PROGRAMME OUTCOME MAPPING

1. **Apply the knowledge of mathematics, science, engineering fundamentals, and computing for the solution of complex engineering problems.**

   Application of Knowledge: The development of a chatbot involves the application of mathematics and computer engineering fundamentals to create algorithms for natural language processing, demonstrating the application of knowledge in mathematics, science, and computing.

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2. **Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using computer engineering foundations, principles, and technologies.**

   Problem Identification and Analysis: Chatbots are designed to identify and analyze user queries or problems and provide relevant responses. This involves researching literature on the topics the chatbot is designed to handle, contributing to problem identification and substantiated conclusions.

3. **Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.**

   When designing a chatbot, considerations for public health and safety, as well as cultural and societal aspects, are important to ensure that the chatbot's responses are appropriate and respectful, aligning with the specified needs.

4. **Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.**

   Research-Based Knowledge: Chatbot development may require research on natural language processing techniques and user behavior analysis, leading to valid conclusions about how to improve the chatbot's performance.

5. **Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.**

Application of Engineering and IT Tools: FastAPI and MySQL are modern engineering and IT tools used to build the chatbot, aligning with the program outcome of applying appropriate techniques and tools to complex engineering activities.

6. **Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.**

Contextual Knowledge and Ethics: The chatbot's responses must consider contextual knowledge, including societal and legal aspects, aligning with the program's focus on reasoning informed by contextual knowledge and ethical principles.

7. **Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.**

Societal and Environmental Impact: Understanding how the chatbot interacts with users and its impact on society aligns with the program's emphasis on understanding the impact of engineering solutions in societal and environmental contexts

8. **Apply ethical principles while committed to professional responsibilities and norms of the engineering practice.**

9. **Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.**

Teamwork and Multidisciplinary Settings: Developing a chatbot often involves collaboration between frontend developers, backend developers, and database administrators, contributing to the program outcome of functioning effectively in diverse teams and multidisciplinary settings

10. **Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.**

Effective Communication: The chatbot's ability to comprehend user queries and provide effective responses aligns with program outcome 10, emphasizing effective communication in complex engineering activities.

11. Apply the engineering and management principles to one's work, as a member and leader in a team.

Engineering and Management Principles: The project integrates engineering and management principles in the development process, as it involves coordinating tasks and managing project components across multiple technologies.

12. Recognise the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Lifelong Learning: Given the dynamic nature of technology, building and maintaining a chatbot requires ongoing learning and adaptation, demonstrating the need for and ability to engage in independent and lifelong learning.