APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

**CENTRE FOR ENGINEERING RESEARCH AND DEVELOPMENT**

**College of Engineering Trivandrum Campus**

**Thiruvananthapuram. Pin 695 016**

**STUDENT PROJECT**

|  |  |  |
| --- | --- | --- |
| Name of the Principal Investigator  (Faculty who is guiding the project) | : | Prof. Athira Prasad |
| Phone no | : | 9446606002 |
| Email id | : | Athiraprasad09@gmail.com |
| Name of the Co-Investigator  (Faculty who is co-guiding the project) | : | NIL |
| Phone no | : | NIL |
| Email id | : | NIL |
| Address of the Institution | : | Mar Athanasius College of Engineering  Kothamangalam, Ernakulam, Kerala,  Pin:686666. |
| Title of the project proposal | : | IOT and PLC based smart home system with PV inverter and blockchain based energy trading. |
| Name(s) of Student investigators | : | 1. Mathew Varghese 2. Ameer Fayiz Kaithakath |
| Semester | : | Seven |
| Branch | : | Electronics and communication Engineering |
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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 research work with particular relevance to the State of Kerala in the economic and industrial development.
2. Grant will be released 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 start of the project.
4. This date of start of the project should be intimated by the Institution authorities/Principal Investigator to CERD. It will, in no case be later than one month after the receipt of the information letter.
5. On completion of the project, 3 copies of the final project report on the work done should be sent to the Council along with the utilization certificate (UC) and statement of expenditure (SE). The Utilization Certificate and Statement of Expenditure should be countersigned by the HOI in the case of Government Institution and should be audited by a chartered accountant in the case of private colleges. The copy of the relevant pages of the Bank pass book should also attached along with the documents for settlement.
6. The institute will maintain separate audited accounts for the project.
7. The institute will not entrust the implementation of the work for which the grant is being sanctioned to another institution nor will it divert the grant receipts to other institute as assistance.
8. The CERD 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 Council may designate Scientist/Specialist or an Expert Panel to review the work done.
9. If the PI to whom the project has been sanctioned wishes to leave the Institution where the project is based, the Institute/PI will inform the same to the Council and in consultation with Council, evolve steps to ensure successful completion of the project, before relieving the PI.
10. Investigators must acknowledge the Council in reports and technical/scientific papers publishing based on the research work done under the project. Investigators are requested to publish some of the research papers emerging out of the project work in leading Indian Journals.
11. If the results of research are to be legally protected by way of patent/copy rights etc. the results should not be published without action being taken to secure legal protection for the research results.
12. The knowledge generated from the project will be the property of CERD and should be properly acknowledged. Transfer to technology generated shall be done in consultation with the CERD.
13. The CERD 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 research work.
14. Equipment head will not be allowed in research funding to private self financing colleges. In special situations, based on recommendations of expert committee, 50% of equipment cost will be reimbursed if and only if the other 50% is shared by the College

We agree to the terms and conditions stated above.

Name & Signature of Name & Signature of Name & Signature of

Principal Investigator Prof-in-charge, Head of Institution

Satellite Centre

(Office Seal)

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APPLICATION FOR GRANT FOR STUDENT PROJECT

|  |  |  |  |
| --- | --- | --- | --- |
| 1. |  |  |  |
| (a) | Title of the Research Proposal | : | IOT and PLC based smart home system with PV inverter and blockchain based energy trading |
| (b) | Broad area/field of classification | : | Consumer Electronics |
| (c) | Project Type(s) (Basic Research/Applied Research/Developmental/Demonstration/Others) | : | Developmental and Demonstration. |
| 2. |  |  |  |
| (a) | Broad objectives of the project | : | Design and implement an IOT based smart home system with a PV inverter which communicates using PLC and implement blockchain based energy trading |
| (b) | Precise objectives of the project | : | Develop an ecosystem for implementing PLC on IOT systems and enable energy trading in a secure way using blockchain technology. Also we aim to encourage the use of solar cells by integrating a solar inverter along with the PLC control system and making it open source. |
| 3. | Applications/Socio-Economic importance  (The relevance, if any, to the utilization  and management of the natural resources  of the State) | : | 1. Decentralized energy production and secure energy trading using blockchain encourages the use of green energy 2. Less dependency on centralized power generation 3. Optimize power usage by predictive analysis and automation 4. Control and monitor the status of devices via internet or mobile application 5. Provide analytics on the energy usage pattern of households. 6. Open source IOT based smart pv inverter system |
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4. Abstract:

Typical IOT based smart home systems requires Wi-Fi coverage for the whole area. This is usually done using expensive routers. Also studies are going on to confirm suspected harmful effects of wifi on human health. We eliminate the need for this broad WIFI coverage for smart homes by communicating control signals over the powerline itself. The system consist of a solar inverter, a main PLC control box and a control box at every switchboard. The control unit is provided with internet access either via lan cable or via WIFI modem. All the switchboards and appliances will be connected to the control unit via existing powerline itself. We implement an online UPS system with lead acid battery for the PV system and the energy usage pattern of all the connected homes can be recorded and analyzed.

