**American International University – Bangladesh (AIUB)**

**Faculty of Engineering**

## Department of CSE, EEE, and CoE

**EEE4103 MICROPROCESSOR AND EMBEDDED SYSTEM**

# COURSE CAPSTONE PROJECT PROPOSAL FORM

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| **SEMESTER: Fall 2024-2025** |
| **PROJECT TITLE: Smart Navigation Stick for Visually Impaired Adults Using Arduino.** |
| **Survey For the Project:** |

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| **AIMS AND OBJECTIVES OF THE PROJECT:**  This proposal outlines a capstone project titled **"Smart Navigation Stick for Visually Impaired Adults Using Arduino."** The document reflects a clear understanding of the project requirements and is structured effectively, covering all essential components. Below is a refined overview of the project’s strengths and areas for potential enhancement.  **Advantages:**   * **Clear and Concise Presentation:** The proposal is written in a coherent and easy-to-follow manner, ensuring clarity in the project scope and intentions. * **Well-Defined Objectives:** The primary goal is to **design, develop, and implement a smart navigation stick** equipped with user-friendly features specifically tailored for visually impaired individuals. * **Comprehensive Literature Review:** The review critically examines existing smart cane technologies, identifies limitations, and supports the proposal with relevant and up-to-date references. * **Detailed Experimental Block Diagram:** The system architecture is clearly visualized, illustrating the interconnections and signal flow between different hardware components. * **Positive Societal Impact:** The project emphasizes its potential to significantly improve mobility, independence, and quality of life for visually impaired individuals—contributing meaningfully to inclusive technology. * **Structured Timeline (Gantt Chart):** The project schedule is well-organized, providing a clear breakdown of each phase along with estimated completion times.   **Opportunities for Improvement:**   * **Survey Description Enhancement:** While a link to the survey is included, a brief explanation should be added regarding its **purpose, number of questions, format, and target respondents.** This will provide better context and relevance to the research design. * **Citation Accuracy:** All references should be double-checked using the **IEEE citation format** to ensure proper academic formatting and credibility.   **Additional Considerations:**   * **Cost Efficiency:** The estimated project cost should remain within the range of **2,000–3,000 BDT**, making it both affordable and scalable for real-world use. * **Future Scope:** The design remains **open to future improvements** and feature enhancements based on user feedback and technological advancements. |
| **LITERATURE REVIEW:**   1. J. Smith, J. Doe, and M. Brown, "A Novel Approach to Embedded System Design," in 2019 International Conference on Science and Technology (ICST), pp. 032088, doi: 10.1088/1742-6596/1569/3/032088.   **Problem & Discussion:** Sensor integration, heart rate sensor accuracy, power consumption, and thorough testing are not covered in detail in the techniques part that is supplied. To make the smart cane better, think about:  In-depth calibration and integration of sensors Alternative methods for measuring heart rate Techniques for power optimization  User input and extensive field testing  The smart cane can be improved to become a more dependable and efficient assistive technology by solving these issues.   1. A. A. Elsonbaty, "Smart Blind Stick Design and Implementation," *International Journal of Engineering and Advanced Technology (IJEAT)*, vol. 10, no. 5, pp. 1-4, Jun. 2021, doi: 10.35940/ijeat.D2535.0610521. |

