1584EN | SOP-8 | 1 | 12V → 5V, 3A |
| LDO Regulator | AMS1117-3.3 | SOT-223 | 2 | 5V → 3.3V, 1A |
| LDO Regulator | MCP1700-3302 | SOT-23 | 1 | 3.3V, 250mA |
| PTC Fuse | 1812L | 1812 | 2 | 1A, 6V protection |
| TVS Diode | SMAJ12A | SMA | 2 | Surge protection |
| Schottky Diode | SS34 | SMA | 2 | 3A, 40V, reverse polarity |

**3. Communication Interfaces**

| **Component** | **Part Number** | **Package** | **Qty** | **Specification / Notes** |
| --- | --- | --- | --- | --- |
| USB-UART Converter | CH340C | SOP-16 | 1 | USB 2.0 |
| Ethernet Module | W5500 | LQFP-48 | 1 | SPI Ethernet |
| RS485 Transceiver | MAX485 | SOIC-8 | 1 | Industrial communication |
| CAN Bus Transceiver | MCP2551 | DIP-8 | 1 | Automotive communication |
| LoRa Module | SX1276 | LoRa-16 | 1 | 433/868/915 MHz long-range wireless |

**4. Sensors – Environmental**

| **Component** | **Part Number** | **Package** | **Qty** | **Specification / Notes** |
| --- | --- | --- | --- | --- |
| Temp/Humidity | DHT22 | TH | 1 | -40~80°C, 0–100% RH |
| Environmental | BME280 | LGA-8 | 1 | Temp, Humidity, Pressure |
| Air Quality | MQ-135 | Module | 1 | CO₂, NH₃, smoke |
| Gas Sensor | CCS811 | LGA-10 | 1 | TVOC, eCO₂ |
| Light Sensor | BH1750 | SOP-5 | 1 | 0–65535 lux |

**5. Sensors – Motion & Position**

| **Component** | **Part Number** | **Package** | **Qty** | **Specification / Notes** |
| --- | --- | --- | --- | --- |
| Accelerometer/Gyro | MPU6050 | QFN-24 | 1 | 6-axis IMU |
| Magnetometer | HMC5883L | DFN-16 | 1 | 3-axis compass |
| GPS Module | NEO-6M | Module | 1 | Location tracking |
| PIR Motion | HC-SR501 | Module | 1 | Human detection |
| Ultrasonic | HC-SR04 | Module | 1 | 2–400 cm distance |

**6. User Interface Components**

| **Component** | **Part Number** | **Package** | **Qty** | **Specification / Notes** |
| --- | --- | --- | --- | --- |
| Tactile Switch | TS-1187A | 6×6 mm | 4 | Push button |
| Rotary Encoder | EC11 | TH | 1 | 15 pulses/360° |
| Touch Sensor | TTP223 | SOT-23-6 | 2 | Capacitive touch input |
| Potentiometer | 3362P | TH | 2 | 10K linear |
| Joystick | PS2-Joy | Module | 1 | 2-axis analog input |

**7. Display & Output**

| **Component** | **Part Number** | **Package** | **Qty** | **Specification / Notes** |
| --- | --- | --- | --- | --- |
| OLED Display | SSD1306 | Module | 1 | 128×64 I²C |
| LCD Display | 1602A | Module | 1 | 16×2 I²C |
| RGB LED | WS2812B | 5050 | 4 | Addressable RGB |
| LED (Various) | 0805 | SMD | 10 | Red/Green/Blue indicators |
| Buzzer | EM-27314 | TH | 1 | 5V passive buzzer |

**8. Power Control & Actuators**

| **Component** | **Part Number** | **Package** | **Qty** | **Specification / Notes** |
| --- | --- | --- | --- | --- |
| Relay | SRD-05VDC-SL-C | Module | 2 | 5V, 10A/250VAC |
| MOSFET | IRLB8743 | TO-220 | 4 | N-channel 30V |
| Motor Driver | DRV8833 | WSON-10 | 1 | Dual H-Bridge |
| Solid State Relay | CPC1017N | DIP-4 | 1 | 60V, 100mA |
| Servo Connector | CONN-3 | Header | 2 | 3-pin 2.54mm |

