APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

CET campus, Thiruvananthapuram - 695 016
Ph: 0471 2598122; Fax: 2598522 www. ktu.edu.in Email: university@ktu.edu.in

No. KTU/RESEARCH5/2967/2024 Dated: 02.08.2024

From

The DEAN (Research)

To

The Principals of affiliated colleges

Sir/Madam

Sub:- Research - Scheme of Financial Assistance to Student Projects-2024-'25 - Application Invited -Intimation- Reg:-

Ref:- U.O No.794/2024//KTU dated 18.03.2024

APJ Abdul Kalam Technological University invites proposals for financial assistance to innovative projects by Undergraduate students of Government, Aided and Government-controlled/Private self financing colleges, under the scheme of the Centre for Engineering Research and Development (CERD). This scheme aims to provide financial assistance to Undergraduate student groups of 7th-semester B.Tech/B.Des/BHMCT and 9th- semester B.Arch of affiliated Colleges under APJ Abdul Kalam Technological University.

Based on the proposal's merits, each project will be eligible for a maximum assistance of Rs 50,000/-.

Evaluation of the project proposals received in the Institutions shall be conducted by a committee appointed by the Head of the institution, based on feasibility and relevance, before forwarding it to the University. A maximum of 5 projects shall be shortlisted by the committee. Details of the project proposals shall be submitted through the Google form sent to the institutional email ID. No individual applications will be entertained.

The details of the scheme and Application format are available in the University website **www.ktu.edu.in**. I request you to give wide publicity for the scheme among the students of your institution and motivate them to undertake innovative projects. The last date for receipt of proposals is 28.08.2024**.**

Yours faithfully Dr.
VINU THOMAS *
DEAN (Research)

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

College of Engineering Trivandrum Campus
Thiruvananthapuram - Pin 695 016.

APPLICATION FORMAT FOR STUDENT PROJECT

SECTION A: GENERAL INFORMATION

1. **Details of the Principal Investigator**
   Name : Dr. Sonal Ayyappan
   Designation : Associate Professor & HOD
   Department : Artificial Intelligence and Data Science
   Phone no : 9447747061
   email id : sonal@scmsgroup.org
2. **Name of the Co-Investigator**
   Name : Ms. Asha S
   Designation : Asst. Professor
   Department : Computer Science & Engineering (Data Science)
   Phone no : 8015255389
   email id : asha@scmsgroup.org
3. **Name(s) of Student investigators:**
   Jeremy Joseph (SCM21CD031)
   Mohammad Bilal (SCM21CD037)
   P P Durga (SCM21CD043)
   Raj Surya V (SCM21CD044)
   Semester: Seven
   Branch: Computer Science & Engineering (Data Science)
4. **Address of the Institution with college code** :SCMS School of Engineering & Technology, Vidya Nagar, Karukutty, Ernakulam-686513
   College Code - SCM
5. **Category of Institute** : Private

Govt.	Aided	Govt. Controlled	Autonomous	Private

6. **Title of the project proposal:** Companion Robot
7. **Objectives of the proposed project:**
   a.Develop a desktop companion robot capable of real-time emotion display, voice recognition, and interaction.
   b.Integrate the robot with IoT devices for smart home control.
   c.Implement features like task management, face recognition, and intruder alerts for enhanced functionality.
   d.Ensure smooth operation and seamless interaction between hardware and software components.
   e.Provide an engaging and efficient user experience with gesture-based interactions and human-like emotional responses.

