SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY,KARUKUTTY

Grants received from Government and non-governmental agencies for research projects / endowments in the institution during the last five years (INR in Lakhs)

ACADEMIC YEAR MAY 2022-JUNE 2023

SLNO:	CODE:	FACULTY NAME	Department	Sanctioned by	Sanctioned amount
1	GCE22-2301	Ms. Meera Varghese	Civil Engineering	CERD_KTU	46000
2	GCE22-2302	Ms. Merin Mathew			160000
3	GCE22-2303	Dr. Praseeja A V			155000
4	GCE22-2304	Dr. Rahul R Pai			90000
5	GEC22-2301	Vinoj PG	ECE		25000
6	GEC22-2302	Mary Catherine			60000
7	GAU22-2301	Dr.Jayadevan P.C	AU		50000
8	GAU22-2302	Dr.Albin Joseph			84000
9	GCSE22-2301	Asha S	CSE		159000
10	GCSE22-2302	Susmi Jacob			26000
11	GME22-2301	Dr Gibin George	ME	ANERT, Department of Power, Government of Kerala	55000
12	GBSH22-2301	Dr.Geethu R	BSH	CERD_KTU	75000
TOTAL SANCTIONED AMOUNT 2022-2023					**985000**

PRINCIPAL
SCMS SCHOOL OF ENGINEERING & TECHNOLOGY
VIDYANAGAR, PALLISSERY, KARUKUTTY
ERNAKULAM, KERALA-683 576

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/RESEARCH 3/1082/2022 Dated: 26.02.2023

From

The DEAN (Research)

To

The Principal,
SCMS College of Engineering and Technology, Ernakulam.

Sir,

Sub:- APJAKTU - CERD - Research Seed Money Scheme - Projects Selected for funding - reg:-

I am glad to inform you that the project proposals as listed in Annexure I are provisionally selected for funding under Research Seed Money (RSM) scheme of KTU.

The expenditure should be incurred as per the sanctioned budget heads and in accordance with terms and conditions given in Annexure II. Format of MOU to be furnished by the college is given as Annexure III.

The Principal Investigators may please be directed to forward request (in Annexure II) for releasing the fund with Bank Account details. The fund will be released only after settling pending accounts of the principal investigator in CERD, if any. Any request received after three months from the date of this letter will not be considered.

Yours faithfully
Dr. Shalij P.R *
DEAN (Research)

Copy To

1. Shri. Jayadevan P C, Assistant Professor in Mechanical Engineering.
2. Dr. Gibin George, Assistant Professor in Mechanical Engineering
3. Dr. Abin Joseph, Assistant Professor in Mechanical Engineering.
4. Smt. Meera Varghese, Assistant Professor in Civil Engineering.
5. Smt. Merin Mathew, Assistant Professor in Civil Engineering.
6. Dr. Praseeja A. V., Assistant Professor in Civil Engineering.
7. Shri. Rahul R Rai, Assistant Professor in Civil Engineering.
8. Smt. Asha S, Assistant Professor in computer Science and Engineering.
9. Dr. Geethu R, Assistant Professor in Science.

10. Smt. Mary Catherine V. G, Assistant Professor in Electronics and Communication Engineering.

* This is a computer system (Digital File) generated letter. Hence there is no need for a physical signature.

Annexure II

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Centre for Engineering Research and Development
Request for releasing RSM grant

Title of Project:

Date of sanction:

Amount sanctioned:

Account No and bank details:

Terms & Conditions for Research Seed Money Scheme

1. The amount sanctioned for the project shall be deposited in a separate joint A/c of Principal Investigator and Head of the institution where the Principal Investigator works. (Name of A/c: CERD Research Seed Money - File No.)

2. The maximum duration of the project will be three years from the date of start of the project

3. The amount has to be utilized as per budget provision under each head. It is the discretion of the University to settle amount towards the purchase of those items not clearly mentioned, if any, in the project proposal.

4. The purchase of equipments shall be in accordance with the store purchase rules. All equipment purchased will be the property of CERD and the stock entry of the items purchased shall be maintained in the College signed by the Investigator, Lab in charge and Principal. Purchase of computers/peripherals is not allowed unless specifically mentioned in the sanction order.

5. 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 other 50% is produced by the college.

6. The stock entries of consumables purchased shall also be done in the consumables stock register of College. Purchase of stationery shall be for project purpose only.

7. Books and literature purchased should be taken into the Stock Register of Central Library or Department library and then distributed to the investigators.

8. The interest accrued will also be accounted in the project.

9. On completion of the project, detailed report of the research work (hard and soft copies), audited statement of accounts and Utilization Certificate in the prescribed format duly attested by the head of the institution shall be submitted within one month on completion of the project for settlement of accounts.

10. If the project is not completed within the time limit, the grant amount should be reimbursed along with the interest accrued.

11. 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 CERD may designate Scientist/Specialist or an Expert Panel to periodically review the work done. The Principal Investigator has to appear for the periodic review meetings.

12. If the PI to whom the project has been sanctioned, leaves the Institution, the Head of Institution/PI shall inform the same to the CERD and in consultation with the CERD, evolve steps to ensure successful completion of the project, before relieving the PI.

13. Investigators must acknowledge the CERD in reports and technical/scientific papers published 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 Journals.

14. 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.

15. The knowledge generated from the project will be the property of the CERD and should be properly acknowledged. Transfer of technology generated shall be done in consultation with the CERD.

We agree to the terms and conditions stated above. Please transfer the amount to the above bank account.

Signature of Principal Investigator:

Name:

Designation:

Signature of Head of Institution:

Name:

Office Address:

Seal

Annexure III

(Stamp paper Rs 200)

MEMORANDUM OF UNDERSTANDING [MOU]

BETWEEN

-Name of Self Financing Engineering College-

AND

APJ Abdul Kalam Technological University (KTU), THIRUVANANTHAPURAM

This Memorandum of Understanding is entered into at Thiruvananthapuram on this --- Day of Month Year

BETWEEN

-Name of Self Financing Engineering College- affiliated to APJ Abdul Kalam Technological University (herein after referred to as COLLEGE) which expression shall unless it be repugnant to the context or meaning thereof to be deemed to mean and include its successors and assigns, represented by The Principal, ---Name of college- place of college -, of the ONE PART.

AND

APJ Abdul Kalam Technological University, CET campus, Thiruvananthapuram-695016 (herein after referred to as KTU) which expression shall, unless it be repugnant to or inconsistent with subject or context thereof, include and be deemed to include their heirs, successors and assigns, represented by The Dean (Research), APJ Abdul Kalam Technological University, Thiruvananthapuram 695016 of the OTHER PART.

1. TERMS OF UNDERSTANDING

1.1. This memorandum of understanding lists out the terms of releasing and utilization of CERD research seed money fund sanctioned to a faculty of COLLEGE for the year ----------.

1.2. The scheme is constituted for the purpose of providing assistance in the form of grants to initiate research work in Engineering and Technology with particular relevance to the State of Kerala in the economic and industrial development.

1.3. Grant will be released to the principal investigator of the project through the Head of the institution.

1.4. The maximum duration of the project will be three years from the date of start of the project

1.5. On completion of the project, one copy of the final project report on the work done should be sent to the CERD along with the utilization certificate (UC) and statement of expenditure (SE).

1.6. The institute will maintain separate audited accounts for the project.

1.7. 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.

1.8. 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 CERD may designate a Scientist/Specialist or an Expert Panel to review the work done.

1.9. If the PI to whom the project has been sanctioned leaves the Institution, the Head of Institution/PI will inform the same to the CERD and in consultation with the CERD, evolve steps to ensure successful completion of the project, before relieving the PI.

1.10. Investigators must acknowledge the CERD in reports and technical/scientific papers published 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 journals.

1. 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.

1.12. The knowledge generated from the project will be the property of the CERD and should be properly acknowledged. Transfer of technology generated shall be done in consultation with the CERD.

1.13. 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 other 50% is produced by the COLLEGE.

1.14. The equipment details must be entered in the stock register of the college and signed by the Investigator, Lab in charge and Principal.

1.15. The college should submit annually the status and details of earlier grants received from KTU with pending statement if any.

1.16. The grant amount should be deposited in a separate bank account in the name of the Principal investigator and Head of Institution jointly.

1.17. The interest accrued shall also be accounted in the project.

1.18. If the project is not completed within the time limit, the grant amount should be reimbursed along with interest accrued.

We agree to the terms and conditions stated above.

2. SCOPE OF MOU

Nothing in this Memorandum is intended to or shall be deemed to establish an exclusive relationship between the parties or to restrict any activities that either party would otherwise be able to undertake. Nothing in this Memorandum is intended to or shall be deemed to establish any partnership or joint venture between the parties or constitute any activities that either party would otherwise be able to undertake.

3. PERIOD

This MOU shall be perpetual. This agreement will be amended or modified by the University at any time.

4. DISPUTE RESOLUTION AND ARBITRATION

This memorandum of understanding shall be governed by the laws of Union of India and State of Kerala. Any dispute arising with this MOU shall be brought to the notice of the Vice-chancellors of the parties who shall try to resolve them, failing which legal reasoning be taken in the jurisdiction of court in Thiruvananthapuram.

The terms and conditions of this memorandum of understanding shall not be disclosed to any third parties by any party of this memorandum of understanding without the prior written consent of both parties.

5. FORCE MAJEURE

Without prejudice to accrued liabilities and rights, no party shall have any liability whatsoever to the other Party or be deemed to be in default by reason of delay or failure in performance under this memorandum of understanding to the extent that such delay or failure is caused by or arises from acts or circumstance or events beyond the reasonable control of that party, including but not limited to acts of god, acts or regulations of any governmental authority, war or national emergency, accident, fire, riot, strikes, lock-outs, industrial disputes, natural catastrophes or epidemics.

Each Party shall bear its own losses arising from such force majeure event(s), if any.

6. INTELLECTUAL PROPERTY

All prior information, design and data existing with either party before the signing of this MoU (pre-existing IP) shall be the sole property of the concerned party. All Intellectual Property including design information, designs, source codes and data generated through the collaboration under this MOU shall be as mutually agreed in writing and also as per the guide line of the funding agency, if such an agency is involved. Any IPR arising specifically out of this collaboration will be owned by both parties, except when mutually agreed in writing otherwise.

IN WITNESS WHEREOF, the parties hereto have caused this memorandum of understanding to be executed in duplicate, through their representatives at Thiruvananthapuram in the day and year first above written:

Now the memorandum of understanding witnesses as follows.

Principal **Name of College** **University** **Place**	**Dean (Research)** **APJ Abdul Kalam Technological** **Thiruvananthapuram 695016**
Witness: 1	**Witness: 1**
Signature :	Signature :
Name :	Name :
Witness: 2	**Witness: 2**
Signature :	Signature :

SCMS School of Engineering and Technology, Ernakulam												
SL No	Name of Principal Investigator	Title of the project	Branch	Amount Sanctioned	Ist installment	2nd installment	Consumables	Equipment	Travel	Contingency		
1	Jayadevan P C Assistant professor	Analysis of Low Reynolds Flow (Stokes Flow) Through Micro Capillaries	ME	50,000	40,000	10,000	40,000	0	5000	5000		
2	Dr. Gibin George Assistant Professor	Development of eco-friendly packaging materials from agricultural wastes.	ME	70,000	60,000	10,000	10,000	50,000	5000	5000		
3	Dr. Albin Joseph Assistant Professor	Development of Floating type solar still desalination system integrated with direct absorption flat plate solar collector for improved productivity	ME	84,000	60,000	24,000	60,000	0	8000	16,000		
4	Meera Varghese Assistant Professor	Sea water intrusion modelling into some of the coastal aquifers in Thrissur district.	Civil Engineering	46,000	35,750	10,250	0	0	14,000	7000	testing charges 25,000	
5	Merin Mathew Assistant Professor	Catchment scale source apportionment of sediment yield into Vembanad Lake	Civil Engineering	160,000	110,000	50,000	40,000	0	20,000	20,000	Testing charges 80,000	
6	Dr. Praseeja A V Assistant Professor	Study of dispersion coefficient of contaminants through different types of soils and remediation using natural fibres	Civil Engineering	155,000	127,500	27,500	30,000	100,000	10,000	15,000		
7	Rahul R. Pai Assistant Professor	Fatigue studies and resilient behavior of crushed brick fly ash lime (CBFL) mix for use in base layer of flexible pavement	Civil Engineering	90,000	57,500	32,500	20,000	0	10,000	10,000	Testing charges 32,000	Experimental charges 18,000
8	Asha S Assistant Professor	Multimodal Ensemble Deep fake Detection using Visual-Audio-Textual features	CSE	159,000	130,000	29,000	5,000	130,000	12,000	12,000		

9	Dr. Geethu R. Assistant Professor	Developing cost effective and eco-friendly copper tin sulphide material for photovoltaic application	Science	75,000	50,000	25,000	40,000	5,000	10,000	20,000
10	Mary Catherine V G Assistant Professor	Touch Activated Soft Robotic Hand Control for Elderly Assistance	ECE	60,000	40,000	20,000	30,000	15,000	5,000	10,000

A.O. No. 182/2023/ANERT

അനെർട്ട്
ANERT
Agency for New and renewable Energy Research and Technology
നവീനവും പുനരുപയോഗയോഗ്യവുമായ ഊർജ്ജ ഗവേഷണങ്ങൾക്കും സാങ്കേതിക വിദ്യകൾക്കുമുള്ള ഏജൻസി
DEPARTMENT OF POWER, GOVERNMENT OF KERALA
Law College Road, PMG, Thiruvananthapuram 695033 • director@anert.in • www.anert.gov.in
Tel.: (+91-471) 2338077, 2334122, 2333124, 2331803 • Fax: (+91-471) 2329853

PROCEEDINGS OF THE CHIEF EXECUTIVE OFFICER

(PRESENT: NARENDRA NATH VELURI I F S)

Abstract

SRI 2022-23-Project Proposal SRI-07/2022-23 titled "Fabrication of Electrolysis Chamber for Water Splitting using Surface Modified Stainless Steel Mesh" submitted by Dr. Gibin George, SCMS School of Engineering and Technology, Karukutty- Financial Assistance of Rs. 55,300/- Sanction Order.

ANERT-RD/18/2023-T8

A.O. No. 182/2023/ANERT 25-07-2023

Ref:

1. Guidelines of the ANERT Programme on Supporting R&D and Innovation (SRI) 2022-23.
2. Note No. ANERT-RD/36/ 2022-T8 dt. 09/05/2023.
3. MoM of Technical Evaluation Committee dt. 15/05/2023 and 16/05/2023
4. Note No. ANERT-RD/36/2022-T8 dt. 27/05/2023
5. Project Proposal SRI-07/2022-23 submitted by Dr. Gibin George,SCMS School of Engineering and Technology, Karukutty.
6. Undertaking dt. 26/06/2023 and signed copy of the Guidelines received on 22/07/2023.

ORDER

Supporting R&D and Innovation (SRI) is a programme by ANERTto promote R & D and innovative ideas and to pilot new models in RE sector. As part of this programme for the year 2022-23, it is proposed to financially and technically support a few Student Projects on topics related to Renewable Energy being carried out under the guidance of a faculty as Principal Investigator. The Guidelines for this programme were finalised (Ref. 1) and project proposals for financial assistance were invited from various institutions in Kerala. In response, 117 project proposals from various institutions were received by ANERT. From these proposals, 20 were short-listed (Ref. 2) for presentation before the Technical Evaluation Committee (TEC), which recommended 10 proposals for financial assistance (Ref. 3). Accordingly, a rank list of these 10 proposals based on merit was prepared by ANERT (Ref. 4). Project Proposal SRI-07/2022-23 submitted by Dr. Gibin George, Assistant Professor, Department of Mechanical Engineering, SCMS School of Engineering and Technology, Karukutty, Ernakulam-683576 (Ref. 5) was recommended with revision and was ranked seventh in the list.

