Assignment 02:

Building an Expert System Using Rule-Based Systems

🎯 Objective

To develop an **Expert System** that helps make simple decisions using **rule-based reasoning** — in this case, suggesting a **career path** based on student interests.

🧩 Concept Recap

✅ What is an Expert System?

An **Expert System** is an AI program that emulates the decision-making process of a human expert.
It:

- Uses a **Knowledge Base** (facts and rules)
- Applies an **Inference Engine** (logic engine that applies rules to facts)
- Gives recommendations or conclusions

⚙️ Tools and Technologies

- **Language:** Python
- **Interface:** CLI (Command Line Interface)
- **Logic Engine / Library:** experta (or pyknow) — for defining rules and reasoning

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📘 Knowledge Base: Sample Rules

Interests	Suggested Career
Maths + Physics	Mechanical Engineering
Programming + Maths	Computer Engineering
Biology + Chemistry	Biotechnology
Circuits + Maths	Electronics Engineering
Programming + Statistics	Artificial Intelligence & Data Science
Programming + AI Concepts	Artificial Intelligence & Machine Learning Engineering

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💻 Step 1: Simple IF–ELSE Implementation (Basic Version)

Before using experta, you can demonstrate the logic using simple Python if-else statements.

```
# Expert System for Career Path Suggestion (Basic Version)

def career_suggestion(interests):
    interests = [i.strip().lower() for i in interests]

    if 'maths' in interests and 'physics' in interests:
```

```
        return "Mechanical Engineering"
    elif 'programming' in interests and 'maths' in interests:
        return "Computer Engineering"
    elif 'biology' in interests and 'chemistry' in interests:
        return "Biotechnology"
    elif 'circuits' in interests and 'maths' in interests:
        return "Electronics Engineering"
    elif 'programming' in interests and 'statistics' in interests:
        return "Artificial Intelligence and Data Science"
    elif 'programming' in interests and 'ai concepts' in interests:
        return "Artificial Intelligence and Machine Learning Engineering"
    else:
        return "No specific suggestion found. Try adding more interests."

def main():
    print("Welcome to the Career Path Expert System!")
    interests = input("Enter your interests separated by commas (e.g., Maths,
Physics, Programming): ").split(',')
    suggestion = career_suggestion(interests)
    print("Suggested Career Path:", suggestion)

if __name__ == "__main__":
    main()
```

Step 2: Rule-Based Implementation Using experta Library

To install:

```
pip install experta
```

Then, use this Python code:

```
from experta import *

class StudentFacts(Fact):
    pass

class CareerExpertSystem(KnowledgeEngine):

    @Rule(StudentFacts(likes='Maths'), StudentFacts(likes='Physics'))
    def mechanical(self):
        print("Suggested Career Path: Mechanical Engineering")

    @Rule(StudentFacts(likes='Programming'), StudentFacts(likes='Maths'))
    def computer(self):
        print("Suggested Career Path: Computer Engineering")
```

```
    @Rule(StudentFacts(likes='Biology'), StudentFacts(likes='Chemistry'))
    def biotech(self):
        print("Suggested Career Path: Biotechnology")

    @Rule(StudentFacts(likes='Circuits'), StudentFacts(likes='Maths'))
    def electronics(self):
        print("Suggested Career Path: Electronics Engineering")

    @Rule(StudentFacts(likes='Programming'), StudentFacts(likes='Statistics'))
    def ai_ds(self):
        print("Suggested Career Path: Artificial Intelligence and Data Science")

    @Rule(StudentFacts(likes='Programming'), StudentFacts(likes='AI
Concepts'))
    def ai_ml(self):
        print("Suggested Career Path: Artificial Intelligence and Machine Learning
Engineering")

def main():
    engine = CareerExpertSystem()
    engine.reset()
    print("Welcome to the Career Path Expert System!")
    interests = input("Enter your interests separated by commas (e.g., Maths,
Physics, Programming): ").split(',')
    for interest in interests:
        engine.declare(StudentFacts(likes=interest.strip()))
    engine.run()

if __name__ == "__main__":
    main()
```

📜 **Sample Output**

```
Welcome to the Career Path Expert System!
Enter your interests separated by commas (e.g., Maths, Physics, Programming):
Programming, Maths
Suggested Career Path: Computer Engineering
```

🧠 **How It Works**

- The system **asks for interests** as input.
- Each interest becomes a **fact**.
- The **Knowledge Engine** matches facts to **rules**.
- When a rule's conditions match, it **triggers an action** (prints career path).