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Terms and Conditions

1. The scheme is constituted for the purpose of providing assistance in the form of grants to students for scientific project work with particular relevance to the State of Kerala in economic and industrial development.
2. The grant will be reimbursed to the principal investigator after the completion of the project through the Head of the institution.
3. The maximum duration of the project will be one year from the date of the start of the project.
4. On completion of the project, one copy of the final project report on the work done should be sent to the University along with the utilization certificate (UC), certified bills, bill wise statement and statement of expenditure (SE).
5. The institute shall maintain separate audited accounts for the project.
6. The institute shall not entrust the implementation of the work for which the grant is being sanctioned to another institution nor shall divert the grant receipts to other institutes as assistance.
7. The University reserves the right to terminate the project at any stage if it is convinced that the grant has not been properly utilized or appropriate progress is not being made. In addition, the University may designate a Scientist/Specialist or an Expert Panel to review the work done.
8. If the PI to whom the project has been sanctioned leaves the Institution, the Head of the Institution/PI shall inform the same to University and in consultation with the University, evolve steps to ensure the successful completion of the project, before relieving the PI.
9. Investigators must acknowledge the University in reports and technical/scientific papers published based on the work done under the project. Investigators are requested to publish papers emerging out of the project work in leading Journals.
10. If the results of project work are to be legally protected by way of patents/copyrights etc. the results should not be published without action being taken to secure legal protection for the project results.
11. The knowledge generated from the project will be the property of the University and should be properly acknowledged. Transfer of technology generated shall be done in consultation with the University.
12. For Private self financing Colleges, 50% of the actual Equipment cost subjected to the maximum of sanctioned amount will be reimbursed by KTU if and only if the proof of remittance of the other 50% is produced by the college.
13. Equipment details must be entered in the stock register of the college and signed by the Investigator, Lab in charge and Principal.
14. The University may enforce additional guidelines for the operation of the student project from time to time and the Institution/Investigators are required to observe such directions in the conduct of the project work.

We agree to the terms and conditions stated above.

Name & Signature of Principal Investigator	Name & Signature of Prof-in-charge, Satellite Centre	Name & Signature of Head of Institution

(Office Seal)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

College of Engineering Trivandrum Campus

Thiruvananthapuram - Pin 695 016.

APPLICATION FORMAT FOR STUDENT PROJECT

SECTION B: TECHNICAL DETAILS

1.
   a) **Title of the Project Proposal:** Companion Robot
   b) **Branch / Subject area**: Computer Science & Engineering (Data Science)
   c) **Project Type** : Others
   d) **Expected scope/outcome**: Prototype

2. **Precise objective (150 words):** The main goal of this project is to design and develop a multifunctional desktop companion robot that integrates artificial intelligence, robotics and IoT technologies to create an interactive and user-friendly assistant that will be able to display a range of emotional expressions on an OLED screen, recognize and respond to voice commands, and perform various tasks such as calendar management, note-taking, setting alarms, etc. Additionally, the robot is equipped with facial recognition and motion detection cameras to improve home security by sending alerts in case of intrusion. The robot also has the ability to control smart home devices via IoT connectivity and control music playback via Bluetooth, acting as a centralized control center for the user's personal needs and home automation. The purpose of this project is to ensure transparent integration of all hardware and software components, provide calm migration between functions, and provide reliable and attractive user experience.

   Abstract (400 words): The growing demand for the automation of intellectuals and the personal assistant's device opened the way to develop multifunctional friends. This project aims to create a universal and interactive experience by creating an office companion robot incorporating artificial intelligence (AI), robot engineering, and things Internet (IoT). The robot is designed to perform a wide range of tasks, including managing daily schedules, controlling smart home devices and providing entertainment, all while maintaining an engaging and emotive interface. At the heart of the robot is the Raspberry Pi 5, a powerful microprocessor that acts as the brains of the device, responsible for data processing, communication and peripheral control. The robot will be equipped with an OLED screen and will be able to display a range of emotions, enabling more human-like interaction.

   These emotions can be triggered based on user commands or environmental stimuli, allowing the robot to sensitively adapt to its environment. The screen also displays important information such as the date, time, weather forecast, etc. Speech recognition and speech synthesis are key features of the robot, allowing it to understand and respond to user commands. Thanks to the treatment of natural languages, robots can perform tasks, such as establishing a reminder, taking notes, and controlling the calendar. This vocal interactive capacity is complemented by a camera system that supports human recognition, and the robot can identify

the user and configure the answer accordingly.

In addition, the camera is used to detect movement, improve the safety of the robot, and warn users for nearby abnormal activities. The robot is also equipped with several servo motors to provide simple gestures by adding physical measurement to interactive abilities. These gestures, combined with the ability to rotate on the robot's base, make the robot more expressive and interesting. Additionally, the robot is equipped with an IR blaster and Bluetooth module for controlling various home appliances and media devices, giving users more convenient control over their environment.

The project will be implemented in two phases over 10 months. The first phase will focus on hardware design, component integration and basic functionality testing. The second phase will include software development, AI training and integration of advanced features such as IoT control and facial recognition. The ultimate goal is to deliver a fully functional prototype that demonstrates the potential of companion robots to improve quality of life by providing assistance, entertainment and improving home security. This project is expected to result in a robust and versatile product prototype that can be further developed into a marketable consumer device. Integrating AI and IoT into a single, user-friendly platform will demonstrate the power of modern technology to create intelligent, interactive systems that seamlessly integrate into everyday life.