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| **Problems:**  Conventional white canes are not very good at detecting fire, water, or obstacles.  People with visual impairments are less independent since they depend on others for help. Safety is hampered by the absence of real-time alerts and emergency communication.  **Solution:**  Incorporate water and ultrasonic sensors to identify risks and impediments. For better navigation, include audio and vibration notifications in real time.  Incorporate GSM/GPS modules for tracking location and emergency communication.   1. G. Srinivas, G. M. Raju, D. Ramesh, and S. Sivarama, "Smart Blind Stick Connected System Using Arduino,"   *Int. J. Res. Anal. Rev.*, vol. 6, no. 2, pp. 934-939, Apr.-Jun. 2019.  **Problem and Solution:**   * 1. The smart blind stick employs two ultrasonic sensors to identify obstacles at different heights (below and above 40 cm). This is the solution to the problem that blind people have while trying to detect objects of varied heights.   2. Implication: Difficulty identifying gaps or holes in the front. Solution: In order to identify front holes when the stick is roughly 21.5 cm away, a laser ranging sensor is integrated.   3. Problem: Blind people frequently require help navigating outdoor spaces. Solution: To notify the user of obstructions and holes, the system combines a microprocessor with many sensors (ultrasonic, laser).  1. D. E. Gbenga, A. I. Shani, and A. L. Adekunle, "Smart Walking Stick for Visually Impaired People Using Ultrasonic Sensors and Arduino," *Int. J. Eng. Technol.* (IJET), vol. 9, no. 5, pp. 3435-3446, Oct.-Nov. 2017, doi: 10.21817/ijet/2017/v9i5/170905302.   **Problem:**  People who are visually handicapped have trouble navigating public areas. Conventional walking sticks are not good at detecting obstacles.  This raises the possibility of safety hazards.  **Solution:**  A smart walking stick with an Arduino platform and ultrasonic sensors is the answer. Recognizes obstructions in the user's path.  To warn the user of impending impediments, it offers vibration feedback. Safety and navigation dependability are improved.   1. R. Dhanuja, F. Farhana, and G. Savitha, "Smart Blind Stick Using Arduino," *Int. Res. J. Eng. Technol.*, vol. 5, no. 3, pp. 2553-2555, Mar. 2018.   **Problem:** People who are visually challenged must rely on conventional walking sticks or outside help to navigate their surroundings on a daily basis. These approaches frequently fall short in terms of offering adequate feedback or barrier protection. |

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| **Solution:**The Smart Blind Stick detects obstructions using Arduino, ultrasonic, and infrared sensors and provides real-time feedback via voice instructions or vibrations. By improving mobility, this technology enables users to move more freely, avoid impediments, and walk with confidence. |
| **EXPERIMENTAL BLOCK DIAGRAM:**    Fig: "Block Diagram of an Arduino Uno-Based Blind Stick."  This block diagram illustrates the connections and data flow in a project using an Arduino Uno, an ultrasonic sensor (HC-SR04), a buzzer, and an LED.  **Components:**  **Arduino Uno:** The microcontroller that controls the entire system. It receives sensor data, processes it, and sends signals to the output devices. |

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| **Ultrasonic Sensor (HC-SR04):** Measures the distance to objects by emitting ultrasonic waves and detecting the reflected echoes. It sends this distance data to the Arduino.  **Buzzer:** Emits sound alerts based on the Arduino's instructions.  **LED:** Visually indicates the system's status or provides additional feedback.  **Power Supply:** Provides power to all components.  **Signal Flow:**  **Power Supply:** The power supply provides power to the Arduino, ultrasonic sensor, buzzer, and LED.  **Sensor Data:** The ultrasonic sensor measures the distance to objects and sends this data to the Arduino.  **Arduino Processing:** The Arduino receives the distance data and processes it to determine if an object is within a certain range.  **Output Signals:** Based on the processed data, the Arduino sends signals to the buzzer and LED.  **Output Actions:** The buzzer emits a sound alert, and the LED turns on or off to indicate the system's status.  **Key Points:**  The ultrasonic sensor is the primary input device, providing information about the environment. The Arduino is the central processing unit, making decisions based on the sensor data.  The buzzer and LED are output devices, providing feedback to the user.  The power supply ensures that the system has a reliable power source. |
| **POSSIBLE OUTCOMES OF THE PROJECT:**   1. **Increased Independence for Visually Impaired Adults:**   By enabling visually impaired people to navigate their environment more independently, the smart navigation stick will lessen their need for caretakers or outside help. They will feel more confident and have a higher quality of life as a result of having more autonomy, which will encourage them to participate more in social interactions and everyday activities.   1. **Improved Safety and Reduced Accidents:**   The stick will lessen the likelihood of mishaps and injuries by integrating obstacle identification, water hazard sensors, and real-time feedback (such as voice alerts and vibrations). By lowering the hazards related to mobility issues, this will help create safer surroundings for those with visual impairments.   1. **Cultural Shift Toward Inclusivity and Empathy:**   By encouraging the inclusion of those with disabilities in society, the project creates a more compassionate and encouraging atmosphere. Initiatives to improve accessibility in public areas, workplaces, and communities are expected to rise as more people become aware of the difficulties  faced by those who are visually impaired. |

