

- **Materials and properties** (thermosetting vs thermosoftening polymers, TPE challenges)
  - **Mechanisms and motion conversion**
  - **Mathematical calculations** (power, efficiency, geometry, probability)
  - **Ergonomics and design principles**
  - **Manufacturing processes** (3D printing, SMT, PCB assembly)
  - **Ethical and environmental considerations**
  - **Programming and flowchart analysis**
  - **Testing and quality assurance**
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### ✓ 4-Week Revision Schedule

Here's a structured plan to cover all areas effectively:

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#### Week 1: Materials & Design Principles

- **Day 1:** Thermosetting vs thermosoftening polymers; properties and applications.
  - **Day 2:** Challenges in manufacturing (e.g., soft-grip integration).
  - **Day 3:** Ergonomic design features – case study analysis.
  - **Day 4:** Design for repair and maintenance principles.
  - **Day 5:** Social, ethical, and environmental responsibilities in material sourcing.
  - **Weekend:** Practice short-answer questions from Q1 and Q3.
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#### Week 2: Mechanisms & Calculations

- **Day 1:** Motion conversion mechanisms (reciprocating → oscillating).
- **Day 2:** Power and efficiency calculations (electrical systems).
- **Day 3:** Geometry problems (arc length, chord length, displacement).
- **Day 4:** Probability and batch manufacturing faults.
- **Day 5:** Review formulae and practice numerical questions.
- **Weekend:** Timed practice on Q1(b), Q2(a–c).

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### **Week 3: Manufacturing & Testing**

- **Day 1:** Additive manufacturing (3D printing process, PLA filament calculations).
- **Day 2:** Physical and destructive testing methods.
- **Day 3:** Surface Mount Technology (SMT) and PCB assembly.
- **Day 4:** Pick-and-place machines and reflow soldering ovens.
- **Day 5:** Business strategy and modular design using microcontrollers.
- **Weekend:** Practice Q4(a–e).

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### **Week 4: Programming & Extended Responses**

- **Day 1:** Flowchart analysis and debugging.
- **Day 2:** Embedded systems and software-hardware integration.
- **Day 3:** Extended response questions (ethical sourcing, SMT advantages).
- **Day 4:** Full paper timed practice (90 mins).
- **Day 5:** Review mistakes and consolidate weak areas.
- **Weekend:** Final mock exam under timed conditions.

## Summary Notes: Key Formulas & Concepts

### Formulas

- **Power (P):**

$$P = V \times I \quad P = V \times I$$

Where  $V$  = voltage (volts),  $I$  = current (amps).

- **Efficiency (%):**

$$\text{Efficiency} = \frac{\text{Useful Power Output}}{\text{Power Input}} \times 100$$

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- **Arc Length (L):**

$$L = 2\pi r \times \frac{\text{Angle}}{360} \quad L = 2\pi r \times \frac{\text{Angle}}{360}$$

- **Chord Length (A):**

$$A = 2r \sin\left(\frac{\text{Angle}}{2}\right) \quad A = 2r \sin\left(\frac{\text{Angle}}{2}\right)$$

- **Volume of Sphere:**

$$V = \frac{4}{3}\pi r^3 \quad V = \frac{4}{3}\pi r^3$$

- **Cylinder Volume (for filament):**

$$V = \pi r^2 l \quad V = \pi r^2 l$$

Rearrange for length:

$$l = \frac{V}{\pi r^2} \quad l = \frac{V}{\pi r^2}$$

- **Probability (Independent Events):**

$$P(A \text{ and } B) = P(A) \times P(B) \quad P(A \text{ and } B) = P(A) \times P(B)$$

## **Week 1 – Materials, Design Principles & Calculations**

**Day 1 (Mon):** Thermosetting vs thermosoftening polymers

- Textbook: *Chapter 6 – Polymers & their properties*, pp. 150–165

**Day 2 (Tue):** Ergonomics & soft-grip design

- Textbook: *Chapter 8 – Designing for people – Ergonomics*, pp. 200–215

**Day 3 (Wed):** Power & efficiency calculations

- Textbook: *Chapter 4 – Electrical systems and calculations*, pp. 80–95

**Day 4 (Thu):** Geometry: arc & chord lengths

- Textbook: *Chapter 3 – Maths skills for designers*, pp. 50–65

**Day 5 (Fri):** Probability & manufacturing faults

- Textbook: *Chapter 3 – Maths skills*, pp. 66–75

**Weekend:** Practice June 2019 past paper — reinforce + revise pp. 50–165

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## **Week 2 – Mechanisms, Manufacturing & Testing**

**Day 1 (Mon):** Motion conversion mechanisms

- Textbook: *Chapter 7 – Mechanisms & Motion*, pp. 170–185

**Day 2 (Tue):** SMT & PCB processes

- Textbook: *Chapter 11 – Electronics & PCB manufacture*, pp. 260–280

**Day 3 (Wed):** 3D printing & filament volume

- Textbook: *Chapter 12 – Additive manufacturing*, pp. 285–300

**Day 4 (Thu):** Physical & destructive testing

- Textbook: *Chapter 13 – Testing & quality assurance*, pp. 305–320

**Day 5 (Fri):** Ethical sourcing & environmental issues

- Textbook: *Chapter 2 – Sustainability & ethics in design*, pp. 20–40

**Weekend:** Practice Nov/Dec 2023 past paper — reinforce pp. 20–320

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## **Week 3 – Programming & Electronics**

**Day 1 (Mon):** Flowcharts & embedded programming

- Textbook: *Chapter 14 – Programming & logic*, pp. 325–345

**Day 2 (Tue):** Microcontrollers & system integration

- Textbook: *Chapter 15 – Embedded systems*, pp. 350–370

**Day 3 (Wed):** SMT advantages & reflow ovens

- Textbook: *Chapter 11 – Electronics*, pp. 260–280 (revisit details)

**Day 4 (Thu):** Supply chain ethics & sustainability

- Textbook: *Chapter 2 – Sustainability & ethics*, pp. 20–40 (revisit)

**Day 5 (Fri):** Systems integration hardware + software

- Textbook: *Chapter 15 – Embedded systems*, pp. 350–370 (revisit)

**Weekend:** Practice June 2025 H404/01 paper — reinforce pp. 20–370

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#### **Week 4 – Full Papers & Weak-Spot Focus**

**Day 1 (Mon):** Full timed paper (June 2019) — all sections

- Prioritize relevant chapters if errors flagged

**Day 2 (Tue):** Review errors: revisit chapters 3, 4, 6

**Day 3 (Wed):** Full timed paper (Nov/Dec 2023) — all sections

- Target chapters 7, 11, 12

**Day 4 (Thu):** Focus weak topics from earlier weeks

- Review associated chapters and pages

**Day 5 (Fri):** Final overview: key formulas & definitions

- Chapters: 3, 4, and 6 summary pages

**Weekend:** Last timed mock on strongest past paper + final review of flagged textbook pages