The main control box is connected to the internet which enables the whole system to be communicated remotely via a website or mobile app. This also enables us to do the analytics on the usage pattern of households and energy usage prediction. We also design an online solar ups which is able to do energy trading with the help of a blockchain based system. Solar energy is gaining popularity these days, but the marketplace for distributed generation of energy is weak. The energy transfer data can be tampered with. We curb this idea by implementing a blockchain based system. It’s based on a distributed ledger. We also use the idea of smart contracts to carry out energy billing.

The inverter market is dominated by a few individuals and majority of the companies buy rights from these proven designers and this increases the cost of them. We aim to make it open source so that engineering community can work on it and thus benefit from the knowledge generated by doing this project.

|  |  |  |  |
| --- | --- | --- | --- |
| 5. | Name(s) of investigator (s) |  |  |
| (a) | Principal Investigator | : | Prof. Athira Prasad |
| (b) | Co-investigator(s) | : | NIL |
| (c) | Student Investigator(s) | : | 1. Mathew Varghese 2. Ameer Fayiz Kaithakath |
| (d) | Branch & Semester | : | Electronics And Communication Engineering, Semester 7 |
| (e) | [**Biodata of (a) (b) & (c) to be attached]** |  |  |
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| 6. | Particulars of equipment required | : | * Power MOSFETs * Transformers * Relays * Solar panel * Battery * Relays * Heatsinks * Passive electronic components * Microcontrollers * WiFi module * Lead acid Battery * Modem * Power supplies |
| 7. | Particulars of any other facilities required | : | 3-D printer, laser Cutter,PCB Fabrication (Available at College Fab Lab) |
| 8. | Particulars of the facilities that will be  provided by the institution where this  project will be implemented. | : | Digital Storage Oscilloscope,  Power supplies, Signal generators, Computer, Working tools |
| 9. | Whether the scheme was submitted to any other organization for financial support, If so, the names of the institutions and their decisions may be indicated. | : | No |
| 10. | Whether at present receiving support  from any other organisation other  than your present department. If so,  full particulars of these may be  given. | : | No. |
|  |  |  |  |

11.Budget Details:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Si No | Item | Description | Quantity | Amount |
| 1. | **Consumables** |  |  |  |
|  | PLA | For 3D printing | 2 | 6000.00 |
|  | Acrylic sheet | 6X1250X1250mm | 4 |  |
|  |  |  |  |  |
| 2. | **Equipments** | | | |
|  | Enclosure structures for all parts | Fabricated using 3D printed and mechanical parts | 1 | 38,000.00 |
| Solar panel | 400w | 1 |
| PCB | 1ftx1ft | 7 |
| Controller | Microcontroller based | 1 |
| PCB fabrication | Add-on boards | 1 |
| Touch screen display |  | 2 |
| Wifi module |  | 2 |
| Power supply |  | 1 |
| Electronic components | For developing the boards | 6 |
| Lead acid battery | 200ah | 1 |
| Modem | Tplink wd8961n | 1 |
| Relays | 5A/230V | 10 |
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|  |  |  |
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| 3. | **Travel** | Purchase |  | 2000.00 |
| 4. | **Research Literature** |  |  | 2000.00 |
| 5. | **Others** | Miscellaneous |  | 2000.00 |
| 6. | **Contingency** |  |  | 2000.00 |
|  |  |  | **Total** | **52000.00** |

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| --- | --- |
| Signature of Principal Investigator:  Name, Address & Telephone No :  Place: Kothamangalam  Date: 19/09/2018 | Prof. Athira Prasad  Assistant Professor,  Department of Electronics and Communication,  Mar Athanasius College of Engineering  Kothamangalam  PIN: 686 666  Ph: 9446606002  Office Seal |
|  |  |

Address:

Director Research,

Centre for Engineering Research and Development,

**APJ Abdul Kalam Technological University,**

College of Engineering Trivandrum Campus,

Thiruvananthapuram.

Pin 695 016.

TO,

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