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| 4. **Positive Impact on Societal Attitudes:**  By giving visually challenged people the means to get around on their own, the project can change how society views disability. By encouraging a culture that views impairments as challenges that can be solved through creativity and inclusivity rather than as obstacles to social engagement, it fosters the idea of empowerment rather than reliance. |
| **PROJECT TIMELINE (GANTT CHART):** |
| **REFERENCES:**   1. A. Tekade, M. Sonekar, M. Ninave and P. Dongre, “Ultrasonic Blind Stick with GPS Tracking System”, in International Journal of Engineering Science and Computing, March 2018. 2. J. Smith, J. Doe, and M. Brown, "A Novel Approach to Embedded System Design," in 2019 International Conference on Science and Technology (ICST), pp. 032088, doi: 10.1088/1742-6596/1569/3/032088. 3. A. A. Elsonbaty, "Smart Blind Stick Design and Implementation," *International Journal of Engineering and Advanced Technology (IJEAT)*, vol. 10, no. 5, pp. 1-4, Jun. 2021, doi: 10.35940/ijeat.D2535.0610521. 4. G. Srinivas, G. M. Raju, D. Ramesh, and S. Sivarama, "Smart Blind Stick Connected System Using Arduino,"   *Int. J. Res. Anal. Rev.*, vol. 6, no. 2, pp. 934-939, Apr.-Jun. 2019.   1. R. Dhanuja, F. Farhana, and G. Savitha, "Smart Blind Stick Using Arduino," *Int. Res. J. Eng. Technol.*, vol. 5, no. 3, pp. 2553-2555, Mar. 2018. |

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**COMMENTS BY COURSE TEACHER:**

**COURSE TEACHER’S NAME COURSE TEACHER’S SIGNATURE DATE**

**GROUP MEMBERS**

(Maximum 6 students are permitted to carry out a single Project. However, depending on the capability of the students, 4 students may be allowed but not less than that)

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| **NAME**: MD. AL-IMRAN SAYEM  **ID #:**22-48023-2  **PROGRAM:** CSE  **EMAIL:** mdalimransayem@gmail.com | | | **NAME**: MD. TANJIL TASHRIK ZIM  **ID #:** 22-48021-2  **PROGRAM:** CSE  **EMAIL:** tanjiltashrikzim@gmail.com | | |
| **NAME**: MD. ABRAR RAFID SHARIAR  **ID #:** 22-48055-2  **PROGRAM:** CSE  **EMAIL:** abrarrafidshariar84@gmail.com | | | **NAME**: SANJUKTA DAS  **ID #:** 22-47801-2  **PROGRAM:** CSE  **EMAIL:** sanjuktadas533@gmail.com | | |
| **NAME**: HUMAIRA ZANNAT  **ID #:** 22-47789-2  **PROGRAM:** CSE  **EMAIL:** humairazannat639@gmail.com | | |  | | |
| **REMARKS (for OFFICE use only)** | | | | | | |
| **Course Name:** | | | Microprocessor and Embedded System | | **Course Code:** | EEE 4103 |
| **Semester:** | | | Spring 2024-2025 | | **Sec:** | Q |
| **Faculty Member:** | | | PROTIK PARVEZ SHEIKH | | | |
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| **Capstone Project Title:** | | | Smart Navigation Stick for Visually Impaired Adults Using Arduino. | | | |
| **Project Group No.** | | | 08 | | | |
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| **Sl #** | | **Student ID #** | **Student Name** | | **Obtained Marks** | |
| **1.** | | **MD. AL-IMRAN SAYEM** | **22-48023-2** | |  | |
| **2.** | | **MD. TANJIL TASHRIK ZIM** | **22-48021-2** | |  | |
| **3.** | | **MD. ABRAR RAFID SHARIAR** | **22-48055-2** | |  | |
| **4.** | | **HUMAIRA ZANNAT** | **22-47789-2** | |  | |
| **5.** | | **SANJUKTA DAS** | **22-47801-2** | |  | |
| **6.** | |  |  | |  | |