3. **Methodology including the project design and plan of work:** The methodology of this project contains a structured approach that conforms to IoT devices and starts with the concept of attached robots and design that provides various interactive functions. The project is divided into two stages. The first phase focuses on the raspberry pi 5 assembly, OLED display, servo motor, Bluetooth, Wi-Fi module, USB camera, and other peripheral devices, etc. At the same time, software development will be carried out for emotion display, speech recognition and basic IoT control. The second phase will focus on refining the robot's functionality, improving the emotion display system, integrating advanced features such as facial recognition, intrusion alerts and task management, and ensuring seamless interaction between hardware and software components. Testing and iterations will be conducted throughout both phases with a focus on user experience, stability, and seamless integration of all components. The final stage will involve user testing and optimization for real-world usage.

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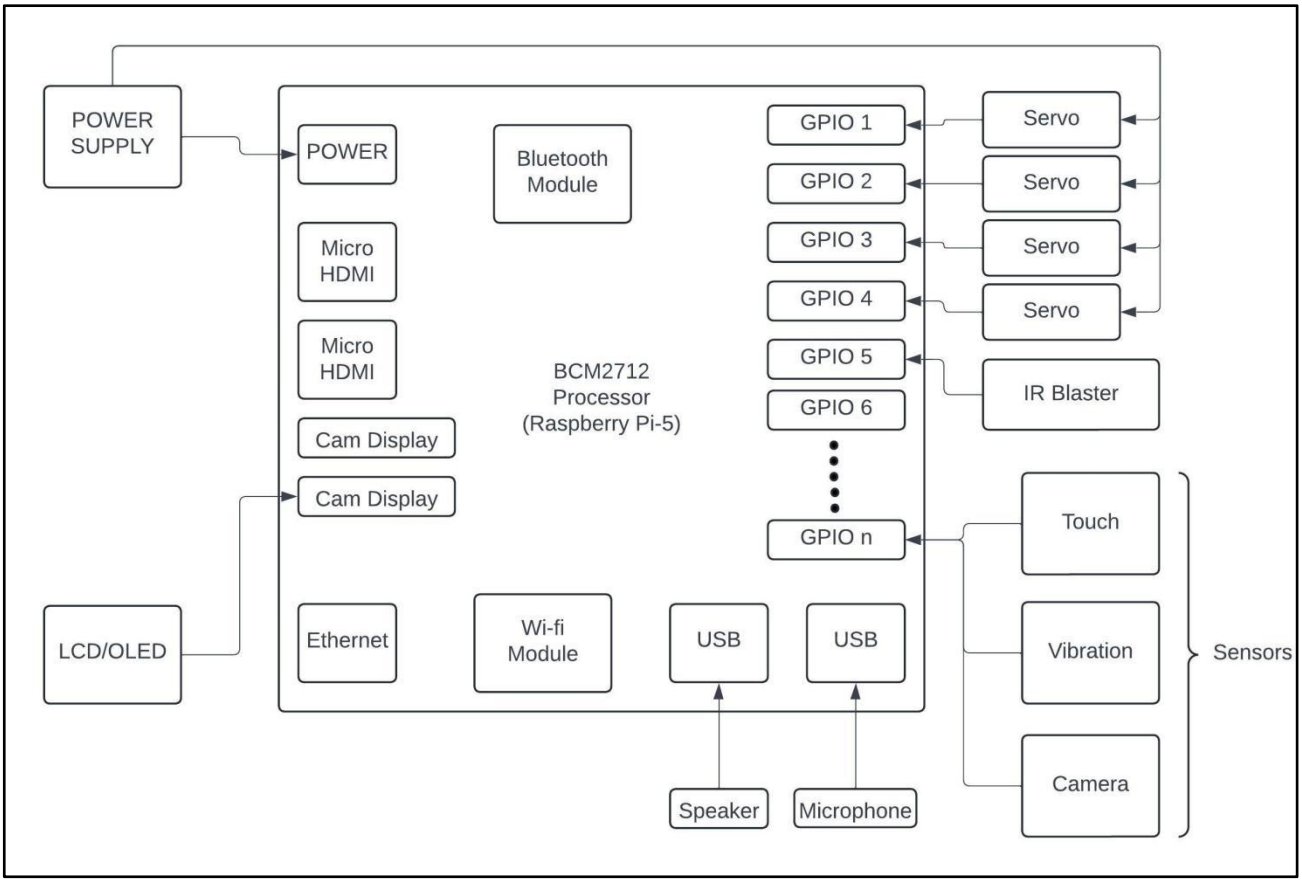

