Project Proposal List:

Finance:

01. Corporate Valuation & M&A Simulation
   a. **Focus**: Corporate Finance, Private Equity & IB, Deal Analysis
   b. Given a specific industry and current market conditions (e.g., recent M&A activity, regulatory climate, macroeconomic backdrop), teams act as analysts at a private equity firm tasked with identifying the best acquisition target. Each team independently selects a publicly traded company in that industry, conducts a valuation (DCF, comparables, precedent transactions), and develops an investment thesis. The challenge culminates in an "Investment Committee" presentation where teams pitch their deal and compete for approval.
      i. Can get more specific in terms later on yk (industry wise, etc.)
      ii. Depending on interest and scale, potential to work with other clubs and make this a bigger event at the end of semester, where all teams present their ideas.
      iii. Open ended in terms of team sizing (can have multiple teams of ~3-4 students)
      iv. Works better as an **semester** long project (not **academic-year**)

02. Sustainable Investing Portfolio Challenge
   a. **Focus**: ESG & Asset Management
   b. Teams construct an ESG-compliant investment portfolio. Analyze ESG scores, carbon intensity data, and sector allocations. Backtest performance against a traditional benchmark to see how returns/risk differ.
   c. **Deliverables**: Portfolio breakdown, backtest performance charts, written analysis of ESG vs. non-ESG tradeoffs.
   d.

03. Startup Financing Casebook
   a. **Focus**: Venture Capital & Entrepreneurship Finance
   b. Over the year, analyze 5–10 early-stage startups (real or simulated), evaluate financing needs, propose fundraising structures, and estimate valuations using VC methods.
   c. **Deliverables**: Compiled casebook, with pitch decks and valuation notes for each startup

04. Fixed Income Yield Curve & Credit Risk Challenge
   a. **Focus:** Bonds, Credit Analysis, Macroeconomics
      Description: Teams act as analysts at a fixed-income desk tasked with building a macro-informed bond portfolio. Each group is given historical and current Treasury yield curve data, corporate bond spreads, and macroeconomic indicators (inflation, unemployment, GDP growth). They must:
      i. Forecast interest rate movements

  ii. Choose a portfolio allocation across maturities and credit ratings

  iii. Present both return and risk expectations under different economic scenarios

 b. **Deliverables:**

  i. Bond portfolio allocation with justification

  ii. Yield curve shift simulations and impact analysis

  iii. Credit risk assessment report

 c. **Engagement Hook:** Teams' portfolios are "stress-tested" mid-project based on simulated Fed policy surprises or recession scenarios.

05. (Continuation): Options Pricing and Trading Strategy

 a. **Focus:** Market Analysis, Trading, Quantitative Finance

 b. This project explores options pricing through Black-Scholes and Binomial Tree models, analyzes real-world options data (Greeks, implied vs. historical volatility), and develops a simple trading strategy based on volatility or hedging principles. The final deliverables include a pricing tool, data visualizations, a backtested strategy, and a polished report.

Engineering:

Bicycle Energy Harvesting System

- **Brief Description:**
  Develop a small alternator-based system that charges a battery while riding a bicycle, with outputs for USB charging.
- **Skills/Tools Needed:**
    - CAD modeling for mounts and enclosures
    - Electrical system design and rectification
    - Power storage and regulation circuitry
    - Prototyping and mechanical assembly
    - Efficiency testing under real-world conditions

    Expected Timeline: 1 sem

    Team Size: 3–5 students

Portable Low-Cost Wind Turbine
- **Brief Description:**
  Create a small, foldable wind turbine capable of charging a USB device. The design will emphasize portability, affordability, and simple assembly, making it suitable for camping, outdoor activities, or emergency uses
- **Skills/Tools Needed:**
    - CAD modeling for blades and aerodynamic housing
    - Fabrication using PVC and 3D printing
    - DC motor selection and buck converter electronics
    - Basic aerodynamics testing in a controlled airflow (fan wind tunnel)
    - Market research and cost analysis for product feasibility

    Expected Timeline: 1 sem

    Team Size: 3–5 students

Modular Assistive Robotic Arm

- **Brief Description:**
  Design a 3D-printed robotic arm that can assist people with limited mobility in performing basic daily tasks such as picking up objects or pressing buttons
- **Skills/Tools Needed:**
    - CAD modeling (SolidWorks, Fusion 360)
    - 3D printing and assembly
    - Microcontroller programming (Arduino or Raspberry Pi
    - Basic electronics and motor control
    - Human factors and ergonomic design