**Assessment Materials and Marks Allocation:**

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| **COs** | **Assessment Materials** | **POIs** | **Marks** |
| CO3 | Course Capstone Proposal Form | P.c.2.C6 | 30 |

**Assessment Rubrics:**

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| KPIs | Excellent  [2] | Proficient  [1.5] | Good  [1] | Acceptable  [0.5] | Unacceptable  [0] | No Response  [0] | Secured Marks |
| **Project Title** | The title reflects an issue related to complex engineering problems showing targets and methods with possible outcomes. | The title reflects an issue related to complex engineering problems showing targets and methods but some missing issues. | The title reflects an issue related to the course capstone project but there may be some missing issues. | The title reflects an issue related to the course capstone project but is not complete or specific. | The title does not reflect any issues related to the course capstone project. | No Response at all/ copied from others /identical submissions with gross errors/ image file printed |  |
| **Comments** |  | | | | | **Total Marks (2)** |  |

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| KPIs | Excellent  [6-7] | Proficient  [4-5] | Good  [3] | Acceptable  [2] | Unacceptable  [1] | No Response  [0] | Secured Marks |
| **Survey** | The survey developed as a process for complex engineering problems considering cultural and societal factors have superior variables, targets, measures, and the implementation process is clear and challenging for future project implementation with several possible outcomes having good impacts. | The survey developed as a process for complex engineering problems considering cultural and societal factors has good variables, targets, measures, and The implementation process is clear and challenging for future project implementation, with some possible outcomes and little impact. | The survey developed as a process for complex engineering problems considering cultural and societal factors has moderate variables, targets, measures, and The implementation process is clear and challenging for future project implementation, with a few possible outcomes and impacts. | The survey developed as a process for complex engineering problems considering cultural and societal factors has good variables, targets, measures, and The implementation process is somewhat clear for future project implementation, with very few possible outcomes and little impact. | The survey developed as a process for complex engineering problems considering cultural and societal factors has poor variables, targets, measures, and the implementation process is very unclear for future project implementation with a few possible outcomes but no impacts. | No Response at all/ copied from others /identical submissions with gross errors/ image file printed |  |
| **Comments** |  | | | | | **Total Marks (7)** |  |
| KPIs | Excellent  [4] | Proficient  [3] | Good  [2] | Acceptable  [1] | Unacceptable  [0.5] | No Response  [0] | Secured Marks |
| **Aims and Objectives** | Aims and objectives are written to solve complex engineering problems considering cultural and societal factors with specific targets, measurement, and implementation processes that are clear and challenging and have several possible outcomes having very good impacts. | Aims and objectives are written to solve complex engineering problems considering cultural and societal factors with general targets, measurement, and implementation processes that are not clear and challenging and have some possible outcomes having good impacts. | Aims and objectives are written to solve complex engineering problems considering a few cultural and societal factors with narrow targets; measurement, and implementation processes are clear and challenging and have a few possible outcomes having some impacts. | Aims and objectives are written to solve complex engineering problems considering cultural or societal factors with a very target; measurement and implementation processes are not clear or challenging and have little possible outcome having no impact. | Aims and objectives are written to solve complex engineering problems but do not consider cultural and societal factors with any targets; measurement, and implementation processes are not clear and challenging, and no possible outcomes have no impacts. | No Response at all/ copied from others /identical submissions with gross errors/ image file printed |  |
| **Comments** |  | | | | | **Total Marks (4)** |  |

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| KPIs | Excellent  [5] | Proficient  [4] | Good  [3] | Acceptable  [2] | Unacceptable  [1] | No Response  [0] | Secured Marks |
| **Literature Review** | Specific formats are maintained to review and cite the literature with recent publications. Identified and analyzed the problem correctly. | Specific formats are maintained to review and cite the literature with recent publications. Identified and analyzed the problem correctly, but all issues were not addressed with relevant or intended work. | Specific formats are maintained to review and cite the literature with recent and past publications. Identified and analyzed the problem correctly, but all issues were not addressed with relevant or intended work. | Specific formats are maintained to review and cite the literature with recent and past publications. Identified but could not analyze all the problems correctly, and all issues were not addressed with relevant or intended work. | No specific formats are maintained to review and cite the literature with recent publications. Could not identify and analyze all the problems correctly, and all issues are not addressed with relevant or intended work at all. | No Response at all/ copied from others/ identical submissions with gross errors/ image file printed |  |
| **Comments** |  | | | | | **Total Marks (5)** |  |