Figure 1.1 – Block Diagram

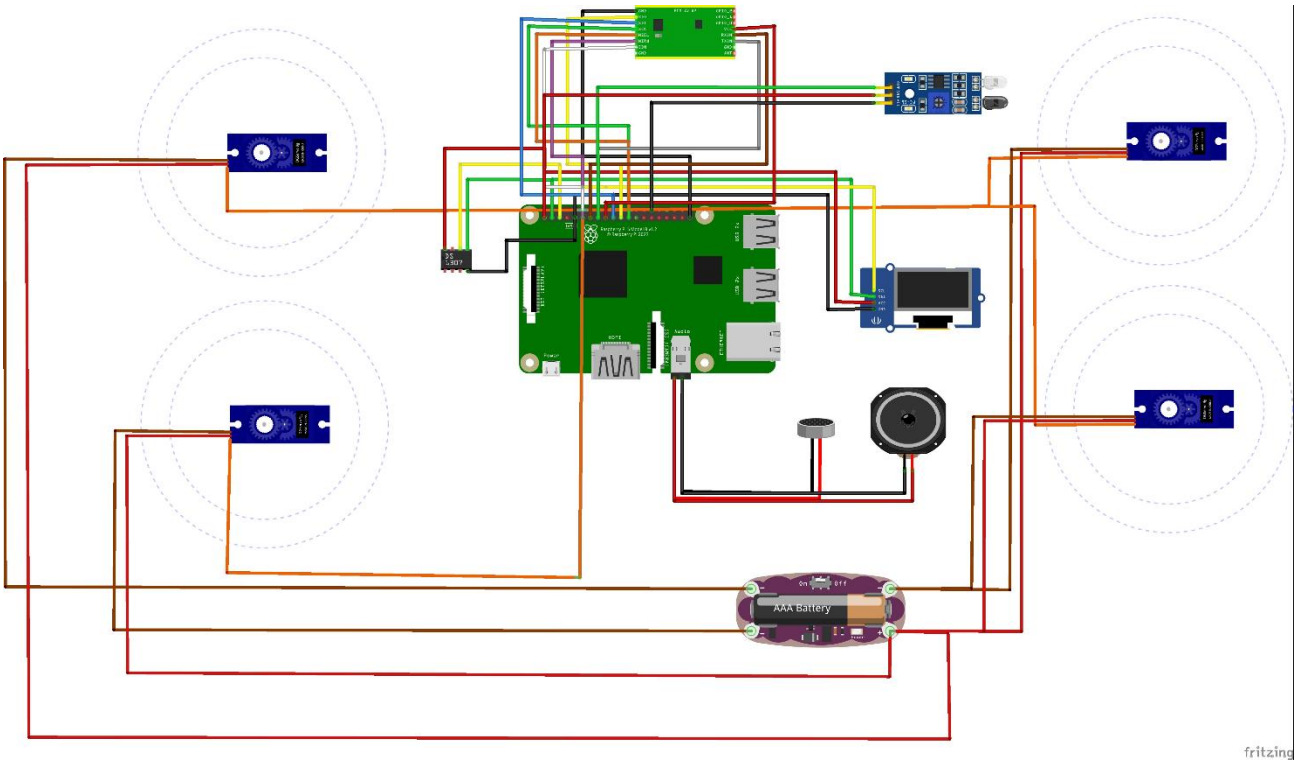

Figure 1.2 – Circuit Diagram

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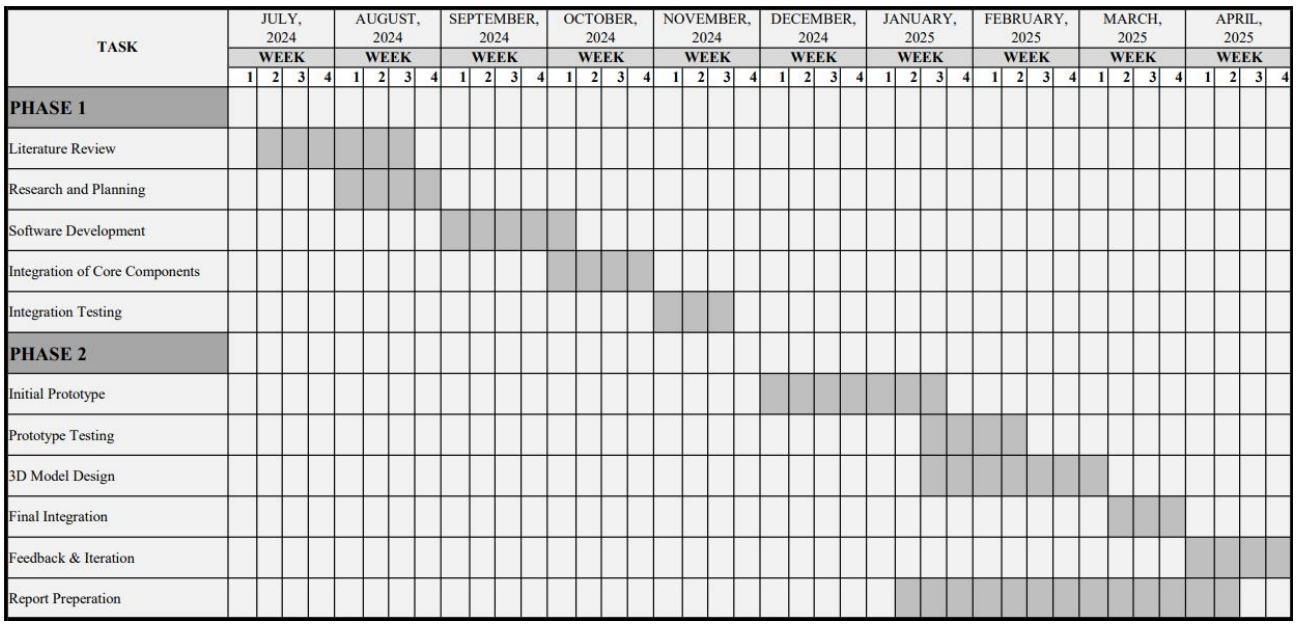

Figure 1.3 - Timeline

Application /importance in the socioeconomic context: The development of multifunctional companion robots has great potential to address both individual needs and those of the broader society in a socio-economic context. As smart homes become increasingly popular, robots will act as integrated hubs to manage everyday tasks, increase convenience and improve quality of life. Robots, which include transparent control for home automation systems, support more efficient and associated lifestyles, reducing the time and effort required for daily actions.

In addition, the ability of robots to provide emotional communication and interaction is a valuable tool for the elderly and those living alone. Its security features such as motion detection and real-time alerts promote home security, which is essential in an era of increasing security concerns. Overall, this project is part of the global trend towards smarter, safer and more connected living environments, providing practical benefits and improving the human experience.

4. **Particulars of equipment required:**

1. Raspberry Pi 5
2. OLED Display
3. Servomotors (x4)
4. Mounting and Housing Components
5. Various Connectors and Cables
6. USB Camera with Privacy Shutter
7. IR Blaster
8. Speakers
9. Microphone
10. Touch Sensor
11. Vibration Motor
12. Power Supply
13. 3D Printed Body

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5. **Particulars of any other facilities required:** 3D Printer