**9. Passive Components – Resistors**

| **Type** | **Part Number** | **Package** | **Qty** | **Value** |
| --- | --- | --- | --- | --- |
| **Resistor** | **RC0805** | **0805** | **20** | **10Ω** |
| Resistor | RC0805 | 0805 | 20 | 100Ω |
| Resistor | RC0805 | 0805 | 20 | 1kΩ |
| Resistor | RC0805 | 0805 | 20 | 10kΩ |
| Resistor | RC0805 | 0805 | 10 | 100kΩ |
| Resistor | RC0805 | 0805 | 10 | 1MΩ |

**10. Passive Components – Capacitors**

| **Type** | **Part Number** | **Package** | **Qty** | **Value** |
| --- | --- | --- | --- | --- |
| Ceramic | CC0805 | 0805 | 30 | 100nF |
| Ceramic | CC0805 | 0805 | 10 | 10μF |
| Ceramic | CC0805 | 0805 | 10 | 22μF |
| Electrolytic | ECE-1 | Radial | 10 | 100μF/16V |
| Electrolytic | ECE-2 | Radial | 5 | 470μF/25V |
| Tantalum | TC-1 | 7343 | 5 | 47μF/16V |

**11. Inductors & Crystals**

| **Component** | **Part Number** | **Package** | **Qty** | **Specification / Notes** |
| --- | --- | --- | --- | --- |
| Power Inductor | LPS4012 | 4×4mm | 3 | 10μH |
| Power Inductor | LPS4012 | 4×4mm | 3 | 22μH |
| Crystal | HC-49S | TH | 2 | 16 MHz |
| Crystal | MC-306 | 3.2×2.5mm | 2 | 32.768 kHz |
| Ferrite Bead | BLM18 | 0603 | 5 | 600Ω @ 100 MHz |

**12. Connectors & Headers**

| **Component** | **Part Number** | **Package** | **Qty** | **Specification / Notes** |
| --- | --- | --- | --- | --- |
| GPIO Header | CONN-20 | 2.54mm | 2 | 20-pin, female |
| DC Power Jack | DC-005 | Panel | 1 | 5.5×2.1mm |
| USB-C Connector | USB-C-31 | TH | 1 | USB 2.0 |
| Terminal Block | TB-2 | 5.08mm | 2 | 2-pin |
| JST Connector | XH-2 | JST-XH | 4 | 2-pin |
| MicroSD Slot | TF-CARD | Push-push | 1 | For data storage |

**Bill of Material – (Approx Unit Cost in INR)**

| **Section / Subtitle** | **Approx Cost (₹)** |
| --- | --- |
| Core Microcontroller & Processing | ₹ 2,150 |
| Power Management & Protection | ₹ 1,050 |
| Communication Interfaces | ₹ 1,200 |
| Sensors – Environmental | ₹ 1,000 |
| Sensors – Motion & Position | ₹ 1,050 |
| User Interface Components | ₹ 350 |
| Display & Output | ₹ 550 |
| Power Control & Actuators | ₹ 500 |
| Passive Components – Resistors / Capacitors | ₹ 250 |
| Inductors & Crystals | ₹ 200 |
| Connectors & Headers | ₹ 370 |

**Final Confirmation**

The complete Bill of Materials (BOM) for the *IoT Node with Voltage Management System* project has been carefully compiled and presented above. Each section includes an estimated cost in Indian Rupees, leading to a total approximate unit cost of **₹7,470** (with a possible variation of ±10%). This estimation covers only the component costs and does not include expenses for PCB fabrication, soldering, GST, or shipping. When produced in bulk (10 units or more), the per-unit cost can be reduced significantly, making the project more economical and scalable for real-world deployment. Overall, this BOM serves as a solid foundation for your IoT node design and provides a reliable reference for accurate cost planning during the production phase.