After scrutiny of the revised proposal titled "Fabrication of Electrolysis Chamber for Water Splitting using Surface Modified Stainless Steel Mesh" and the clarifications provided by Dr. Gibin George, budget for execution of the project was finalised to be Rs. 61,800/- in which Rs. 55,300/- would be the financial assistance from ANERT. He was requested to submit an undertaking and signed copy of the guidelines. These documents have been received by ANERT (Ref. 6). Therefore, sanction is hereby accorded for providing financial assistance of Rs. 55,300/- (Rupees fifty five thousand three hundred only) for execution of the project proposal SRI-07/2022-23 (as detailed in the below table) strictly adhering to the Guidelines of the programme. The eligible amount calculated will be released to the head of institution only on submission of the required documents after completion of the project.

ANERT-RD/18/2023-T8

A.O. No. 182/2023/ANERT

Details of the Project:

1	Title of the project	Fabrication of Electrolysis Chamber for Water Splitting using Surface Modified Stainless Steel Mesh	
2	Reference Number	SRI-07/2022-23	
3	Details of Investigators	**Principal Investigator**: Dr. Gibin George, Assistant Professor, Department of Mechanical Engineering, SCMS School of Engineering and Technology, Karukutty. **Student Investigators:**	
		1 Govind T V	B. Tech. Mechanical Engineering
		2 Gokul Unnikrishnan	B. Tech. Mechanical Engineering
		3 Alen Bijan	B. Tech. Mechanical Engineering
		4 Abin Pauly	B. Tech. Mechanical Engineering
4	Objectives	1 Design and fabrication of the prototype of an SPV powered electrolysis chamber using surface modified stainless steel meshes with nanostructures of Ni and Co hydroxides as electrodes. 2 Composition Analysis of the outlet gas.	
5	Duration of the Project	9 months from 25-07-2023	
6	Total Approved Budget	Equipment and Software	Rs. 13,000/-
		Consumables	Rs. 18,000/-
		Testing	Rs. 13,800/-
		Travel	Rs. 5,000/-
		Others	Rs. 10,000/-
		Contingencies	Rs. 2,000/-
		TOTAL	Rs. 61,800/-
7	Institutional Share	Rs.6,500/- (For Equipment and Software)	
8	Financial Assistance from ANERT	Rs. 55,300/-	

The expenditure in this regard will be met from the outlay for Item No. iii(e) Supporting R&D and Innovation of the Head of Account "3. ANERT as Knowledge Hub for Renewable Energy [2810-00-800-90-08-35-00]" in the budget for the Financial Year 2023-24.

NARENDRA NATH VELURI I F S
CHIEF EXECUTIVE OFFICER

Copy to:
1. The Principal, SCMS School of Engineering and Technology, Karukutty, Ernakulam-683 576
2. Dr. Gibin George, Assistant Professor, Department of Mechanical Engineering, SCMS School of Engineering and Technology, Karukutty, Ernakulam-683 576

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/RESEARCH 3/1082/2022 Dated: 26.02.2023

From

The DEAN (Research)

To

The Principal,
SCMS College of Engineering and Technology, Ernakulam.

Sir,

Sub:- APJAKTU - CERD - Research Seed Money Scheme - Projects Selected for funding - reg:-

I am glad to inform you that the project proposals as listed in Annexure I are provisionally selected for funding under Research Seed Money (RSM) scheme of KTU.

The expenditure should be incurred as per the sanctioned budget heads and in accordance with terms and conditions given in Annexure II. Format of MOU to be furnished by the college is given as Annexure III.

The Principal Investigators may please be directed to forward request (in Annexure II) for releasing the fund with Bank Account details. The fund will be released only after settling pending accounts of the principal investigator in CERD, if any. Any request received after three months from the date of this letter will not be considered.

Yours faithfully
Dr. Shalij P.R *
DEAN (Research)

Copy To

1. Shri. Jayadevan P C, Assistant Professor in Mechanical Engineering.
2. Dr. Gibin George, Assistant Professor in Mechanical Engineering
3. Dr. Abin Joseph, Assistant Professor in Mechanical Engineering.
4. Smt. Meera Varghese, Assistant Professor in Civil Engineering.
5. Smt. Merin Mathew, Assistant Professor in Civil Engineering.
6. Dr. Praseeja A. V., Assistant Professor in Civil Engineering.
7. Shri. Rahul R Raj, Assistant Professor in Civil Engineering.
8. Smt. Asha S, Assistant Professor in computer Science and Engineering.
9. Dr. Geethu R, Assistant Professor in Science.

File Ref.No.KTU/RESEARCH5/5310/2022

APJ Abdul Kalam Technological University
Thiruvananthapuram

Abstract

APJAKTU - Financial Assistance to Student Projects 2022-23 - Administrative Sanction accorded - Orders issued.

RESEARCH SECTION

U.O.No. 672/2023/KTU Thiruvananthapuram, Dated: 18.03.2023

Read:-1. Minutes of the 1st meeting of Engineering Research Council dated 27.01.2010.
2. Minutes of 2nd meeting of Executive Committee dated 21.10.2010.
3. Meeting of the 2nd Research Council dated 29.02.2017.
4. Proposals of Student Projects for Financial Assistance.
5. Screening Committee meeting held on February 2023 for evaluation of project proposals.

ORDER

Vide paper read 1st above, the Engineering Research Council had approved the scheme for Financial Assistance to Student Projects for the Government Engineering Colleges. Vide paper read 2nd above, it was decided to extend the financial assistance to the student projects to the students of the Government aided and Government Controlled Engineering Colleges.

It was decided to extend the financial assistance to Student Projects for all engineering colleges affiliated to the University with NBA accreditation as per paper read 3rd above. It was also decided that the financial assistance will be provided as reimbursement of expenditure occurred for the sanctioned project.

The Screening Committee meetings held in February 2023 evaluated the project proposals forwarded from Engineering Colleges affiliated to the University and recommended financial assistance to selected proposals as per the List appended.

Administrative sanction is therefore accorded for financial assistance to student project for an amount of ₹46,58,352/- (Forty Six Lakhs Fifty Eight Thousand Three Hundred and Fifty Two only) as detailed in the list attached below. The project shall be completed within a period of 1 year and the project shall be completed with the students who presented the project before the Screening Committee.

The expenditure should be incurred as per the terms and conditions as per Annexure II attached. The amount will be reimbursed to the Principal of the concerned Colleges only after the successful completion of the project and on the production of certified bills & vouchers along with the audited utilization certificate, statement of expenditure and project completion report.

The expenditure shall be met from the Head of Account “CERD (Plan) 4181-6307-Innovative Student Project”.

Orders are issued accordingly.

Sd/-

Dr. Shalij P.R *
DEAN (Research)

Copy to:-
1. Principals of Engineering Colleges.
2. Principal Investigators.

* This is a computer system (Digital File) generated letter. Hence there is no need for a physical signature.

Financial Assistance for Innovative Student Project- List of selected Projects 2022-23

College of Engineering Trivandrum

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	Remarks
1	Dr V R Rajeev Professor Co-Investigator Muhammed Arif M Associate Professor Dr Ajith G Nair Associate Professor	Sanjo Paul Kalluvilayathil Rojan Antony Abhinand G Jayashankar P	Mechanical	A parametric investigation and optimization study of TiSO2 sludge as abrasive in water jet machining application	50,000	4,000	44,000	1,000	1,000	
2	Pradeep A Assistant Professor	Akshay P Nair Aravind K Varghese Ebin Joseph Goutham Joseph	Mechanical	Design and fabrication of LS-2 type parabolic trough collector for study of heat transfer fluid and seasonal orientation	50,000	19,000	25,000	1,000	5,000	
3	Dr Joseph Zacharias Professor	Alan B Thomas Joseph Varghese Ninan Tony Sarath Sojan	ECE	GPS spoofing and anti-spoofing using software defined radio (SDR)	45,000		40,000	1,000	4,000	
4	Dr. Sreelatha G. Professor Co-Investigator Dr. Biju K. S Associate Professor	Abhishek George Favas P Shane John Jose Sovin Don Desilva	ECE	Bathymetry Mapping using UAV	50,000		50,000			
5	Dr. Anitha Edison Professor Co-Investigator Lalu V Assistant Professor	Abhiram Krishnan ER Adarsh R Fathima BR Lynn Collins	ECE	Ofset Prediction Under Heterogeneous Traffic	40,000	3,000	35,000	1,000	1,000	
6	Ameenudeen P E Assistant Professor	Abhijth Narayan S Abhinand Sankar J Aditya S Amrita A Nair	ECE	Physical implementation of a reinforcement learning model with emphasis on reward side channels	25,000	1,500	21,000	1,500	1,000	

7	Dr Jisha V R Professor	Adith R K Chirag B Chandran Joel Pat David Padmanabhan Rajesh Nair	EEE	Aero Amphibious vehicle	50,000	5,000	43,000	1,000	1,000	
8	Dr Jayakumar P Associate Professor	Manu Moncy Nanditha S Nikhil TS Sreelakshmi S	EEE	Power Flow Management in Bidirectional DC-DC Converter	20,514	4,100	13,299	1,640	1,475	
9	Monish M Assistant Professor	Abin Philip Jeswin Jaimon KeertanaSujit Sanjay P J	EEE	Design and Implementation of Control Strategy for the Performance Improvement of Switched Reluctance Motor	35,000	7,000	20,000	4,000	4,000	
10	Sini T Assistant professor	Deon Mathew Dhanya S S Krishnamoorthy Malavika P V	Civil	Performance Evaluation Of Bamboo Geocell Reinforced soil	20,000	6,000		3,000	6,000	Others 5,000/-
11	Dr. Piyoosh P Assistant professor	Antony S John Chethana Pradeep Hazel Mary Kampakkaran Nandana Sony	CSE	LexRead - Development of an open-source interactive and customizable reader-writer application for users with dyslexia and related conditions	17,860	17,860				
12	Dr. Ajeesh Ramanujan AssociateProfessor	Fausan Asharaf Aswin A P Bayan K Muhammed Fazil	CSE	MeetShort: Automatic Meeting Summariser	13,300	13,300				
13	Dr Sumesh Divakaran HOD	Nanda Kishor M Pai Natasha Mathew Paurnami Pradeep Sourav Satheesh	CSE	Beyond Graduation - Smart Alumni Management Platform	12,800		7,800		5,000	

14	Dr. Piyoosh P Assistant professor	Sudev Suresh Sreedevi Ajai Krishna K V Aryasree S S Deepika Mohan	CSE	Project Mudrika - A secure and transparent disaster management infrastructure powered by blockchain	16,250	10,000	6,250			

Government Engineering College Thrissur

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
15	Dr Sajith Babu C Professor	Vaisakh P Jasir V A V Pratheeshkumar Paul Jojo Parokkaran	Mechanical	Synthesis of Mg-Hydroxyapatite /bioactive glass nano powder compasites and their characterization	44,650	10,000	21,500	1,000	12,150	
16	Dr. A R Jayan. Professor Co-Investigator Riyas KS Assistant Professor	ANJANA N SATHYAN ASWIN RAMESH GAYATHRY MENON JOHN JTHARAYIL	ECE	AUTOMATED SOLAR PANEL CLEANER	12,690	3,000	7,690	1,000	1,000	
17	Abdul Raouf Khalid Assistant Professor	Adithya Krishnu Gopikrishnan TC Steena Xavier Vipin E	ECE	Wall Painting Robot	30,000	3,000	25,000	1,000	1,000	
18	Binitha Joseph Mampilly Associate Professor	Amal Leven Amulya M S Chris Joseph Easwari M	EEE	Electromagnetic Suspension System with Energy Regeneration	44,300	5,000	34,000	2,500	2,800	
19	Dr. RAJESH K. Associate Professor	JEREMIYA MATHEW KHURAIJAM RICKY MARIA PAULSON MOHAMMED SHERIN ELACHOLA	EEE	AN ECO-FRIENDLY CROP PROTECTION SYSTEM	45,640	4,000	35,640	2,000	4,000	
20	Deepak B Assistant Professor	Lakshmi Sreedhar Sanika Abhayadev J Sreelakshmi Sruthi K S	Civil	Predictive Model for Strength of Geopolymer Mortar Using Machine Learning	48,846	14,450	26,896	500	1,000	Chemical tests 6,000/-

21	Deepak B Assistant Professor	Sajith Krishna M Sudheeran VS Vaishnavy Sabu Nath Mohammed Hashir K K	Civil	Comparative study of different supplementary cementitious materials	49,788	3,220	30,068	1,000	3,500	Chemical tests 12,000/-
22	Dr. Manilal A M Associate Professor	Aksa John Bhavana VK Kartik S Menon Midhunkrishnan S	BTBC-CH-FT	Photocatalytic Splitting of Water using Silver-doped TiO2 Nanoparticles	37,208	7,208	25,000	2,000	3,000	
23	Dr. Praseetha PNair AssociateProfessor	Afsal E Amal Joseph Anand Krishna RajV Krishna Suresh	BTBC-CH-FT	Synthesisof Fuel oil by catalytic pyrolysis of polyethylene.	32,000	6,000	8,000	5,000	5,000	Characterization 8,000
24	Ranjana R Assistant Professor	Nayana Rajan Rohith Lakhan K Sakshy Joseph Thejas V S	BTBC-CH-FT	Catalytic Conversion of Glycerol to Ethanol Using Silver-impregnated Zeolite as Catalyst	49,900	8,900	15,000	3,000	3,000	Characterization 20,000
25	Dr Sajeena Beevi B AssociateProfessor	Hasnath Femi P Muhsina H S Suhail Asharaf Vivek vijayan	BTBC-CH-FT	Synthesis of nanoencapsulated phase change material for thermal energy storage	50,000	5,000	20,000	2,000	3,000	Characterization 20,000
26	Ajeesh KN Associate Professor	Abhijith Manoj Aparna K Menon Hariprasad MB Meghana CS	BTBC-CH-FT	Selective Extraction of lithium from spent Li-Ion Battery	30,000	4,500	6,000	3,000	3,000	Characterization 13,500

GEC Sreekrishnapuram

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
27	Dr. Joseph Peter Assistant Professor Co-Investigator Dr. Vinitha Chellappan Associate Professor	Sreenath U Athira R Sabna K I Haritha E S	EEE	Isolated DC-DC converter fed space vector PWM modulated	47,000	10,000	30,000	2,000	5,000	