6. **Particulars of the facilities that will be provided by the institution wherethis project will be implemented:** Fab Lab

7. **Whether the scheme was submitted to any other organization for financialsupport, if so, the names of the institutions and their decisions may be indicated:** N/A

8. **Budget Details**: Estimated expenditure

Sl No	Items	Amount (Rs)
1	Consumables – include the list of consumables which cost more than Rs. 1000/- **(Do not exceed 20% of the total amount)**	6000
2	Equipment – Include the list of equipment (For Private self financing Colleges, 50% of the actual Equipment cost subject to the maximum of sanctioned amount shall be borne by the college)	18000
3	Travel **(Do not exceed 10% of the total amount)**	3000
4	Contingency **(Do not exceed 10% of the total amount)**	3000
	Total	30000

Place:
Date:

Signature of Principal Investigator:
Name, Address & Telephone No

Address:

Office Seal

Dean Research,
APJ Abdul Kalam Technological University,
College of Engineering Trivandrum Campus,
Thiruvananthapuram -Pin 695 016.

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Annexure II

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Terms & Conditions for Financial Assistance to Student Projects

1. The amount has to be utilized as per budget provision under each head.

2. The purchase of equipment shall be in accordance with the store purchase rules. All equipment purchased will be the property of the University and the stock entry of the items purchased shall be maintained in the College. Purchase of computers/peripherals is not allowed unless specifically mentioned in the sanction order.