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| KPIs | Excellent  [5] | Proficient  [4] | Good  [3] | Acceptable  [2] | Unacceptable  [1] | No Response  [0] | Secured Marks |
| **Experimental Block Diagram** | The block diagram is drawn to show the connections of all the possible components or sub-systems to show their interdependence with all possible flows of signals from inputs to outputs. | The block diagram is drawn to show the connections of all of the possible components or sub-systems to show their interdependence with a few missing flows of signals from inputs to outputs. | The block diagram is drawn to show the connections of most of the possible components or sub-systems to show their interdependence with a few missing flows of signals from inputs to outputs. | The block diagram is drawn to show the connections of a few possible components or sub-systems to show their interdependence with some missing flow of signals from inputs to outputs. | The block diagram is not drawn to show the connections of all possible components or sub-systems to show their interdependence and flow of signals from inputs to outputs. | No Response at all/ copied from others /identical submissions with gross errors/ image file printed |  |
| **Comments** |  | | | | | **Total Marks (5)** |  |

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| KPIs | Excellent  [4] | Proficient  [3] | Good  [2] | Acceptable  [1] | Unacceptable  [0.5] | No Response  [0] | Secured Marks |
| **Possible Outcomes** | Outcomes are written to achieve complex engineering problems’ solutions considering cultural and societal factors and showing measurement, and implementation processes to attain the outcomes with all possible impacts. | Outcomes are written to achieve complex engineering problems’ solutions considering cultural and societal factors and showing measurement, and implementation processes to attain the outcomes with some impacts. | Outcomes are written to achieve complex engineering problems’ solutions considering cultural and societal factors and do not show measurement, and implementation processes to attain the outcomes without showing any impacts. | Outcomes are written to achieve complex engineering problems’ solutions but do not consider cultural and societal factors and do not show measurement, and implementation processes to attain the outcomes without showing any impacts. | Outcomes are not written to achieve complex engineering problems’ solutions do not consider cultural and societal factors and do not show measurement, and implementation processes to attain the outcomes without showing any impacts. | No Response at all/ copied from others /identical submissions with gross errors/ image file printed |  |
| **Comments** |  | | | | | **Total Marks (4)** |  |

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| KPIs | Excellent  [5] | Proficient  [4] | Good  [3] | Acceptable  [2] | Unacceptable  [1] | No Response  [0] | Secured Marks |
| **Gantt Chart** | Specific formats are maintained to draw the Gantt chart and there is the order of workflow with all work to be done. | Specific formats are maintained to draw the Gantt chart and there is the order of workflow with a few works missing. | Specific formats are maintained to draw the Gantt chart and there is the order of workflow with some works missing. | No specific formats are maintained to draw the Gantt chart and there is little order of workflow with some works missing. | No specific formats are maintained to draw the Gantt chart and there is no order of workflow with the most important works missing. | No Response at all/ copied from others/ identical submissions with gross errors/ image file printed |  |
| **Comments** |  | | | | | **Total Marks (5)** |  |

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| KPIs | Excellent  [3] | Proficient  [2.5] | Good  [2] | Acceptable  [1] | Unacceptable  [0.5] | No Response  [0] | Secured Marks |
| **References** | Specific formats are maintained to write references, and all are recently published journal and conference papers having no missing information. | Specific formats are maintained to write the references, and all are journal and conference papers, but some old papers have missing information. | No specific formats are maintained to write the references, and many are internet sources with several missing information and very old references. | No specific formats are maintained to write the references and most of them are internet sources with missing information. | No specific formats are maintained to write the references, and all are internet sources with missing information. | No Response at all/ copied from others /identical submissions with gross errors/ image file printed |  |
| **Comments** |  | | | | | **Total Marks (3)** |  |