Rajiv Gandhi Institute Of Technology, Kottayam

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
28	Dr. Manish M Assistant Professor Co-Investigator Dr. Swapnesh S Assistant Professor	Hari Krishnan Akash Antony Ambady Krishnanath Sradha S	Mechanical	Posterior Chest Vibrator	50,000	10,000	35,000	2,000	3,000	
29	Dr. Manojkumar M Associate Professor Co-Investigator Dr. Swapnesh S Assistant Professor	Sharvari Bhat K M Samnoon Mu-ad T K Haneen Nishoy Alappat N	Mechanical	Portable Tile Glue Application Machine with Adjustable Glue Thickness	42,491	2,000	34,991	2,500	3,000	
30	Salih Sulaiman Assistant Professor	Abhiram N K Amal J Alappat Muhammed Shameem VP Vinayak Vikram	ECE	AUTOMATIC COPRA, ARECA NUT DRYING AND MONITORING MACHINE	40,000	4,000	31,000	1,000	4,000	
31	Dr Upama Rajan Associate Professor	Alan Antony Amruth P Arya Thomas Elizabeth Mariya Siby	ECE	Library Assistant Robo Arm	45,000	4,000	37,000	1,000	3,000	
32	Dr. Johnson Mathew Head of the Department Co-Investigator Dr. Dolly Mary Abraham Professor	Abhiram L Hareendran Jyothilakshmi B Shabana S Swathi S	EEE	Axial Load-power flexible autonomous ALFA BLDC Motor	50,000	4,500	33,500	2,000	10,000	
33	Dr Dhanya B S Associate Professor	Aswin M Harinandan S B Nikhil Abe Victor Sreekuttan K B	Civil	Mechanical and shrinkage characteristics of hybrid fiber reinforced concrete with different binder system for white topping application	50,000	10,000	30,000	5,000	5,000	

GCE Kannur

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
34	Nishanth K Assistant Professor	Abhishek Bhaktha K Gautham MP Nandakumar V Nithin Raj PR	Mechanical	Experimental investigations on the performance of surgical mask incinerator with the aid of distributed heat source	26,800	6,300	13,000	5,000	2,500	
35	Laseena C A Assistant Professor	Adersh B S Aruna S Najila T Amrutha S	ECE	ANIMAL DETECTION AND MONITORING USING LORAWAN	19,500		19,500			
36	Dr. Ranjith Ram Professor	Anusree R Deepika Raj Nambiar R Goutham Shahmin K	ECE	Real-time disease detection in cardamom plant leaves	23,000		23,000			
37	Dr Ajith M S Assistant Professor	Aiswarya B Mohan Ajith Krishnan Anjali S K Devu K V Sharanya Raghu T P	Civil	Comparative Study on Internal Curing of Concrete	46,000	13,000	30,000	2,000	1,000	

GEC Kozhikode

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
38	Dr. Baburaj M Associate Professor	Adharsh G S Vishnu Hari M Vishnu Muraleedharan Robin Rajeev Daniel	ECE	“MULLTRENNER”- Automatic Waste Segregation	32,000		32,000			

GEC Wayanad

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
39	Dr. Ahammed Muneer K V Associate Professor	Aparna VJ Sharikh M Yyshnav K	ECE	Glenohumeral-Elbow Therapy BOT(GET-BOD	36,000	4,000	28,500	1,000	2,500	
40	Dr. Arun Varghese Assistant Professor	Akshay K S Naveen P T Shahir N C Rishika B Ram	ECE	Autonomous Drone for Area Monitoring and Delivering Products	40,000	4,000	32,000	1,000	3,000	
41	Binoy K P Assistant Professor	RABEEH E MURSHID C T. RANEES M NANDHU KRISHNA B	EEE	Super capacitor and Battery Power Management for EV	30,000	2,500	21,500	3,000	3,000	
42	Dr. Jayaprakash. P Professor	Rafeetha V C Amna Shirin N K Aparna P R Sahla Mariyam CP	EEE	Solar Powered Induction Cooker	50,000	10,000	39,000		1,000	

GEC Barton Hill

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
43	Dr. Nelsa Abraham Associate Professor Co-Investigator Beena.S Assistant Professor	RISHAB AALAYATHIL ARDRA S GAYATHRY SV NAZRIN ANSARI	ECE	HYBRID ENERGY HARVESTING FOR IoT DEVICES	30,000	6,000	19,000	1,000	4,000	

Mar Athanasius College of Engineering Kothamangalam

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	

44	Kiran Christopher Assistant Professor Co-Investigator Nithin Eldho Subhash Assistant Professor	Praison A S Neelima KS John Lee Joseph G Akhil Krishnan	Mechanical	Automatic Copra Extraction System	50,000	10,000	35,000	1,000	4,000	
45	Dr Biju B Professor Co-Investigator Dr Shankar Krishnapillai Professor	Ajith Krishna Sajeev Aswin Saneesh Sarath P S Vyshnav K	Mechanical	Energy Harvesting using Tulip Turbine	40,000	5,000	25,000	5,000	5,000	
46	Anjaly Viswan Assistant Professor Co-Investigator Dr. Aji Joy Professor	Jyotsna S Darsana Sabu Anjana N K Aswin K	ECE	Solar powered automatic cloth drying rack	20,000	7,000	10,000		3,000	
47	Dr. Siny Paul Professor Co- Investigator Jeena Joy Associate Professor	Ajesh S Anandhu Prakash Akshay Jyothis M Anand E.S	EEE	Nanocomposite Based Electrical Insulation in High Voltage	39,600	5,100	32,500	1,000	1,000	
48	Emmanuel Babu P Assistant Professor Co-Investigator Mohitha Thomas Assistant Professor	Abin Shaji Arya Sunil Sudheema K Vysakh K T	EEE	Nutmeg Decortication and Seed Quality Grading System	47,360	4,500	36,860	3,000	3,000	
49	Alpha Lukose Assistant Professor Co-Investigator Elson John Professor	Anjala Fathima Aysha Ameena T S Raniya Nousheen Baker Vishnupriya P J	Civil	Flood control system using self raising blood barrier for Kerala	33,000	7,500	16,500	4,500	4,500	
50	Pristy Paul T Assistant Professor Co-Investigator Dr Elizabeth Isaac Assistant Professor	Roshan R. Sandra Mariyam Jacob Blessey Maria Saju	CSE	Blockchain Enabled Clustered Edge Intelligent Devices	29,961	1,000	27,961	1,000		

51	Dr Elizabeth Isaac Assistant Professor Co-Investigator Leya Elizabeth Sunny Assistant Professor	Jazeel Anwar Manu P S Vidya V	CSE	Automatic robotic arm for pepper plucking	45,000		45,000			
52	Dr. Jisha P Abraham Professor Co-Investigator Dr Elizabeth Isaac Assistant Professor	Abisha Simon Malavika Raju Sreekala K R	CSE	Bionic hand for amputee using myoelectric direct control sysytem	50,000	500	48,500	500	500	

Model Engineering College, Thrikkakara

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
53	Jagadeesh Kumar P Assistant Professor Co-Investigator Pradeep M Associate Professor	Kalyani Pradeep Kiran Ajith Joseph Jeswin Pius	ECE	Fall Detection using mmWave Radar Sensor	30,000	25,000		3,000	2,000	
54	Dr. Preetha Theresa Joy Professor Co-Investigator Sreekumar K Assistant Professor	Adithya A Aldrin Jenson Gouri Hariharan Nayana Vinod	CSE	MULTI-LAYERED ARCHITECTURE FOR ANOMALY DETECTION IN SURVEILLANCE NETWORKS USING DISTRIBUTED COMPUTING	50,000	4,000	46,000			
55	Sreekumar K Assistant Professor	Krishnendu nambiar Nikita Menon Sharat Jacob Jacob Rahulkrishna V Nambiar	CSE	Building A General-purpose Compute-efficient Training Mechanism For Language	50,000	4,200	45,800			

SCT College of Engineering, Thiruvananthapuram

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	

56	Dr Sheeja M K HOD	Jassim Shaji K J Abhirami Rohith G Sarma Sruthi B Nair	ECE	Visualization of Thermal Diffusivity using DHI (Digital Holographic Interferometry)	35,000	1,000	32,000	1,000	1,000	
57	SubhaV Assistant Professor	Sravan H Varun Asokan Nivya PS	ECE	Lung Cancer Cell Enhancement Detection using Fourier Ptychography Microscopy.	20,000		20,000			
58	Dr. Kamal Krishna R Assistant Professor Co-Investigator Dr. Arun M Assistant Professor	Anand M S Suryajith SS Akhilesh R Akshaj B	Mechanical	Performance enhancement techniques of Gasoline engines Retrofitted with CNG fuel system.	50,000	9,000	35,000	1,000	5,000	
59	Syama R Assistant Professor	Afreen A Habeeb Dhanya S B Nithin P	CSE	Home automation using AR	20,500	5,000	12,500	2,000	1,000	
60	Susmitha Kumari S Assistant Professor Co-Investigator Jickson D H Assistant Professor	Aishathul Haniyya Ann Elza George Parvathy S Sidharth S	BTBC-CH-FT	A study of the impact of various drying techniques on the performance of solid state fermentation process for Prodigiosin production.	50,000	10,000	30,000	5,000	5,000	
61	Gayathri V Assistant Professor Co-Investigator Dr K.B Radhakrishnan Professor & Head	V VISHAL MOORTHY SREERAJ BITTU THOMAS CK ASWATHI	BTBC-CH-FT	Struvite Production & Treatment of Dairy waste Water using Fluidized Bed Reactor	50,000	9,000	33,000	5,000	3,000	
62	Biju Jacob Professor Co-Investigator Susmithakumari S Assistant Professor	Parvathy P Safna Siraj T.S Sagarkrishna G Lekshminarayanan Potti S	BTBC-CH-FT	COMPARATIVE STUDIES ON THE EFFECT OF VARIOUS BACTERIAL CARRIERS IN SELF-HEALING CONCRETE	50,000	20,000	10,000	10,000	10,000	

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
63	Dr. Anzar S M Assistant professor	Zainudheen Abdul Muiz Akshay Ravikumar Savithri Krishna	ECE	AI based automatic lie detection system using electroencephalogram	40,000	2,000	33,500	1,500	3,000	
64	Dr. Mathew Skaria Professor Co-Investigator ABHIJITH ARUN ASSISTANT PROFESSOR	AHAMMED THANZIL S GANANDHU KRISHNA SAMEER R AHAMMED EASA A	Mechanical	RECLAMATION OF CATHODE MATERIALS FROM LITHIUM ION BATTERIES THROUGH CRYOGENIC BALL MILLING SETUP	50,000	10,000	35,000	2,000	3,000	

NSS College of Engineering, Palakkad

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
65	Dr. Suresh PR Professor Co-Investigator Dr. VINOD V Professor	Adithya S Afrad Hussian Ajay A Aswin R Nath Dhananjay P S	Mechanical	Convertible Wheel Chair Cum Bed	50,000	5,000	39,000	1,000	5,000	
66	Dr Sreelekshmi Pillai G Assistant Professor	Arya K S Balakrishnan N Goutham Manikandan Devika Selvan	Civil	Study of strength and swell characteristics of Palakkad black cotton stabilized using industrial wastes	50,000	12,000	30,000	3,000	5,000	
67	Dr Keerthy M Simon Assistant professor Co-Investigator Dr Rejani V U Associate Professor	Aparna C B Bhavya Prasanth Chaithanya S	Civil	Influence of waste cooking oil on enhancing the properties of aged bitumen	50,000	9,000	35,000	4,000	2,000	
68	Dr Biju M S Associate Professor Co-Investigator Chippy M Rajan Assistant Professor	Joney Ori P V Mohammed Farhan Saket Narayanan Tharun Nath N	Civil	Enhancing the Properties of Recycled Gypsum Using Polymers	44,000	8,000	25,000	5,000	6,000	

College of Engineering Pathanapuram

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
69	Thulaseedharan R Assistant Professor Co-Investigator Vimal S V Assistant Professor	Arun U P Yadhu Krishnan Rijo Rajan Jobish T G	Mechanical	Clam meat seperation and cleaning mechanism	50,000	31,700	12,300	1,000	5,000	
70	Sreesh P S Assistant Professor Co-Investigator Afsal M Assistant Professor	Akhil S Amaljith MS Sreehari S	Mechanical	Design and development of a semi automatic weaving machine to convert tailoring waste to door mat	48,800	9,600	29,600	4,800	4,800	
71	Dr. Siva Bala P Assistant Professor Co-Investigator Remya S R Assistant Professor	Pranav P G Rajalakshmi S Kumar Aswin P S Arundhathi A M	Civil	Construction of prototype of cell filled concrete block pavement and its structural & economical analysis	50,000	10,000	30,000	5,000	5,000	
72	Deepa R Assistant professor Co-Investigator Dr. Siva Bala. P Assistant professor	Fathima J Gokulkrishna S Bhavya A	Civil	Development of a low cost mixed media biofilter for the removal of iron content from water sources surrounding KMML area Chavara	50,000	7,500	32,500	5,000	5,000	
73	Prasanth.R Assistant Professor Co-Investigator Sruthi S V Assistant Professor	Ajas S Mohammed Ajay Sivan Sagar Reji. Said Ali I	CSE	Borewell Rescue Robot Using Haptic Flow Sensor	33,900		30,900	1,000	2,000	

College of Engineering, Adoor

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	

74	Dr. Jayachandran ES Professor and HOD	Abhiram Mohan Gayathri Hari Malavika P Arabhi Radhakrishnan	ECE	Low Cost Portable Ventilator	30,000	3,000	21,500	1,000	4,500	

College of Engineering, Attingal

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
75	Mini Kumari G Assistant Professor Co-Investigator Sajitha V Raj Assistant Professor	Surya M Siji S R Archana Jayaprakash Lekshmi J	ECE	Solar powered automatic cloth rack	30,000	15,000	12,000	1,000	2,000	

College of Engineering Chengannur

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
76	Raji A Assistant Professor	Akshay Pradeep Krishna Ajith Malavika Santhosh Nikhil Jayakumar	ECE	Smart machine learning based pen dispenser	18,000	4,000	11,000	1,000	2,000	

College of Engineering Kidangoor

Sl No	**Name of Princpal Investigator**	**Name of Student Investigators**	**Branch**	**Title of the Project**	**Amount Sanctioned**	**Consumables**	**Equipments**	**Travel**	**Contingency**	
77	Shiney Thankachan Assistant Professor Co-Investigator Dr. Silpa S Prasad Assistant Professor	Jikku Vijay A Sana Jayasankar R	ECE	Metamaterial Incorporated wearable antenna for 5G application	25,000	5,000	15,000	2,000	3,000	

78	Sonima M.P Assistant Professor Co-Investigator Praseetha K Head Of The Department	Aromal Salimon Sidharth Saju Arun E V Irshad I	EEE	PRELIMINARY ACTION CONTROL FOR PREVENTION OF WILDFIRE AND DROUGHT USING IOT AND LORA DEVICE BY FOREST WEATHER FORECASTING	25,180	4,200	16,980	2,000	2,000	
79	Praseetha K Head Of The Department Co-Investigator Aparna Jose Assistant Professor	Albin J Babu Athul Rajan JohnShaji Sooraj Sunil	EEE	EV REGENERATION THROUGH AIR AND MAGNETIC SHOCK	48,500	4,000	42,000	1,500	1,000	
80	Bindiya Hari P Assistant Professor Co-Investigator .Remya KrishnanR Assistant Professor	FathimaYoosuf Bhagya P V Sreesankar T S Mathew Zacharia	Civil	Treatment of Textile Wastewater Banana Trunk using Adsorbents	29,799	9,000	15,799	3,000	2,000	
81	Bindiya Hari P Assistant Professor Co-Investigator Divya S Nair HOD	Bilfi M Abraham B Vasudev Nanditha P Sandra H Pillai	Civil	"Dairy Wastewater sludge Treatment Electricity Microbial Fuel Cell"	25,250	13,250	7,000	3,000	2,000	
82	Divya S Nair Assistant Professor & HOD Co-Investigator Bhavya G Nair Assistant Professor	Aiswarya Anil Anchala Monichan Sony T Saji	Civil	INVESTIGATION ON SUGARCANE BAGASSE ASH BASED GEOPOLYMER BRICK	50,000	14,000	33,500	2,500		
83	Dr. Ojus Thomas Lee Associate Professor Co-Investigator Chitra Merin Varghese Assistant Professor	Sreejith S S Jayakrishnan Akshara Santhosh Ardra Haridas	CSE	Reading Device for deaf and blind in real time speech	22,000	2,000	17,000	1,500	1,500	