Expected Timeline: 1 sem

Team Size: 5–7 students

Software:

CodeTutor AI
   a) **Focus:** Educational Technology, AI, Software Development Support
   b) **Brief Description:** An AI-powered debugging assistant that explains compiler/runtime errors in plain English, suggests targeted fixes, and teaches related programming concepts for long-term learning. It aims to help both beginner and intermediate programmers understand why their code fails while providing resources to improve their skills.
   c) **Skills/Tools Needed:**
      i) Python, Node.js
      ii) Large Language Model APIs
      iii) VS Code Extension API
      iv) Docker and WebSockets
      v) Frontend development (React.js)
   d) **Expected Timeline:** 1 semester
   e) **Team Size:** 4–6 students

MeetMind: AI Meeting Companion
   a) **Focus:** Productivity, Natural Language Processing, Collaboration Tools
   b) **Brief Description:** A meeting assistant that transcribes conversations in real time, extracts key points, detects sentiment, and creates actionable summaries. It integrates with tools like Slack, Trello, and Google Calendar to automatically log action items and reminders, streamlining post-meeting workflows.
   c) **Skills/Tools Needed:**
      i) React.js, Flask/FastAPI
      ii) Speech-to-Text APIs
      iii) Transformer-based sentiment analysis
      iv) Google Workspace & Slack API integrations
   d) **Expected Timeline:** 1 semester
   e) **Team Size:** 4–6 students

TimeSense: Deep Work Analytics Tool
   a) **Focus:** Productivity, Behavioral Analytics
   b) **Brief Description:** A desktop application that tracks app usage and activity patterns to detect when users are most focused, recommends optimal work/break cycles, and provides weekly productivity insights. Designed to help individuals and teams build sustainable, high-performance work habits.
   c) **Skills/Tools Needed:**
      i) Electron.js desktop app framework
      ii) Python for data processing
      iii) SQLite for local storage
      iv) Activity recognition APIs

v)   Data visualization libraries
d) **Expected Timeline:** 1 semester
e) **Team Size:** 3–5 students

StockScope: Interactive Stock & ETF Explorer

a) **Focus:** FinTech, Data Visualization, AI Analytics
b) **Brief Description:** A web-based dashboard that integrates fundamental, technical, and sentiment data to help investors make informed decisions. It offers AI-generated investment summaries, real-time stock charts, and overlays for technical indicators like MACD, RSI, and Bollinger Bands.
c) **Skills/Tools Needed:**
   i)   React.js frontend
   ii)   Flask backend
   iii)   Alpha Vantage & Yahoo Finance APIs
   iv)   NLP for sentiment analysis
   v)   Plotly/D3.js for interactive charting
d) **Expected Timeline:** 1 semester
e) **Team Size:** 4–6 students

CareerLens: AI Job & Skill Matcher

a) **Focus:** Career Tech, AI, Data Analytics
b) **Brief Description:** A platform that analyzes a user's resume, LinkedIn profile, and current skill set, then matches them with tailored job postings and suggests upskilling paths. AI detects skill gaps for target roles and recommends relevant online courses, certifications, and networking opportunities.
c) **Skills/Tools Needed:**
   i)   MERN stack (MongoDB, Express, React, Node.js)
   ii)   LinkedIn & job board API integrations (Indeed, Adzuna)
   iii)   LLM APIs for resume parsing and skill gap analysis
   iv)   Data visualization for skill maps
d) **Expected Timeline:** 1 semester
e) **Team Size:** 4–6 students

Algorithm Visualizer

a) **Focus:** Education Technology, Algorithms, Data Structures, Visualization
b) **Brief Description:** A web-based platform where students can visualize algorithms and data structures in action. Users can step through sorting, searching, graph, and dynamic programming algorithms with interactive animations, inspect memory/state changes, and modify inputs to see real-time effects. Designed to help CS students understand core concepts and debug logic visually.
c) **Skills/Tools Needed:**
   i)   React.js frontend for interactive visualizations
   ii)   Python/Node.js backend for algorithm simulation
   iii)   D3.js for animation

      iv)   User accounts & progress tracking

d) **Expected Timeline:** 1 semester

e) **Team Size:** 4–6 students