🧩 💻 Design and CAD (Computer-Aided Design) Roadmap (12 Weeks)

🗓️ Week 1: Introduction to CAD

- What is Computer-Aided Design (CAD)?
- History, importance, and evolution.
- Applications in E&TC (PCB), Mechanical (3D design), and Civil (plans & layouts).

🗓️ Week 2: CAD Software Tools

- Overview of popular CAD tools:
    - AutoCAD, SolidWorks, Fusion 360 (Mechanical)
    - Eagle, KiCad, Altium (E&TC – PCB)
    - Revit, SketchUp (Civil)
- Installation and basic navigation.

🗓️ Week 3: 2D Drawing Basics

- Drawing entities: lines, arcs, circles, polylines.
- Coordinate systems: absolute, relative, polar.
- Layers, line types, and dimensions.

🗓️ Week 4: 3D Modeling Fundamentals

- Basics of 3D CAD: extrusion, revolve, sweep, loft.
- Working with primitives: cube, cylinder, cone, sphere.
- Creating assemblies and exploded views (Mechanical focus).

🗓️ Week 5: Isometric & Orthographic Projections

- Isometric views, orthographic projections.
- Sectional views and dimensioning.
- Real-world component drawing practice.

🗓️ Week 6: PCB Design for E&TC

- PCB layout design basics.
- Schematic drawing → netlist → PCB routing.
- Tools: KiCad, Eagle.

🗓️ **Week 7: Circuit Simulation & Testing**

- Simulating analog/digital circuits (Multisim, LTspice).
- Verifying PCB connections and footprints.
- Signal integrity, thermal analysis basics.

🗓️ **Week 8: CAD for Civil Engineering**

- Plotting floor plans, electrical and plumbing layouts.
- Elevation and sectional drawings.
- Annotating and dimensioning architecture designs.

🗓️ **Week 9: Mechanical Design Optimization**

- Stress analysis, motion simulation.
- Materials and weight optimization.
- Finite Element Analysis (FEA) basics in SolidWorks.

🗓️ **Week 10: Advanced Modeling Techniques**

- Surface modeling, sheet metal design.
- Parametric modeling and design intent.
- Assembly constraints and motion links.

🗓️ **Week 11: Rendering and Animation**

- Photorealistic rendering.
- Creating walkthroughs (Revit, SketchUp).
- Product animations and exploded views.

🗓️ **Week 12: Final Project / Mini Design Challenge**

- Choose based on branch:

    - 🛠️ Mechanical: Gearbox or robotic arm.
    - 🧲 E&TC: 2-layer PCB for a wearable device.
    - 🏗️ Civil: Full building layout with plan/elevation.
- Include modeling + rendering + documentation.

🛠️ **Tools You May Use:**

- **AutoCAD, SolidWorks, Fusion 360**
- **LTSpice, Eagle, KiCad, TinkerCAD**
- **Revit, SketchUp, ANSYS, Creo**