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
84	Shahimol Basheer Assistant professor Co-Investigator Dr. Biju K HOD	Abhinand M Ryan Joe Sajeev Mariyappan M	EEE	Dynamic Wireless Power Transfer for Electric Vehicles	26,500	5,000	18,000	1,000	2,500	

College of Engineering Trikaripur

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
85	VIJIMOL VIJAYAN Assistant Professor Co-Investigator Binesh Mohan P Assistant Professor	ATHULJYOTHI FATHIMATH RAHNA SWETHA K ROSHAN M	EEE	A NOVEL CURVE ASSIST BRAKING SYSTEM BASED ON HOUGH TRANSFORM USING RASWROAT ALGORITHM	45,965	5,000	35,965	2,500	2,500	
86	Prasoon PP Assistant Professor Co-Investigator Thamara C Assistant Professor	Adithyan A S Veena Baburaj Anju KK Athira P R	Civil	Biocompatible Water Quality Improvement Using Natural Agents	21,000	12,000	2,000	3,000	4,000	

LBS Institute of Technology for Women Thiruvananthapuram

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
87	Dr Suma Sekhar Associate Professor	Fathima N Jumana B Nila A Sandra S Chandran	ECE	Underwater audio and data transmission using Li-Fi	10,000	5,000		2,500	2,500	
88	Dr Resmi R Assistant Professor Co-Investigator Dr Deepesh Edwin Assistant Professor	Ashmitha B.S Goury Nandhana N.S Harsha Hari Jisha Rani G.S	ECE	UV disinfection Device	15,000	3,000	3,000	3,500	5,500	

89	Dr Sajan K Jose Associate Professor	Divya S Kumar Jasmin S Jyothi S Lekshmi P J	Civil	Partial replacement of cement with phosphogypsm and bagasse ash in foamed concrete	26,077	4,733	17,844	2,500	1,000	

LBS College of Engineering, Kasaragod

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
90	Sheeja V Assistant Professor Co-Investigator Baby Sindhu A V Assistant Professor	Nithin T A Muhammed Hussair KP Aswin K T Vignesh U	EEE	Design and development of motor drive system for electric tiller	41,000	2,000	34,000	3,000	2,000	

Adi Shankara Institute of Science & Technology Kalady

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
91	Dr.Jithesh k AssociateProfessor Co-Investigator Dr. Eldose K K Professor	Goutham Reji Jestin Joseph Joel Shaji Joseph Babu	Mechanical	3D Printing filament from waste plastic	19,000	3,000	12,000	2,000	2,000	
92	Dr. Ajay Kumar Associate Professor Co-Investigator Albins Paul Assistant Professor	Abhirami KB Gopika Rajeev Devikalekshmi J Shenoi D Keerthana Prasad	ECE	Implementation of 2 - Way Interactive Digital Notice Board	18,250	5,250	7,500	2,500	3,000	
93	Dr. P. JenoPaul Professor Co-Investigator Alan P Mathew Associate Professor	Ajay George Balasankar R Saranjith M S S Chandrachoodan	EEE	Multi sensor regenerative charging for electric vehicles	14,500	3,000	7,500	2,000	2,000	
94	Harshananda TN Assistant Professor Co-Investigator Clydin P A Assistant Professor	Niya Thomas Niranjan Krishnan KA Afsal Fathima Noura	Civil	Development of landslide prediction system	19,150		15,150	3,000	1,000	

95	Dona Joy Assistant professor Co-Investigator Dr. A N Swaminathan Associate professor Co-Investigator	Martin Baby Ramkumar S Vishnu Raju Krishna das P M	Civil	Estimation of congestion cost evaluation and solution	12,153		10,400	753	1,000	
96	Manesh T Associate Professor Co-Investigator Rose Mary Varghese Assistant Professor	Dona Antony C S Pooja Akshara S	CSE	On the detection of DoS attacks towards WiFi and IoT networks	17,350	1,000	12,350	2,000	2,000	
97	Prabhu M Assistant Professor Co-Investigator Sobha T Assistant Professor	Afsana Shahul Aiswarya Vijay Akhil Babu	CSE	Counterfeit drug detection usibg blockchain and machine learning	13,000	12,000		1,000		
98	Simi M S Assistant Professor Co-Investigator Gripsy Paul Assistant Professor	Abhishek Hareesan Menon Alfiya M J Hamna Hassan V M	CSE	Emergency assistance for paralyzed using eye blink detection	13,325		10,325	1,000	2,000	

Amal Jyothi College of Engineering, Kottayam

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
99	Mathew J Joseph Assistant Professor Co-Investigator George Sebastian Assistant Professor	NOHIN SALVE OONNITTAN NEERAJ RAJEEV NAIR ALAN JOSE JOSHUA PHILIP THOMAS	Mechanical	Assistive Tilting Mechanisms for Vertical Flow Pumps in Kuttanad	11,000	3,000	4,000	2,000	2,000	
100	Muth S Assistant Professor Co-Investigator Reeju Elisa Baby Assistant Professor	Kevin K Abraham Tojin Tom Varghese Toufeeq P Taje	ECE	3D Printer & Filament Making Machine	27,700	7,200	13,100	3,400	4,000	

101	Dennis Thomas Assistant Professor Co-Investigator Dr S N Kumar Assistant Professor	Abhay Chandran Abin K Babu Deon P Charly Jith John Daniel	EEE	Ultrasound imaging system	31,400	6,000	20,400	3,000	2,000	
102	Sreeja C Assistant Professor Co-Investigator Dr. Godwinraj D Associate Professor	Edwin K Biju Eric Lukose Gladson Jiji Naveen C Abraham	EEE	Hysteresis Compensation for the motion tracking of piezoclectric actuator in Nano-Positioning	34,500	8,000	20,500	3,000	3,000	
103	Dr. Mini Mathew Professor	Gifty Mary Mathew Leni Ann Biju Grace Susan Binu Geo George Joice	Civil	Recycling and reusing of waste materials red mud (RM), M sand dust and rice husk ash as artificial coarse aggregate for construction by geo polymerization for	45,000	7,000	30,000	3,000	5,000	
104	Dr. Aju Mathew George Assistant Professor	An Mariya Deve MD Aswani Unni Bhagya S Abin Joseph	Civil	Biosorption Studies on Simultaneous Removal of Multi-metal ions Chromium (Cr VI) and Copper (Cu II) from Aqueous Solution using Novel biosorbent Synthesized from Salvinia Minima	21,000	8,000	5,000	4,000	4,000	
105	Surej Rajan C, Assistant Professor Co-Investigator Dr Soney C George	Joshua Thomas Alex Kavya Manoj S K Midhun Men	BTBC-CH-FT	Flame retardant Melamine incorporated NR-NBR/Nano/Micro clay composites oil seals for oil rig applications	27,678	7,908	11,862	3,954	3,954	
106	Nikhi Maria Raju Assistant Professor Co-Investigator Dr Soney C George	Manjima K peter Philip Sabadh	BTBC-CH-FT	Bioinspired ZnO blended electrospun polyurethane membrane for air pollution	32,000	8,000	16,000	4,000	4,000	

Federal Institute of Science And Technology Ernakulam

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	

107	Ambili A R Assistant Professor Co-Investigator Dr S Krishnakumar Professor	Manal Zubair Nima Mehrin Muskan M A Nima Subair	ECE	CERTEDETECTRONv2.0 - To develop a system of Engineering students which can categorize students certificate for the automatic calculation of activity points	32,000	8,000	17,000	4,000	3,000	

JyothiEngineeringCollege,Thrissur

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
108	Dr. Anoopa Jose Chittilappilly HOD Co Investigator JineshK J AssistantProfessor	Anakha Subrahmanian Aswin V Emil Kitho N C	Mechanical	Attachable E-hand bike for wheelchair	35,000	10,000	15,000	5,000	5,000	

Marian Engineering College Thiruvananthapuram

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
109	Sanobiya BS Assistant Professor Co-Investigator Renju CM Assistant Professor	Abhinand M G Adarsh Murali Nikhitha Dharmendran Steni S	Civil	DEVELOPMENT OF GEOPOLYMER PAVERBLOCKS AT AMBIENT CURING	30,250	8,600	9,750	4,400	7,500	
110	Greeshma T Assistant Professor	Rubeena Nazeer C. Brahma Dathan Akshay Madhu Krishananunni A	Civil	Analysing Emission Hotspot Along Urban corridors	22,250		14,750	7,500		
111	Dr Sheeja Augstin A Professor Co-Investigator Sreena V G Assistant Professor	Akhil Krishna U Athul S George Ananya Kurian S Praneel	CSE	Web Accessible -Video Conferencing App with Sign Language Recognition System	35,000	10,000	15,000	5,000	5,000	

Mar Baselios Christian College of Engineering & Technology, Peermade

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
112	Vishnu.V.Gopi Assistant Professor	Adarsh Koshy John Adheena Dileep Allwin Jacob Giya Mary George	ECE	Portable and Foldable Electric Scooter for Smart Cities	40,000	6,000	30,000	2,000	2,000	

Mar Baselios College of Engineering and Technology, Thiruvananthapuram

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
113	Dr.Jayakumarj J Head & Professor	Amal Anilkumar Faiz.an Ahamed Dawood Josipha Sebastian Nandan S	ECE	Development of Transit signal priority module with integrated AI assistant	25,500	3,000	17,500	2,000	3,000	
114	Amritha B.J. Assistant Professor	Abhinav A. Pillai Aravind U.R. Varun George	ECE	Electric Wheelchair with Sip and Puff Technology, for quadriplegic/ALS patients	29,000	2,000	23,000	2,000	2,000	
115	Dr Nisha G K Professor Co-Investigator Sandhya P Assistant Professor	Mayoorika Venu Tomin J S Vaishnav Dev Vivin John Thomas	EEE	Two wheeler EV with regenerative braking and V2X technology	27,500	4,000	22,500		1,000	
116	Dr Neethu Roy Professor	Aswin Asok N Thanzeer Arun Raj A Nirmal Sabu Isaac	Civil	Development of Cement Treated Subbase (CTSB) Mix having Partial Replacement of Coarse Aggregates with Construction Demolition Waste for Optimum Permeability and Strength	28,000	2,500	22,000	2,000	1,500	
117	Dr Jisha S V Associate Professor	Arpitha R Nair Asmidh N S Ganga Gopan Govind S P	Civil	Mitigation measures using. Soil bioengineering in rainfall induced landslide prone areas	33,500	10,000	16,500	5,000	2,000	

118	Dr. Jaya S. Pillai Assistant Professor	Devika Jose Feba Ann Varughese Navajith Sasi Pallavi Premjith	Civil	Wastewater treatment combined with CO2 biofixation and biofuel production using indigenous microalgae	50,000	13,000	34,000	1,000	2,000	

Muthoot Institute of Technology and Science Ernakulam

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
119	Dr. Praveen K M Assistant Professor Co-Investigator Ashna Varghese Assistant Professor	Abhishek P Abraham Varghese Aby P Aji Nosh Peter	Mechanical	Development of fish scale derived Nano-Hydroxyapatite (HAp) based paints and putties for wall coating and crack filling	28,500	9,800	9,000	4,800	4,900	
120	Dr.Mary Lissy P N Associate.Professor	Karishma Anna Jolly Sandra Sathyan Sradha Shaji Sreelakshmi M S	Civil	Surface modified nanocellulose membrane in the removal of Cr(VI) from aqueous media.	30,000	8,000	16,000	3,000	3,000	
121	Sruthy T G Assistant Professor	Ashil M A Athira Anil S Balagopal U S Aaliya	Civil	Jute - Pineapple (Jupine) Geotextile for Ground Improvement	25,400	6,400	17,000		2,000	
122	Dhanya Sudarsan Assistant Professor	Rohan Mathew Philip Ashwin Shaji Rishabh K Raj Fathima Althaf	CSE	Breast Cancer Detection and Classification using Patch-Based Learning Techniques	22,200	4,500	12,000	2,850	2,850	

Rajagiri School of Engineering & Technology Ernakulam

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
123	Seema Safar Assistant Professor	Abhijith Das Amijith M M Devika M Joshy Diya Theresa Sunil	CSE	Enriching transformers for image captioning using fourier transforms	30,000		25,000	5,000		

Saintgits College of Engineering Kottayam

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
124	Arun K Varghese Assistant Professor Co-Investigator Harinarayanan Namboothiri MG Assistant Professor	Abel Thomas Adithya Kiran S Ajil B Kallukalam Alen Mammen Varghese	Mechanical	Automated Trash Segregator	31,500	7,500	17,500	4,500	2,000	
125	Daru Anna Thomas Assistant Professor Co - Investigator Ancy Sara Varghese Assistant Professor	Abin Shaji Adhin M B Surya Kumar Maheswari V Nair	EEE	Automatic Rubber Latex Coagulation Machine	30,725	8,600	14,175	3,700	4,250	
126	Arun G Sankar Assistant Professor Co-Investigator Arsha Giri Assistant Professor	Anila Sreelakshmi Anu Mary Alex Feba Varghese Akhil Reny Chacko	Civil	Treatment of Industrial Wastewater to analyze the Efficiency of Constructed Wetlands	35,000	10,000	15,000	5,000	5,000	
127	Jithin Kurian Andrews Assisiant Professor Co-Investigator Dr. Susan Rose Professor	Don James Christy Kuriakose Devesh K Nampoothiri Ashwin Joseph	Civil	Rejuvenation of Scarified Bituminous Pavement Materials	35,000	10,000	15,000	5,000	5,000	
128	Alice Johny Assistant Professor Co-Investigator M Gayathri Devi Assistant Professor	Josh Abraham Kuriakose Kiran K Mathew Shawn Markose Puthenpurakkal Vishal Thomas	Civil	Smart Wrap: The Future of Sustainable Building Insulation with Recycled PET and Thermoelectric Materials	30,232	10,465	9767	5,000	5,000	
129	Dr. Jobil J Arackal Assistant Professor	Abhishek A Ambily Jolly Mohammed Shafin Sha Nandu V M	BTBC-CH-FT	Development and fabrication of portative analyzer for quality Determination of Honey Using	28,000	4,000	22,000	1,000	1,000	
130	Dr. Anshy Oonittan Assistant professor	EMIL ALEXY MATHEWS ROSHIN KURIAN JAYASURYA V SNEHA SATHEESH	BTBC-CH-FT	Treatment of Wastewater in Cement industry Using Electrochemical Methods	7,250	2,000	3,250	1,000	1,000	

SCMS School of

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
131	Dr Gibin George Assistant Professor Co-Investigator Vishnu H Assistant Professor	Aman S Arun P Gopikrishna Premchand Richu Shaju	Mechanical	Biodegradable packing peanuts based on banana leaf ribs.	17,500	1,000	12,500	2,000	2,000	
132	Vinoj P G Assistant Professor Co-Investigator Dr Varun G Menon Professor	Anandu Suresh Sagar P Gokul Sayuj MJ Yunus A A	ECE	Forest fire fighting using FPV drone	25,000	10,000	5,000	5,000	5,000	
133	Susmi Jacob Assistant Professor Co-Investigator Dr Varun G Menon Professor	Mahesh S Mahesh V C Suhail Nassar	CSE	A deep learning model for smart phone authentication during voice interaction through in ear wearable sensors	26,500	2,000	16,500	4,000	4,000	

Sree Buddha College of Engineering Pattoor

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
134	Dr J B Sajin Associate Professor Co-Investigator Dr M S Senthil Saravanan Professor	Chikku Mathew Nithin Sabu Parameswaran Namboothiri K Pranav K	Mechanical	Design and feasibility studies on natural cellulose for baby diapers	20,000	10,000		5,000	5,000	

St. Joseph's College of Engineering & Technology, Palai

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	

135	Dr. Jilse Sebastian Associate Professor Co-Investigator Dr Lijo Paul Associate Professor	Jackson Joy Jobin P J Jobin George Yadukrishna B	Mechanical	Synthesis of photo curable resin from cellulose nanocrystals	32,000	15,000	9,500	2,500	5,000	
136	Dr. Rajesh Baby Associate Professor Co-Investigator Dr.George Tom Varghese	Jeswin Philip Jinish K Reji. Rejoy George Diya Jose	Mechanical	Smart Bed, A self adjustable bed for bedridden patients to prevent bedsore	36,500	10,000	16,500	5,000	5,000	
137	Dr. Bennet Kuriakose Associate Professor	Akshaya Varghese Amrutha Shaji Diyana Tomy Jomet Thomas	Civil	SELF HEALING CONCRETE USING BACTERIA FROM COW DUNG	50,000	42,500		2,500	5,000	
138	Divya Sunny Assistant Professor	Sathwik P Nair Rajat Mathew Noel Jacob	CSE	SpecAssist - Live transcribing smartglasses	18,835		14,835	2,000	2,000	

Vidya Academy of Science and Technology,Thrissur

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
139	Dr. Anjali P Sasidharan Assistant Professor Co-Investigator Chithira Ajeeth Assistant Professor	Rahna K Rajeev John J Emmatty Helma Mariya Davis	Civil	Microbe Induced Calcium Carbonate Precipitate Mediated Brick Manufacturing	39,000	25,000	4,000	5,000	5,000	

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 equipments 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 College. Purchase of stationery shall be for project purpose 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 amount towards the purchase of those items not clearly mentioned, if any, in the project proposal.

