**📘 Embedded Systems Components – Study Notes**

**1. Resistors**

* **Use cases:** Limit current, voltage dividers, pull-up/pull-down, biasing.
* **Notes:**

**2. Capacitors**

* **Use cases:** Decoupling, filtering, smoothing, AC coupling.
* **Notes:**

**3. Inductors**

* **Use cases:** Energy storage, buck/boost converters, filters, EMI suppression.
* **Notes:**

**4. Diodes (Standard, Schottky, Zener)**

* **Use cases:** Rectification, reverse polarity protection, voltage clamping, flyback protection.
* **Notes:**

**5. Transistors (BJT, MOSFET)**

* **Use cases:** Switching, amplification, level shifting, motor drivers.
* **Notes:**

**6. Voltage Regulators**

* **Use cases:** Provide stable supply (3.3 V, 5 V), linear vs switching.
* **Notes:**

**7. Oscillators & Crystals**

* **Use cases:** Generate stable clock signals for microcontrollers and communication.
* **Notes:**

**8. Operational Amplifiers & Comparators**

* **Use cases:** Signal conditioning, buffering, active filtering, threshold detection.
* **Notes:**

**9. Switches, Relays & MOSFET Drivers**

* **Use cases:** User inputs, mode selection, driving high-power loads.
* **Notes:**

**10. Sensors**

* **Use cases:** Convert physical signals (temp, light, pressure, motion) into electrical signals.
* **Notes:**

**11. ADCs / DACs**

* **Use cases:** Bridge between analog world and microcontrollers.
* **Notes:**

**12. Protection Components**

* **Use cases:** ESD protection, fuses, TVS diodes, surge suppression.
* **Notes:**

**13. Connectors & Interfaces**

* **Use cases:** Power input, programming headers, sensor connections, user interfaces.
* **Notes:**

**14. Indicators (LEDs, Displays)**

* **Use cases:** Visual feedback, status indication, user interface.
* **Notes:**