3. The stock entries of consumables purchased shall also be done in the consumables stock register of the College. Purchase of stationery shall be for project purposes only. Printing charges for multiple copies of the project report will not be admissible.

4. The maximum duration of the project is one year from the date of sanction. It is the discretion of the University to settle the amount towards the purchase of those items not clearly mentioned, if any, in the project proposal.

5. On completion of the project, a detailed report of the research work, audited statement of accounts Utilization Certificate and Expenditure Statement in the prescribed format duly attested by the head of the institution along with original bills towards expenditure incurred with payment certificate of the Principal Investigator shall be submitted within one month of completion of the project for reimbursement of expenditure. The Bank Account details of the Principal shall be submitted along with the request for reimbursement. Requests for reimbursement shall not be considered after the date of submission of documents as above.

6. For reimbursement of expenses under the head **Travel**, Train tickets/Bus tickets/Taxi receipts, in original,affixing payment certificate of the Principal Investigator specifying the purpose of travel with actual distance of journeyand fare shall be submitted.

7. On all publications resulting from the finding of the research/project, due acknowledgement shall be given to the University.

8. Books or literature purchased, if any, should be taken into the Stock Register of the Central Library or Department Library and then distributed to the investigators.

9. The expenditure under the head **Others** is admissible as per the budget proposed. All other expenditure has to be included in the head Contingencies.

Title of Project

Signature of Principal Investigator:

Name:

Office address:

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

CENTRE FOR ENGINEERING RESEARCH AND DEVELOPMENT

College of Engineering Trivandrum

Campus Thiruvananthapuram - Pin 695 016.

FINANCIAL ASSISTANCE FOR STUDENT PROJECT

Introduction

The objective of this scheme is to provide financial assistance to the students of Engineering Colleges affiliated with KTU for the conduct of Scientific Projects.

Eligibility (who can apply)

Any faculty who is currently working in Government Engineering Colleges / Government Aided Colleges and Government Controlled Colleges in Kerala and desirous of guiding a group 7th or higher semester B.Tech/BDes/BHMCT and 9th or higher semester B.Arch Students for a Project can apply for financial assistance under this scheme. Faculty with three years of experience, working in KTU affiliated private self financing colleges are also considered for funding.

Guidelines

1. The application for financial assistance in the prescribed format should be submitted through the google form sent to the institutional email id. No individual applications will be entertained.
2. The students are requested to submit a brief proposal in the “Prescribed Format” to enable the scrutinizing and sanctioning of proposals for funding by the committee.
3. Item wise financial estimates should be mentioned clearly in the proposal submitted, showing rates, quantity and total for each item.

Rules

1. These rules may be called the 'Rules for grant of financial assistance to student projects of scientific, technological and environmental importance, conducted in the State'.

2. Under these rules financial assistance will be granted to the students of 7th or higher semester B.Tech/B.Des/BHMCT and 9th or higher semester B.Arch Students of KTU affiliated Engineering Colleges in Kerala for conducting scientific research projects.

3. Financial assistance is limited to specific items of expenditure or to cover a part of the expenditure on the whole function.

4. Funding Norms

   a. Student projects will be eligible for a maximum of Rs.50, 000/-. These should be forwarded by the guide through the College Principal.
   b. Subject to the availability of funds, the proposal for financial assistance will be screened and approved by the duly constituted committee, which will subsequently be sanctioned by the APJ Abdul Kalam Technological University.
   c. Financial assistance will be reimbursed to the principal investigator through the Principal of the concerned institution.
   d. The final report, statement of expenditure and utilization certificate shall be submitted after successful completion of the project.
   e. Utilization certificate and Statement of expenditure shall be furnished to The Dean Research, APJ Abdul Kalam Technological University, within three months from the last day of the programme. The accounts should be audited by the accounts officer of the institution / Chartered Accountant.
   f. The APJ Abdul Kalam Technological University reserves the right to order verification/audit of accounts by any Officer authorized by it and is open to audit by the Accountant General. The Accounts shall be kept safely for a minimum period of three years.
   g. The recipient organization shall comply, with such other conditions as may be suggested in the 'guidelines' issued in this regard from time to time.
   h. The private self financing Colleges will be considered for funding.
   i. No equipment head will be allowed in research funding to private self financing colleges. In special situations, based on recommendations of the expert committee, 50% of equipment cost will be reimbursed if and only if the other 50% is shared by the College.