5. On completion of the project, 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 journey and 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. Book or literature purchased, if any, should be taken into the Stock Register of 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

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

No. KTU/RESEARCH 3/1082/2022 Dated: 26.02.2023

From

The DEAN (Research)

To

The Principal,
SCMS College of Engineering and Technology, Ernakulam.

Sir,

Sub:- APJAKTU - CERD - Research Seed Money Scheme - Projects Selected for funding - reg:-

I am glad to inform you that the project proposals as listed in Annexure I are provisionally selected for funding under Research Seed Money (RSM) scheme of KTU.

The expenditure should be incurred as per the sanctioned budget heads and in accordance with terms and conditions given in Annexure II. Format of MOU to be furnished by the college is given as Annexure III.

The Principal Investigators may please be directed to forward request (in Annexure II) for releasing the fund with Bank Account details. The fund will be released only after settling pending accounts of the principal investigator in CERD, if any. Any request received after three months from the date of this letter will not be considered.

Yours faithfully
Dr. Shalij P.R *
DEAN (Research)

Copy To

1. Shri. Jayadevan P C, Assistant Professor in Mechanical Engineering.
2. Dr. Gibin George, Assistant Professor in Mechanical Engineering
3. Dr. Abin Joseph, Assistant Professor in Mechanical Engineering.
4. Smt. Meera Varghese, Assistant Professor in Civil Engineering.
5. Smt. Merin Mathew, Assistant Professor in Civil Engineering.
6. Dr. Praseeja A. V., Assistant Professor in Civil Engineering.
7. Shri. Rahul R Rai, Assistant Professor in Civil Engineering.
8. Smt. Asha S, Assistant Professor in computer Science and Engineering.
9. Dr. Geethu R, Assistant Professor in Science.

10. Smt. Mary Catherine V. G, Assistant Professor in Electronics and Communication Engineering.

* This is a computer system (Digital File) generated letter. Hence there is no need for a physical signature.

Annexure II

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Centre for Engineering Research and Development
Request for releasing RSM grant

Title of Project:

Date of sanction:

Amount sanctioned:

Account No and bank details:

Terms & Conditions for Research Seed Money Scheme

1. The amount sanctioned for the project shall be deposited in a separate joint A/c of Principal Investigator and Head of the institution where the Principal Investigator works. (Name of A/c: CERD Research Seed Money - File No.)

2. The maximum duration of the project will be three years from the date of start of the project

3. The amount has to be utilized as per budget provision under each head. It is the discretion of the University to settle amount towards the purchase of those items not clearly mentioned, if any, in the project proposal.

4. The purchase of equipments shall be in accordance with the store purchase rules. All equipment purchased will be the property of CERD and the stock entry of the items purchased shall be maintained in the College signed by the Investigator, Lab in charge and Principal. Purchase of computers/peripherals is not allowed unless specifically mentioned in the sanction order.

5. 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 other 50% is produced by the college.

6. The stock entries of consumables purchased shall also be done in the consumables stock register of College. Purchase of stationery shall be for project purpose only.

7. Books and literature purchased should be taken into the Stock Register of Central Library or Department library and then distributed to the investigators.

8. The interest accrued will also be accounted in the project.

9. On completion of the project, detailed report of the research work (hard and soft copies), audited statement of accounts and Utilization Certificate in the prescribed format duly attested by the head of the institution shall be submitted within one month on completion of the project for settlement of accounts.

10. If the project is not completed within the time limit, the grant amount should be reimbursed along with the interest accrued.

11. 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 CERD may designate Scientist/Specialist or an Expert Panel to periodically review the work done. The Principal Investigator has to appear for the periodic review meetings.

12. If the PI to whom the project has been sanctioned, leaves the Institution, the Head of Institution/PI shall inform the same to the CERD and in consultation with the CERD, evolve steps to ensure successful completion of the project, before relieving the PI.

13. Investigators must acknowledge the CERD in reports and technical/scientific papers published 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 Journals.

14. 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.

15. The knowledge generated from the project will be the property of the CERD and should be properly acknowledged. Transfer of technology generated shall be done in consultation with the CERD.

We agree to the terms and conditions stated above. Please transfer the amount to the above bank account.

Signature of Principal Investigator:

Name:

Designation:

Signature of Head of Institution:

Name:

Office Address:

Seal

Annexure III

(Stamp paper Rs 200)

MEMORANDUM OF UNDERSTANDING [MOU]

BETWEEN

-Name of Self Financing Engineering College-

AND

APJ Abdul Kalam Technological University (KTU), THIRUVANANTHAPURAM

This Memorandum of Understanding is entered into at Thiruvananthapuram on this --- Day of Month Year

BETWEEN

-Name of Self Financing Engineering College- affiliated to APJ Abdul Kalam Technological University (herein after referred to as COLLEGE) which expression shall unless it be repugnant to the context or meaning thereof to be deemed to mean and include its successors and assigns, represented by The Principal, ---Name of college- place of college -, of the ONE PART.

AND

APJ Abdul Kalam Technological University, CET campus, Thiruvananthapuram-695016 (herein after referred to as KTU) which expression shall, unless it be repugnant to or inconsistent with subject or context thereof, include and be deemed to include their heirs, successors and assigns, represented by The Dean (Research), APJ Abdul Kalam Technological University, Thiruvananthapuram 695016 of the OTHER PART.

1. TERMS OF UNDERSTANDING

1.1. This memorandum of understanding lists out the terms of releasing and utilization of CERD research seed money fund sanctioned to a faculty of COLLEGE for the year ----------.

1.2. The scheme is constituted for the purpose of providing assistance in the form of grants to initiate research work in Engineering and Technology with particular relevance to the State of Kerala in the economic and industrial development.

1.3. Grant will be released to the principal investigator of the project through the Head of the institution.

1.4. The maximum duration of the project will be three years from the date of start of the project

1.5. On completion of the project, one copy of the final project report on the work done should be sent to the CERD along with the utilization certificate (UC) and statement of expenditure (SE).

1.6. The institute will maintain separate audited accounts for the project.

1.7. 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.

1.8. 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 CERD may designate a Scientist/Specialist or an Expert Panel to review the work done.

1.9. If the PI to whom the project has been sanctioned leaves the Institution, the Head of Institution/PI will inform the same to the CERD and in consultation with the CERD, evolve steps to ensure successful completion of the project, before relieving the PI.

1.10. Investigators must acknowledge the CERD in reports and technical/scientific papers published 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 journals.

1. 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.

1.12. The knowledge generated from the project will be the property of the CERD and should be properly acknowledged. Transfer of technology generated shall be done in consultation with the CERD.

1.13. 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 other 50% is produced by the COLLEGE.

1.14. The equipment details must be entered in the stock register of the college and signed by the Investigator, Lab in charge and Principal.

1.15. The college should submit annually the status and details of earlier grants received from KTU with pending statement if any.

1.16. The grant amount should be deposited in a separate bank account in the name of the Principal investigator and Head of Institution jointly.

1.17. The interest accrued shall also be accounted in the project.

1.18. If the project is not completed within the time limit, the grant amount should be reimbursed along with interest accrued.

We agree to the terms and conditions stated above.

2. SCOPE OF MOU

Nothing in this Memorandum is intended to or shall be deemed to establish an exclusive relationship between the parties or to restrict any activities that either party would otherwise be able to undertake. Nothing in this Memorandum is intended to or shall be deemed to establish any partnership or joint venture between the parties or constitute any activities that either party would otherwise be able to undertake.

3. PERIOD

This MOU shall be perpetual. This agreement will be amended or modified by the University at any time.

4. DISPUTE RESOLUTION AND ARBITRATION

This memorandum of understanding shall be governed by the laws of Union of India and State of Kerala. Any dispute arising with this MOU shall be brought to the notice of the Vice-chancellors of the parties who shall try to resolve them, failing which legal reasoning be taken in the jurisdiction of court in Thiruvananthapuram.

The terms and conditions of this memorandum of understanding shall not be disclosed to any third parties by any party of this memorandum of understanding without the prior written consent of both parties.

5. FORCE MAJEURE

Without prejudice to accrued liabilities and rights, no party shall have any liability whatsoever to the other Party or be deemed to be in default by reason of delay or failure in performance under this memorandum of understanding to the extent that such delay or failure is caused by or arises from acts or circumstance or events beyond the reasonable control of that party, including but not limited to acts of god, acts or regulations of any governmental authority, war or national emergency, accident, fire, riot, strikes, lock-outs, industrial disputes, natural catastrophes or epidemics.

Each Party shall bear its own losses arising from such force majeure event(s), if any.

6. INTELLECTUAL PROPERTY

All prior information, design and data existing with either party before the signing of this MoU (pre-existing IP) shall be the sole property of the concerned party. All Intellectual Property including design information, designs, source codes and data generated through the collaboration under this MOU shall be as mutually agreed in writing and also as per the guide line of the funding agency, if such an agency is involved. Any IPR arising specifically out of this collaboration will be owned by both parties, except when mutually agreed in writing otherwise.

IN WITNESS WHEREOF, the parties hereto have caused this memorandum of understanding to be executed in duplicate, through their representatives at Thiruvananthapuram in the day and year first above written:

Now the memorandum of understanding witnesses as follows.

Principal **Name of College** **University** **Place**	**Dean (Research)** **APJ Abdul Kalam Technological** **Thiruvananthapuram 695016**
Witness: 1	**Witness: 1**
Signature :	Signature :
Name :	Name :
Witness: 2	**Witness: 2**
Signature :	Signature :

SCMS School of Engineering and Technology, Ernakulam												
SL No	Name of Principal Investigator	Title of the project	Branch	Amount Sanctioned	Ist installment	2nd installment	Consumables	Equipment	Travel	Contingency		
1	Jayadevan P C Assistant professor	Analysis of Low Reynolds Flow (Stokes Flow) Through Micro Capillaries	ME	50,000	40,000	10,000	40,000	0	5000	5000		
2	Dr. Gibin George Assistant Professor	Development of eco-friendly packaging materials from agricultural wastes.	ME	70,000	60,000	10,000	10,000	50,000	5000	5000		
3	Dr. Albin Joseph Assistant Professor	Development of Floating type solar still desalination system integrated with direct absorption flat plate solar collector for improved productivity	ME	84,000	60,000	24,000	60,000	0	8000	16,000		
4	Meera Varghese Assistant Professor	Sea water intrusion modelling into some of the coastal aquifers in Thrissur district.	Civil Engineering	46,000	35,750	10,250	0	0	14,000	7000	testing charges 25,000	
5	Merin Mathew Assistant Professor	Catchment scale source apportionment of sediment yield into Vembanad Lake	Civil Engineering	160,000	110,000	50,000	40,000	0	20,000	20,000	Testing charges 80,000	
6	Dr. Praseeja A V Assistant Professor	Study of dispersion coefficient of contaminants through different types of soils and remediation using natural fibres	Civil Engineering	155,000	127,500	27,500	30,000	100,000	10,000	15,000		
7	Rahul R. Pai Assistant Professor	Fatigue studies and resilient behavior of crushed brick fly ash lime (CBFL) mix for use in base layer of flexible pavement	Civil Engineering	90,000	57,500	32,500	20,000	0	10,000	10,000	Testing charges 32,000	Experimental charges 18,000
8	Asha S Assistant Professor	Multimodal Ensemble Deep fake Detection using Visual-Audio-Textual features	CSE	159,000	130,000	29,000	5,000	130,000	12,000	12,000		

9	Dr. Geethu R. Assistant Professor	Developing cost effective and eco-friendly copper tin sulphide material for photovoltaic application	Science	75,000	50,000	25,000	40,000	5,000	10,000	20,000
10	Mary Catherine V G Assistant Professor	Touch Activated Soft Robotic Hand Control for Elderly Assistance	ECE	60,000	40,000	20,000	30,000	15,000	5,000	10,000

1. APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

College of Engineering Trivandrum Campus,
Thiruvananthapuram. Pin 695 016

Application format for Research Seed Money

1. Title of the Research Proposal: Analysis of Low Reynolds Flow (Stokes Flow) Through Micro Capillaries

2. Name & address & experience of Investigator:

Dr. Jayadevan P C, Assistant Professor, Department of Automobile Engineering, SCMS School of Engineering and Technology, Karukutty-683576
jayadevanpc@scmsgroup.org
9946742436

3. Teaching experience: 8 Years

4. Objectives of Research (150 words)

The objectives of the research are,
i) To investigate the characteristics of flow at low Reynolds numbers
ii) Investigate the effect of surface irregularities on the flow characteristics
iii) Develop in vitro devices based on the analysis

5. Broad Subject area / field of classification: Fluid Dynamics, Microchannel Flows

6. Project Type(s) (Basic Research / Applied Research / Developmental / Demonstration /Others: Applied Research

7. Abstract (400 words)

Fluid flow through microchannels has very wide applications in engineering and bio-medical fields. Low Reynolds number flow serves the basis for many applications in biological systems, developing microelectromechanical devices, in porous media, etc. A clear understanding of the fluid dynamics of Stokes flow through microcapillaries are very essential for the design of MEMS and for the development of in-vitro devices. In macro scale, Stokes flow can be modeled by linearizing the Navier-Stokes equation. But the dimensions reduce to micro-scale, the flow deviates from the fundamental understandings. The studies reveal that the deviation may be due high aspect ratio of the microchannels or the effect of surface irregularities of the channel. The present study aims to explore the fluid flow characteristics of microcapillaries at low Reynolds numbers.

8. Scientific scope of the Research proposal (400 words)

The above problem has high research potential since the flow through cardiovascular systems can be modeled as Stokes flow in an in-vitro platform. The fluid flow in Lab-on-a-chip and Organ-on-a-chip is purely in low Reynolds number regime. The latest concept of the human-on-a chip can also be modeled by Stoke flow. The understanding of Stokes flow characteristics in microchannels can be applied in drug delivery and testing. Moreover, the diverse applications, Stokes flow through microcapillaries is a fundamental research problem in the area of micro and nanofluidics.

9. Applications / Socioeconomic importance / Relevance, if any, for the utilization and management of the natural resources of the State)

Understanding the dynamics of the flow can be applied to the design and fabrication of many in-vitro systems to mimic the in-vivo mechanisms. The analysis of body fluids for the detection of different ailments will become fast and economical if we use microscale systems. Also, the sample size for the testing will decrease drastically. All of these will lead to the advancement in point-of-care diagnostics and eventually to rural healthcare developments, which is a major concern in a developing country like India.

10. Scientific background of the project

a) **Importance of the problem:** The problem of low Reynolds number flow through microchannels has importance in engineering as well as biomedical applications. Apart from the wide variety of applications, it has high fundamental/basic research value. An understanding of the characteristics of fluid flow is very important for the design of microfluidic devices, also for the development of new materials in the field of bio-microfluidics[1-7].

b) **Related work already performed or in progress at your organization or in the state**: A successful research team working in the area of micofluids and nanofluidics at NIT Calicut under the guidance of Prof. Dr. C B Shoban.

I have done my research work both experimental and numerical, at Heat transfer Research laboratory of GEC Thrissur.

At SCMS presently no experimental works are going on in the related field. Computational analysis of fluid flow through microchannels are performing with the help of Ansys Fluent.

c) **Related work already performed or in progress at other places in India or abroad:** In all primary institutions like IISc and IITs have well-equipped micro and nano research laboratories with numerical and experimental facilities.

11. Details of any preliminary work done by the investigator

i) Jayadevan, P.C., Siddharth, R. and Kamath, P.M., 2019. Modeling Frictional Characteristics of Water Flowing Through Microchannel. *Journal of Applied Fluid Mechanics*, *12*(1), pp.243-255.

ii) Siddharth, R., Jayadevan, P.C. and Kamath, P.M., 2017, March. Numerical study on effect of sinusoidal roughness pattern on fluid flow through microchannels. In *2017 International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS)* (pp. 1-4). IEEE.

iii) Jayadevan, P.C. and Kamath, P.M., 2021. Experimental investigation of liquid flow through microtubes of manufactured roughness level. *International Journal of Fluid Mechanics Research*, *48*(4).

12. Detailed year-wise work plan (Indicate methods / Techniques to be used)

Activity (Months)	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24
Review of Literature								
Computational Analysis								
Experimental analysis								
Analysis of data								
Report Writing								

13. Particulars of equipment required

i) Computational Facility with Ansys Fluent and MATLAB

ii) Experimental facility

14. Particulars of any other facilities required

Nil

15. Particulars of the facilities that will be provided by the institution where this projectwill be implemented

The institution has a licensed version of Ansys Fluent

16. Whether the project was submitted to any other organization for financial support : No

17. Budget Details: Estimated expenditure: Rs. 75000

Sl No	Items	Amount (Rs)
1	**Consumables** i) Fabrication of microchannel ii) Consumables like pneumatic tubes, connectors etc	Rs:30000 Rs: 10000
2	Equipment (For Private self-financing Colleges, 50% of the actual Equipment cost subject to the maximum ofsanctioned amount shall be borne by the college)	Nil
3	**Travel** i) Travel to labs and fabrication facility	Rs: 15000
4	**Contingency** To buy journals, books, Accommodation etc	Rs: 20000
	Total	Rs:75000

18. The sources of funding the project including funds from other agencies from whichfinancial assistance is obtained/expected to be obtained, and the quantum of assistance from each agency: Nil

19. Quantum and nature of assistance expected from the APJAKTU: Financial support

20. Name and address of the authority of Institution authorized to receive the grant:

SCMS School of Engineering and Technology
Vidya Nagar, Palissery, Karukutty,
Kerala 683576

21. Whether grant under this scheme had been availed earlier by the investigator: (If so,provide details): No

22. Details of projects already undertaken by the Principal Investigator with any otherfunding agency: Nil

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3. Mahmud, M.P., Bazaz, S.R., Dabiri, S., Mehrizi, A.A., Asadnia, M., Warkiani, M.E. and Wang, Z.L., 2022. Advances in MEMS and Microfluidics-Based Energy Harvesting Technologies. *Advanced Materials Technologies*, p.2101347.
4. Nie, J. and He, Y., 2022. Integration of three-dimensional printing and microfluidics. In *Multidisciplinary Microfluidic and Nanofluidic Lab-on-a-chip* (pp. 385-406). Elsevier.
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Declaration

Certified that the details furnished above are correct to the best of my knowledge and belief and that the amount of financial assistance, if granted, will be utilised for the purpose for which it is granted within the time prescribed by APJAKTU. I also undertake to abide by the rules and other conditions prescribed by the grantee.

Dr. Jayadevan P.C.

Name and Signature
of the Investigator

Name and Signature of
Head of the Institution

(Office seal)

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DR. PRAVEENSAL C.J.
PRINCIPAL
SCMS SCHOOL OF ENGINEERING & TECHNOLOGY

Place: Karukutty

Date: 27/4/2022

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

College of Engineering Trivandrum Campus, Thiruvananthapuram. Pin 695 016

Application format for Research Seed Money

1. **Title of the Research Proposal**: Development of Floating type solar still desalination system integrated with direct absorption flat plate solar collector for improved productivity.

2. Name & address & experience of Investigator: ***(Mobile No. and e-mail are mandatory)***	Dr Albin Joseph Assistant Professor Department of Automobile Engineering SCMS School of Engineering and Technology, Ernakulam Mob: 7025934379 Email: albin@scmsgroup.org

3. **Teaching experience: 6 Months**

4. **Objectives of Research (150 words**)

- To synthesis carbon dot based nanofluid.
- To investigate the photo thermal conversion efficiency of the synthesized nanofluid.
- To optimize the synthesis process parameters of nanofluid.
- To prepare a spectrally selective floating type absorber
- To optimize the coating process parameter involved in the preparation of spectrally selective absorber.
- To design and fabricate the solar still and direct absorption flat plate solar collector.
- To investigate the performance of floating type absorber based solar still integrated with the direct absorption flat plate solar collector

5. **Broad Subject area / field of classification:** Desalination

6. **Project Type(s) (Basic Research / Applied Research / Developmental / Demonstration /Others:** Applied Research

7. Abstract (400 words)

In the present scenario, in many countries scarcity of water is a major issue. Desalination of sea water stands as a potential solution to meet the demand of water. However, desalination by employing fossil fuels as the energy source is expensive as well as polluting. Utilization of renewable energy is one of the possible solutions for the same. Among the various sources of renewable energy, solar energy is one of the clean and potential resources recommended by the experts due to its free availability. Desalination can be achieved by various devices like multi-stage flash distillation, Reverse Osmosis, Solar Stills, etc. Solar stills are compact low-cost devices that are suitable for small communities with minimal operational cost. In a conventional solar desalination system, the Still is placed under the solar irradiance and the evaporated water is condensed and collected. It is noticed from the literature that temperature of the water in the Still has very high influence in the performance of the stills. Productivity was found to be enhanced with the temperature of saline water, which could be feasible with an external heating. Hence the present proposal aims to develop a floating type solar still coupled with a direct absorption flat plate solar collector. In the flat plate collector, a solar selective C-Dot nanofluid is proposed as the working fluid. The C-Dot nanofluid absorbs the heat through the flat plate collector and transfer the heat to the solar still thus enhances the temperature of the saline which further results improved productivity. In addition, direct solar absorption system has additional advantage compared to conventional collectors that works on surface absorption as it neglects the chance of conduction and convectional losses.

8. Scientific scope of the Research proposal (400 words)

As it is well known that the fresh water is a matter of existence in earth due to which the production of fresh water has of great importance in the society. Even though the conventional desalination systems meet the present demands, the economic and ecological aspects of these system were drawn back. The conventional solar still vaporize the water from the saline by extracting the heat from the solar radiation. However, it is advisable to achieve an enhanced temperature at the surface of the saline water that improves the productivity, which was accomplished by the introduction of floating absorber. Moreover, further enhancement could be expected with addition heating of the saline water. By considering all these facts the proposal aims to improve the productivity of the existing solar stills by introducing floating absorber and a flat plate collector for external heating. The working fluid used in flat plate collector is a solar selective nanofluid that could a solar absorptivity in the range of 90 to 95%. Moreover, since the proposed system run the potential of solar radiation, the associated carbon emission and promote the sustainability.

9. Applications / Socioeconomic importance / Relevance, if any, for the utilization andmanagement of the natural resources of the State)

Kerala state experience the scarcity of water during the month of February to may, which is period at which the ambient temperature is very high. (Maximum recorded value is 41.3 in Palakkad). Cities are mainly affected by these issues where it is difficult to get underground water due to the concern with soil pollution and population. Moreover, the large consumption of deep water by various factories especially of soft drink units, demands for fresh water to the citizens. Hence it is very important find some other means which is more convenient. Due to these reasons solar desalination dominates more to achieve the fresh water for the society. Moreover, the proposed project could find its application in mass production of fresh water by various governmental authorities if implemented at commercial scale.

10. Scientific background of the project

a) Importance of the problem.

As per the survey done by the National Renewable Energy Laboratory [1], the solar radiation falling on Indian region is around 7.5 kWh/m^2, which could be converted into useful forms. Taking into consideration the climatic aspects in a country like India, it could be strongly stated that solar energy production has great potential. Moreover, the production of fresh water is one of the essential needs in the present scenario in a state like Kerala. Many of people depends on deep water for their need during the peak summer. Many of the cities in Kerala face the water scarcity during the month of March to May during which the solar radiation is nearly 900 W/m^2. In this circumstance it could be strongly recommend that the successful installation of proposed project could be capable of fresh water production to meet the demand.

b) Related work already performed or in progress at your organization or in the state.

A number of studies have been conducted and reported worldwide, however the studies conducted in the state are limited. National institute of technology Calicut is the main organization where the research on desalination was progressing, specifically on floating absorber based still, and a few results are available in the literature. As per the report of G. Sebastian and S Thomas [2], the introduction of floating absorber to the conventional solar still enhances the productivity of the still. The authors observed a maximum efficiency of 88.6%. In addition to this reported study, ore studies on floating absorber based solar stills are under progress in the organization.

c) Related work already performed or in progress at other places in India or abroad.

The technique of extracting fresh water through solar desalination was emerged from the 19th century itself. The working of these solar desalination by employing stills resembles the natural hydrological cycle [3]. However, many modifications have been done on the conventional solar stills and recent studies mainly focus floating type absorber based solar stills. Floating type absorber based solar stills when compared to the conventional stills is equipped with the absorber plate in floated manner. The temperature of fluid in the still have high influence in the performance of the still. Due to this reason reports on solar stills integrated with other heat source are also available with improve productivity. As per the literature the stills integrated with the other heat source exhibits better performance [4,5]. Some of the relevant literatures are summarized in table 1

Table 1.

Summary of some of the relevant international literature

*CSS: conventional solar still

**SS: Solar still

Publisher/Year /Country	Integrated system	Solar still type	Remarks
Elsevier/2017/ Algeria [6]	Vertical Rotating wick	CSS	• Improve effective surface area for absorption and evaporation • Average thermal efficiency in 20% more than CSS. • Moving wick breaks surface tension which improves heat transfer.
Elsevier/2016/ Egypt [7]	Phase change material	CSS	• Daily production is 67% more than CSS • Production is enhanced during night time due to release of latent heat
Elsevier/2015/ Egypt [8]	Use of nanofluids, reflectors and external condensers	Corrugated wick SS	• Corrugated wick increases the surface area resulting in more HT • Nano particles are had good thermal storing and heat transfer properties • 285% and 255% productivity when using CuO and Al2O3
Elsevier/2014/ Oman [9]	Refrigeration cycle	Inverted SS	• Additional heat source into the basin from condenser of the refrigerator • Cooling of glass cover with refrigerator which enhances condensation rate.
Elsevier/2013/ Egypt [10]	Internal reflectors	Stepped SS	• Productivity is 75% higher than CSS • More water in stepped basin for same depth, also stepped basin has higher surface area.

Elsevier/2019/ Egypt [11]	Solar dishes with conical tank, PV panels and tracking system	CSS	• Water in the conical tank is heated with dish collectors • The heated water sprayed in basin to enhance evaporation
Elsevier/2019/ Iraq [12]	Underground heat exchanger		• Water vapor condenses in pipes underground • Humidity ratio increases along the length of the still • Water production is increased by 50%
Elsevier/2018/ Iran [13]	Nano coating of condensing surface	CSS	• Nano coating results in drop wise condensation • Coated surface gives more distillate at 500 inclinations than 10o • Drop wise condensation leads to more dripping
Elsevier/2018/ Iran [14]	Reticular porous media	CSS	• Sponge rubber is used because it has low Cp • Sponge rubber has more surface area • Efficiency is less than conventional still at evening time but overall productivity is more
Elsevier/2019/ Iran [15]	Flat plate reflectors with cooling system	Modified SS with angled bars	• Basin and reflector inclination is adjusted to get maximum solar radiation • 14 % more efficient than CSS at 25^{o} inclination

A number of studies on solar desalination are progressing around the world. IIT madras sets India's first solar powered desalination plant in Chennai which could generate 10,000 liters of fresh water. However, research on solar desalination in Indian research also have found a remarkable position among the world research. Arunkumar et al. [16] experimented on the floating type absorber by inducing the porous texture on the absorber and by introducing bubble wrap insulator around the still. As per the authors, this modification enhanced the productivity of the stills from 1.91 l/m^2 to 3.1 l/m^2. The state of Tamil Nadu is one of the prominent sources of research, in which the institutions like Indian institute of Technology, Madras, National institute of Technology, Trichy, Anna University Chennai, are the major contributors. IIT madras sets India's first solar powered desalination plant in Chennai. M Muraleedharan et al [17] conducted and experiment by integrating a conventional solar still to a linear Fresnel lens concentrator. The authors claim a 250.27% enhancement in the productivity of modified stills compared to the

conventional still. Likewise, a number of experiments have been conducted in the national level, a brief summary of some of the relevant literature is shown in the Table 2.

Table 2.

Summary of some of the relevant national level literature.

Publisher/Year/Country	Integrated system	Solar still type	Remarks
Elsevier/2019/ India [18]	Permanent ferrite rings magnets	CSS	• Magnetization of water increased distillate output by 50% • The magnets act as heat storage medium • Magnetization of water increases its evaporation by decreasing surface tension
Elsevier/2019/ India [19]	Hollow fins	DSSS	• Optimization of fin number and thickness • Water temperature is higher than absorber plate due to fins • Circular hollow fins are better than square hollow fins
Elsevier/2018/ India [20]	Peltier based hybrid PV	CSS	• Peltier effect is used to cool the condensing surface and heat the absorber plate • 30% more efficient than CSS and 6 times more yield
Elsevier/2019/ India [21]	Multiple V shaped floating wicks	CSS	• Floating wicks made from black jute cloth wrapped in thermocol • Daily output is more than CSS • Basin water and glass cover temperature is lower and higher than CSS •
Elsevier/2018/ India [16]		CSS	• Bubble wrap was used to prevents heat loss and carbon to impregnated foam to increases surface area • CIF is hydrophilic so the top surface becomes wet when placed in water unlike sponges • Productivity is 35% more

Elsevier/2017/ India [22]	Solar pond and Reflectors	Double basin with stepped upper basin	• 105% increase in productivity than CSS • Heat exchange from solar pond and lower basin
Elsevier/2015/ India [23]	Parabolic dish concentrator with cover cooling with charcoal in fins	Triple basin SS	• Yield increased by 104% • Cover cooling done by pump • Concentrator increased lower basin temperature by 26o C
Elsevier/2017/ India [24]		Triangular pyramid solar still with inclined still	• Yield improved by 79% • Hot water from inclined still is used to increase the productivity of pyramidal still
Taylor and Francis /2017/ India [25]	Air Blower	CSS	• Blower causes bubbling effect which increases evaporation • 100% increase in efficiency when using blower
Elsevier/2017/ India [26]	Basin height (mean distance between glass cover and saline water) and stirring of water	CSS	• Yield increases with reduction in basin height and stirring • Motor with PV panel is used for stirring • Stirring increases the efficiency by 30 %

Gaps Identified for the literature

A number of solar selective materials were considered to analyze its influence on desalination. However, the parametric studies on floating absorber type solar still are not much explored. Moreover, the attempts to enhance the bulk fluid temperature of solar still is limited.

11. **Details of any preliminary work done by the investigator:** The carbon dot nanofluids has been synthesized and its influence on direct absorption parabolic collector was established by the investigator. Synthesis procedure, characterization, and performance evaluation on parabolic collector is detailed in the article, "**Albin Joseph**, Shijo Thomas* Energy, exergy and corrosion analysis of ultra-high stable Carbon quantum dot nanofluid employed direct absorption solar collector, Renewable Energy 181 (2022) 752-737."

12. Detailed year-wise work plan (Indicate methods / Techniques to be used)

Task No	Description	Year 1				Year 2			
		3	6	9	12	15	18	21	24
1	Procurement of equipment and materials								
2	Synthesis of Carbon dot nanofluid and spectrally selective floating absorber.								
3	Characterization of synthesized nanofluid and absorber coating.								
4	Optimization of synthesis process parameters of carbon dot based nanofluid and floating absorber								
5	Fabrication and installation of flat plate collector for direct solar adsorption collector and floating type solar stills.								
6	Evaluating the influence of optimized carbon dot based nanofluid and floating absorber at various working condition.								
7	Report preparation								

The methodology of proposed research is divided mainly into four stages as follows.

Stage 1: Synthesis and parameter optimisation of carbon dot/ Ethylene glycol nanofluid: Ascorber acid could be used as the carbon source. The carbonisation of ascorbic acid in presence of Cu^{2+} at 150^{o}C yield the carbon dot. The optimisation of constituent concentration in the preparation of nanofluid needs to be performed to achieve the highly solar selective and stable nanofluid. Base fluid used is the ethylene glycol which could be used for medium temperature heat transfer application due to it desired properties.

Stage 2: Characterization of synthesized carbon dot nanofluid: The optical absorbance of nanofluid could be measured using the UV spectrophotometer. The thermo-physical properties like thermal conductivity and viscosity could be analyzed using the KD2 Pro Thermal Analyzer and Rheometer, respectively. In addition, structural and morphological analysis could be performed, Transmission electron microscopy (TEM) and X-ray Diffraction (XRD).

Stage 3: Prepation and optimisation of coating process parametres floating absorber. Expholiated graphate or few layer graphence is coating on aluminium sheets through electrophoretic deposition. The processprameters like concentration of electrolite, electrode seperation, electrode potential, and operation time could be optimised using the design of experiment concenpt.

Stage 4: Design and fabrication of experimental setup: Figure 1 shows the schematic of experimental setup. The experimental setup consists of a flat plate collector and a floating type absorber solar still. The synthesized nanofluid is made to flow through the collector, placed at the focus of flat

plate collector that absorbs the irradiance and subsequent heat conversion takes place. This heat is the taken to heat the saline water in the solar still. Further the nanofluid will be directed to a reservoir from which to the inlet of the trough by means of a pump.

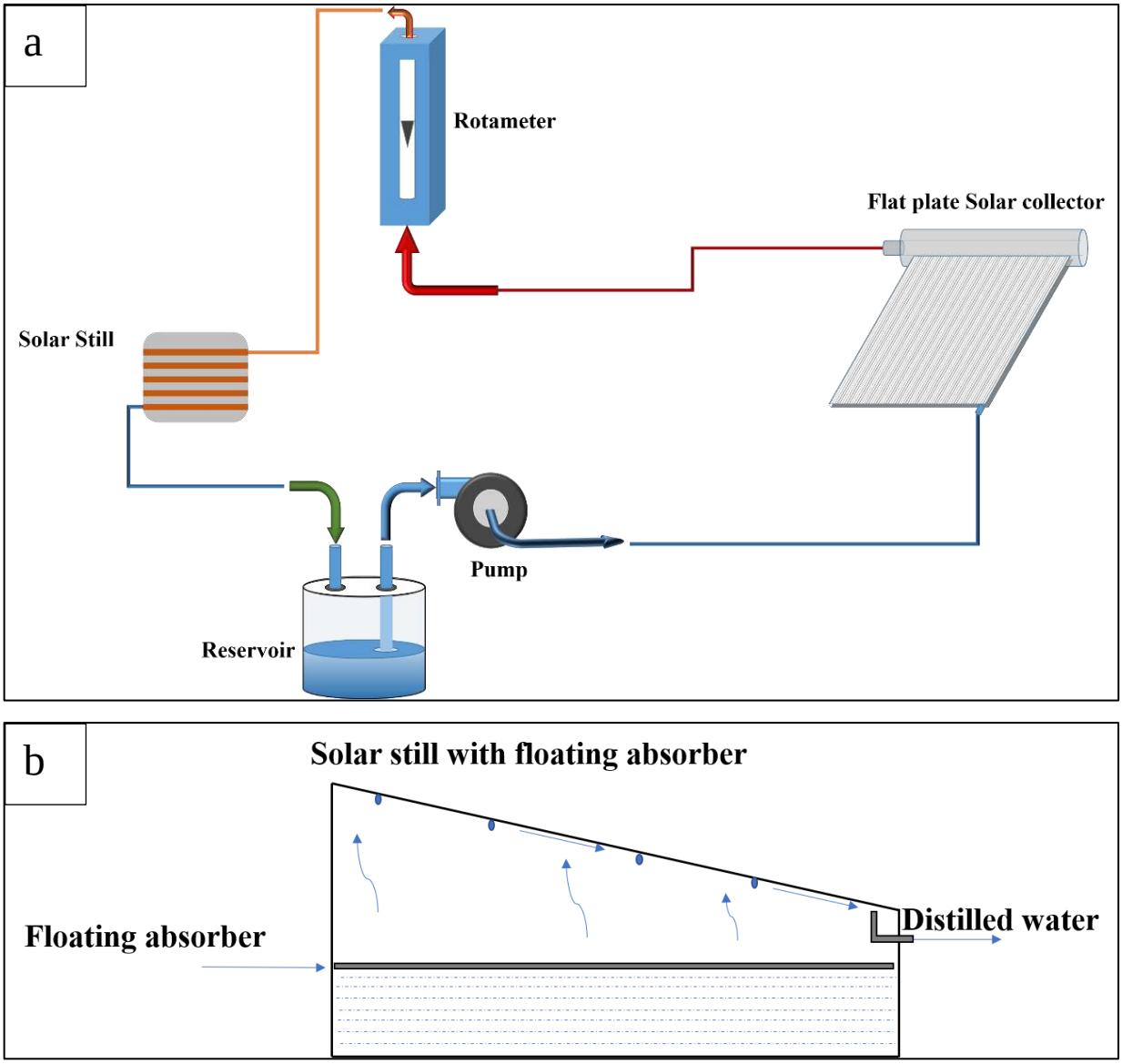

Fig.1. Schematic of experimental setup. a) Hydraulic cycle. b) Floating type Solar still

13. Particulars of equipment required: No additional equipment's required

Sl No	Equipment	Purpose	Availability
1	Hot plate Magnetic Stirrer	Synthesis of C-Dot nanofluid	Available at PI's Institute
2	Weighing Balance	Synthesis of C-Dot nanofluid	Available at PI's Institute

14. **Particulars of any other facilities required:** Characterization of C-Dot Nanofluid could be done at STIC at payment basics.

15. **Particulars of the facilities that will be provided by the institution where this projectwill be implemented:**

Sl No	Facility	
1	Workshop facility	Yes
2	Magnetic Stirrer	Yes
3	Weighing Balance	Yes

16. **Whether the project was submitted to any other organization for financial support:** No

17. **Budget Details: Estimated expenditure**

Sl No	Items	First Year	Second Year	Amount (Rs)	Justification
1	Consumables	40,000	20,000	60,000	• Purchase of chemicals like, ascorbic acid, copper acetate, Sodium Hydroxide etc. • To meet the expense for the fabrication of solar collector
2	Equipment			Nil	
3	Travel	10,000	10,000	20000	• The travel fund is mainly required for meeting the expenses in connection with the visits required for various characterization and testing not available at the institute • Attending peer reviewed conference in India and also for attending the review meetings.
4	Contingency	15,000	15,000	30000	• Characterization of C-Dot Nanofluid. TEM, XRD, BET, UV-vis-NIR spectroscopy etc are the characterization that are required to perform.
	Total	65,000	45,000	1,10,000	

18. The sources of funding the project including funds from other agencies from which financial assistance is obtained/expected to be obtained, and the quantum of assistance from each agency: NIL

19. Quantum and nature of assistance expected from the APJAKTU: Financial support

20. Name and address of the authority of Institution authorized to receive the grant:

SCMS School of Engineering and technology
Vidya Nagar, Palissery, Karukutty,
Kerala 683582

21. Whether grant under this scheme had been availed earlier by the investigator: (If so, provide details): NO

22. Details of projects already undertaken by the Principal Investigator with any other funding agency: NO

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[26] T. Rajaseenivasan, R. Prakash, K. Vijayakumar, K. Srithar, Mathematical and experimental investigation on the influence of basin height variation and stirring of water by solar PV panels in solar still, Desalination 415(2017) 67-75

Declaration

Certified that the details furnished above are correct to the best of my knowledge and belief and that the amount of financial assistance, if granted, will be utilised for the purpose for which it is granted within the time prescribed by APJAKTU. I also undertake to abide by therules and other conditions prescribed by the grantee.

Name and Signature of the Investigator Dr Albin Joseph

Name and Signature of Head of the Institution

(Office seal)

Place: Karukutty

Date: 28-4-2022

File Ref.No.KTU/RESEARCH5/5310/2022

APJ Abdul Kalam Technological University
Thiruvananthapuram

Abstract

APJAKTU - Financial Assistance to Student Projects 2022-23 - Administrative Sanction accorded - Orders issued.

RESEARCH SECTION

U.O.No. 672/2023/KTU Thiruvananthapuram, Dated: 18.03.2023

Read:-1. Minutes of the 1st meeting of Engineering Research Council dated 27.01.2010.
2. Minutes of 2nd meeting of Executive Committee dated 21.10.2010.
3. Meeting of the 2nd Research Council dated 29.02.2017.
4. Proposals of Student Projects for Financial Assistance.
5. Screening Committee meeting held on February 2023 for evaluation of project proposals.

ORDER

Vide paper read 1st above, the Engineering Research Council had approved the scheme for Financial Assistance to Student Projects for the Government Engineering Colleges. Vide paper read 2nd above, it was decided to extend the financial assistance to the student projects to the students of the Government aided and Government Controlled Engineering Colleges.

It was decided to extend the financial assistance to Student Projects for all engineering colleges affiliated to the University with NBA accreditation as per paper read 3rd above. It was also decided that the financial assistance will be provided as reimbursement of expenditure occurred for the sanctioned project.

The Screening Committee meetings held in February 2023 evaluated the project proposals forwarded from Engineering Colleges affiliated to the University and recommended financial assistance to selected proposals as per the List appended.

Administrative sanction is therefore accorded for financial assistance to student project for an amount of ₹46,58,352/- (Forty Six Lakhs Fifty Eight Thousand Three Hundred and Fifty Two only) as detailed in the list attached below. The project shall be completed within a period of 1 year and the project shall be completed with the students who presented the project before the Screening Committee.

The expenditure should be incurred as per the terms and conditions as per Annexure II attached. The amount will be reimbursed to the Principal of the concerned Colleges only after the successful completion of the project and on the production of certified bills & vouchers along with the audited utilization certificate, statement of expenditure and project completion report.

The expenditure shall be met from the Head of Account "CERD (Plan) 4181-6307-Innovative Student Project".

Orders are issued accordingly.

Sd/-

Dr. Shalij P.R *
DEAN (Research)

Copy to:-

1. Principals of Engineering Colleges.
2. Principal Investigators.

* This is a computer system (Digital File) generated letter. Hence there is no need for a physical signature.

SCMS School of

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
131	Dr Gibin George Assistant Professor Co-Investigator Vishnu H Assistant Professor	Aman S Arun P Gopikrishna Premchand Richu Shaju	Mechanical	Biodegradable packing peanuts based on banana leaf ribs.	17,500	1,000	12,500	2,000	2,000	
132	Vinoj P G Assistant Professor Co-Investigator Dr Varun G Menon Professor	Anandu Suresh Sagar P Gokul Sayuj MJ Yunus A A	ECE	Forest fire fighting using FPV drone	25,000	10,000	5,000	5,000	5,000	
133	Susmi Jacob Assistant Professor Co-Investigator Dr Varun G Menon Professor	Mahesh S Mahesh V C Suhail Nassar	CSE	A deep learning model for smart phone authentication during voice interaction through in ear wearable sensors	26,500	2,000	16,500	4,000	4,000	

Sree Buddha College of Engineering Pattoor

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	
134	Dr J B Sajin Associate Professor Co-Investigator Dr M S Senthil Saravanan Professor	Chikku Mathew Nithin Sabu Parameswaran Namboothiri K Pranav K	Mechanical	Design and feasibility studies on natural cellulose for baby diapers	20,000	10,000		5,000	5,000	

St. Joseph's College of Engineering & Technology, Palai

Sl No	Name of Princpal Investigator	Name of Student Investigators	Branch	Title of the Project	Amount Sanctioned	Consumables	Equipments	Travel	Contingency	

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

CENTRE FOR ENGINEERING RESEARCH AND DEVELOPMENT
College of Engineering Trivandrum Campus
Thiruvananthapuram. Pin 695016.

APPLICATION FORMAT FOR STUDENT PROJECT

SECTION A: GENERAL INFORMATION

1. Name of the Principal Investigator : VINOJ P G, ASSISTANT PROFESSOR,ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT,SCMS SCHOOL ENGINEERING AND TECHNOLOGY,KARUKUTTY

   (Faculty who is guiding the project)
   Phone no : 9446276238
   Email id : vinojpg@scmsgroup

2. Name of the Co-Investigator : Dr. VARUN G MENON, HOD & PROFESSOR,COMPUTER SCIENCE AND ENGINEERING DEPARTMENT,SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY ,KARUKUTTY

   (Faculty who is co- guiding the project)
   Phone no : 8714504684
   Email id : varunmenon@scmsgroup.org

3. Name(s) of Student investigators : ANANDU SURESH, SAGAR P GOKUL, SAYOOJ M.J, YUNUS A A

   Semester : S7 BTECH
   Branch : ELECTRONICS AND COMMUNICATION

4. Address of the Institution : SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY,KARUKUTTY 683576,ANGAMALY

5. Title of the project proposal : FOREST FIRE FIGHTING USING FPV DRONE

(Attach biodata of 1, 2 & 3)

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 the economic and industrial development.

2. 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 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 CERD 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 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 CERD may designate 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 Institution/PI shall inform the same to the CERD and in consultation with the CERD, evolve steps to ensure successful completion of the project, before relieving the PI.

9. Investigators must acknowledge the CERD in reports and technical/scientific papers publishing 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 patent/copy rights 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 CERD and should be properly acknowledged. Transfer of technology generated shall be done in consultation with the CERD.

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 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 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 project work.

We agree to the terms and conditions stated above.

22/12/21

Name & Signature of
Principal Investigator
VINOJ P.G

Name & Signature of
Prof-in-charge,
Satellite Centre

Name & Signature of
Head of Institution

Dr. ANITHA G. PILLAI
PRINCIPAL
SCMS SCHOOL OF ENGINEERING
AND TECHNOLOGY

(Office Seal)

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

CENTRE FOR ENGINEERING RESEARCH AND DEVELOPMENT

College of Engineering Trivandrum Campus

Thiruvananthapuram - Pin 695016.

APPLICATION FORMAT FOR STUDENT PROJECT

SECTION B: TECHNICAL DETAILS

1. (a) Title of the Project Proposal: FOREST FIRE FIGHTING USING FPV DRONE

(b) Branch / Subject area : Electronics and Communication Engineering/
(c) Project Type (Developmental / Demonstration / Others): Demonstration

2. Precise objective (150 words):

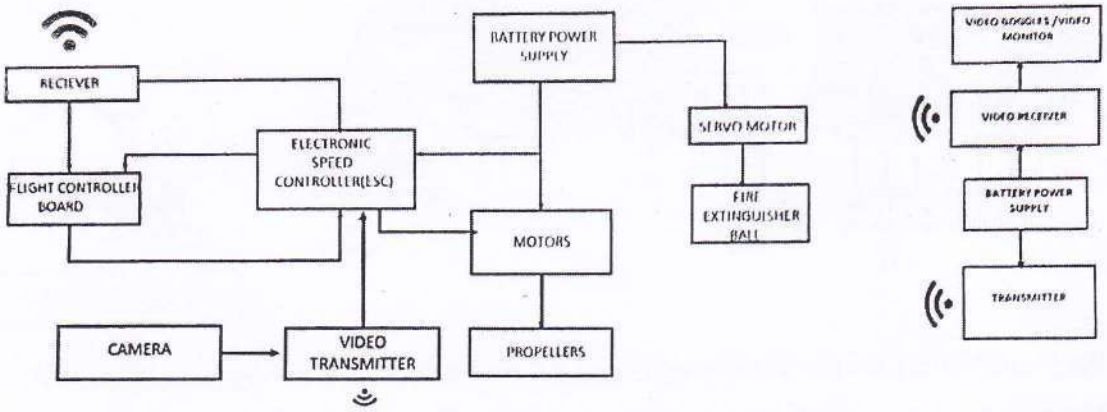
Looking into history, as we can see lots of fire incidents and accidents that can result in a huge amount of damage and losses for people involved in it. Fire fighters are the primary help which we look for but how much can they help. Let see some of the problems faced by fire fighters. Firstly, forest wildfires mainly fires in central forest are very difficult to reach and when they reach there the fires will be spread to its surrounding areas. Lots of accidents like fires in high rise buildings, fires in home, fires in stadium etc. Drones are usually flying unmanned robot that can be remotely accessed or to fly freely through software-controlled flight plans in their embedded systems. This technology provides various applications not only in firefighting operation but also in the field of aerial surveillance and monitoring. Thus, we propose a firefighting FPV drone to counter the threats caused by fire.

3. Abstract (400 words):

We will be designing a fully stable, compatible FPV which can be easily controlled and operated by human beings for firefighting operations. We have seen these FPVs and drones for the past decades and they are performing different operations which are assigned to them. By the rapid growth and advancements in technology, the areas or field of applications of these devices are implemented becoming huge. Fire accidents are quick and spreads fatly making us unresponsive to fight against it. We are focusing on a FPV which can be implemented in the live fire accidents to reduce and control fire, and also it should be budget friendly. Several accidents are occurred to fire fighters during their operation. By using Fire Fighting FPV fire accidents can be easily spotted and it can be easily extinguished without causing any hazards to human beings. Our FPV will rapidly respond to fire fighter's commands which will help them to extinguish fire at heights. Our project focuses on the great social service which helps to reduce the loss of property and assets of

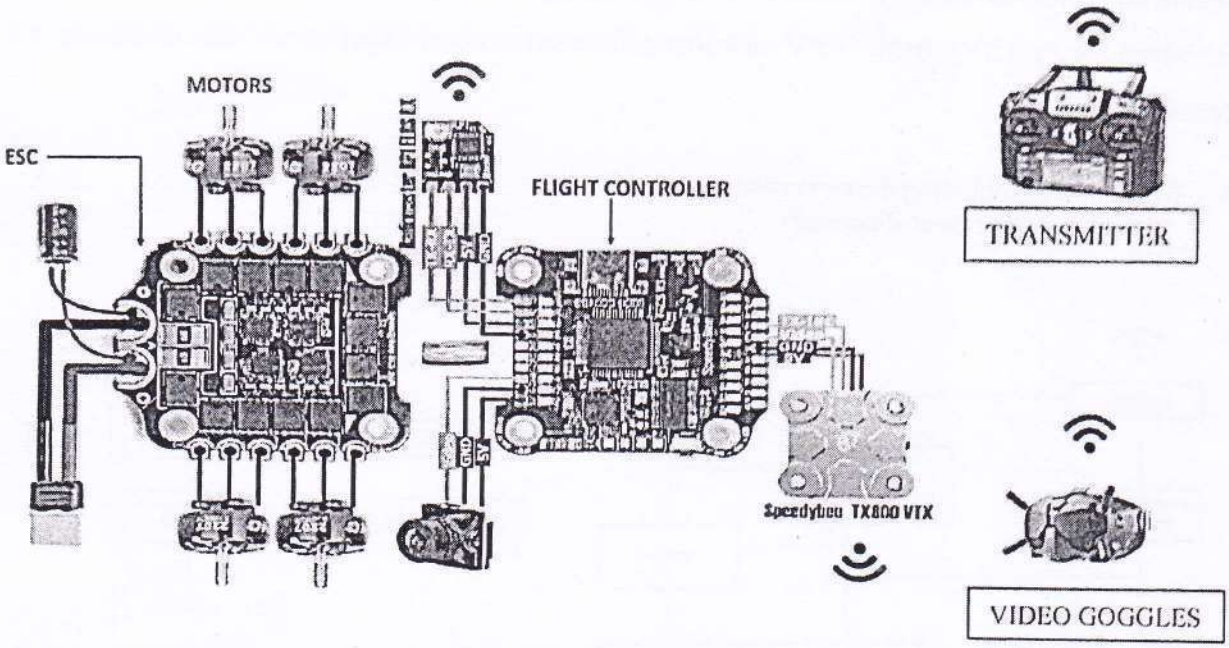
people and can provide them better and reliable living and working conditions. We have briefly explained the operation of the FPV and also conducted various experiments that emphasizes its core working.

4. Methodology including the work plan:
(Attach separate sheet if needed)



In the drone, the receiver will receive the signals once they have been delivered by the transmitter. The flight controller processes the signal from the receiver along with the information given by the sensors employed like gyroscope and accelerometer. The ESC (Electronic Speed Controller) will receive the signal once it has been analyzed by the flight controller, and it will then decide how much power should be supplied to the motor. Mechanical connections allow the propellers to revolve and generate thrust from the motors. The fire extinguisher ball's shell is opened by a servo motor that is driven by the transmitter.The motors with sufficient torque is designed to produce the thrust for carrying the drone mechanical structure and extinguisher ball. The user can view the forest sight remotely from his location and control the motion of the FPV. The FPV can also be programmed for the Automatic detection of the Fire prone regions and activate the delivery of extinguisher ball in the absence of manual control. Once the fire is detected alerts can be given to the take over the manual control. Thus the system detects the forest fire and delivers the extinguisher ball at appropriate location and sufficiently early to prevent the further spread of the fire.

CIRCUIT DIAGRAM :



The circuit diagram shows how the video goggle and RF transmitter communicates with the FPV wirelessly. The 12v Lippo batteries will be utilized for powering the system. The flight controller and ESC communicates through I2C Interface for the stable operation of the Drone. High torque motors are interfaced to ESC along with the propellers to produce the required thrust for lifting the FPV.The Camera module is interface to the Flight controller for capturing the live video feed of the area under surveillance. The controller also processes the sensor feedback information for providing better stability for the FPV during the flight.

Phase	Outcomes	Means/ Tools	Duration
1	Interfacing Sensor with controller	**Components:-** MAMBA F406 MK2+F50 Flight controller stack **Tools:-** Beta Flight software, PCB design software	2 week
2	Interfacing actuators with controller	**Components:-** Servo motors, BLDC motor, Transmitter and Receiver **Tools:-** PCB Design Software	2week
3	Design of Charging unit	**Components:-**Li-Po battery, Li-Po battery Charger	2 week

4	Fire extinguishing ball testing	**Components:-** Fire extinguishing ball	2 weeks
5	Deployment,Assembly and testing	**Tools:-** Soldering Iron, Multi-meter,3D printer, 3D modeling software, PCB design software,Beta Flight software.	6 week

5. Application / importance in the socioeconomic context:
   1) Can be used in confined spaces
   2) Easy to extinguish fire at heights
   3) Used to locate victims
   4) Helps to reduce the direct involvement of fire fighters during their operation.
   5) Prevents Natural calamity like forest fire
   6) Save the Life of Animals, plants and preserves the forest region
   7) Alerts the authority when initial fire hazards occurs

6. Particulars of equipment required: NA
   (Equipment only to govt / govt supported institutions)

7. Particulars of any other facilities required:
   1) 3D printers
   2) Soldering
   3) Electronics work bench
   4) PCB Milling Machine

8. Particulars of the facilities that will be provided by the institution where this project will be implemented:
   1)3D printers
   2) Soldering
   3) Electronics work bench
   4) PCB Milling Machine

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. Budget Details: Estimated expenditure

Sl No	Items	Amount (Rs)
1	Consumables **(Do not exceed 20% of the total amount)**	10,000/-
2	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)	10,000/-
3	Travel **(Do not exceed 10% of the total amount)**	5,000/-
4	Contingency **(Do not exceed 10% of the total amount)**	5,000/-
	Total	30,000/-

Budget Justification:

1. Consumables: Rs 10,000/-(Ten Thousand): Purchase of components like battery, PLA material for 3d printing, PCB Manufacturing Materials, Development boards, LED, Resistors, Propellers, Frame structure etc.

2. **Equipment :** Rs 10,000/-(Ten Thousand) :Purchase of electronic Equipment like Multi-meter, MAMBA F406 MK2+F50 Flight controller stack ,Servo motors, BLDC Motors,

3. 3. **Travel:** Rs 5,000/-(Five Thousand)

Travel Budget will be utilized for meeting forest authorities, NGO and subject experts

4. Contingency: Rs 5,000/-(Five Thousand)

Contingency Fund is utilized for patent filing, medical committee approval, to cover unforeseen risks during device testing

Signature of Principal Investigator:

Name, Address & Telephone No:

VINOJ PG,
ASSISTANT PROFESSOR, DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING, SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY,
KARUKUTTY-683576
MOB: 9446276238

Place: Karukutty
Date: 22/12/2022

Office Seal

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/RESEARCH 3/1082/2022 Dated: 26.02.2023

From

The DEAN (Research)

To

The Principal,
SCMS College of Engineering and Technology, Ernakulam.

Sir,

Sub:- APJAKTU - CERD - Research Seed Money Scheme - Projects Selected for funding - reg:-

I am glad to inform you that the project proposals as listed in Annexure I are provisionally selected for funding under Research Seed Money (RSM) scheme of KTU.

The expenditure should be incurred as per the sanctioned budget heads and in accordance with terms and conditions given in Annexure II. Format of MOU to be furnished by the college is given as Annexure III.

The Principal Investigators may please be directed to forward request (in Annexure II) for releasing the fund with Bank Account details. The fund will be released only after settling pending accounts of the principal investigator in CERD, if any. Any request received after three months from the date of this letter will not be considered.

Yours faithfully
Dr. Shalij P.R *
DEAN (Research)

Copy To

1. Shri. Jayadevan P C, Assistant Professor in Mechanical Engineering.
2. Dr. Gibin George, Assistant Professor in Mechanical Engineering
3. Dr. Abin Joseph, Assistant Professor in Mechanical Engineering.
4. Smt. Meera Varghese, Assistant Professor in Civil Engineering.
5. Smt. Merin Mathew, Assistant Professor in Civil Engineering.
6. Dr. Praseeja A. V., Assistant Professor in Civil Engineering.
7. Shri. Rahul R Rai, Assistant Professor in Civil Engineering.
8. Smt. Asha S, Assistant Professor in computer Science and Engineering.
9. Dr. Geethu R, Assistant Professor in Science.

10. Smt. Mary Catherine V. G, Assistant Professor in Electronics and Communication Engineering.

* This is a computer system (Digital File) generated letter. Hence there is no need for a physical signature.

Annexure II

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Centre for Engineering Research and Development
Request for releasing RSM grant

Title of Project:

Date of sanction:

Amount sanctioned:

Account No and bank details:

Terms & Conditions for Research Seed Money Scheme

1. The amount sanctioned for the project shall be deposited in a separate joint A/c of Principal Investigator and Head of the institution where the Principal Investigator works. (Name of A/c: CERD Research Seed Money - File No.)

2. The maximum duration of the project will be three years from the date of start of the project

3. The amount has to be utilized as per budget provision under each head. It is the discretion of the University to settle amount towards the purchase of those items not clearly mentioned, if any, in the project proposal.

4. The purchase of equipments shall be in accordance with the store purchase rules. All equipment purchased will be the property of CERD and the stock entry of the items purchased shall be maintained in the College signed by the Investigator, Lab in charge and Principal. Purchase of computers/peripherals is not allowed unless specifically mentioned in the sanction order.

5. 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 other 50% is produced by the college.

6. The stock entries of consumables purchased shall also be done in the consumables stock register of College. Purchase of stationery shall be for project purpose only.

7. Books and literature purchased should be taken into the Stock Register of Central Library or Department library and then distributed to the investigators.

8. The interest accrued will also be accounted in the project.

9. On completion of the project, detailed report of the research work (hard and soft copies), audited statement of accounts and Utilization Certificate in the prescribed format duly attested by the head of the institution shall be submitted within one month on completion of the project for settlement of accounts.

10. If the project is not completed within the time limit, the grant amount should be reimbursed along with the interest accrued.

11. 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 CERD may designate Scientist/Specialist or an Expert Panel to periodically review the work done. The Principal Investigator has to appear for the periodic review meetings.

12. If the PI to whom the project has been sanctioned, leaves the Institution, the Head of Institution/PI shall inform the same to the CERD and in consultation with the CERD, evolve steps to ensure successful completion of the project, before relieving the PI.

13. Investigators must acknowledge the CERD in reports and technical/scientific papers published 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 Journals.

14. 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.

15. The knowledge generated from the project will be the property of the CERD and should be properly acknowledged. Transfer of technology generated shall be done in consultation with the CERD.

We agree to the terms and conditions stated above. Please transfer the amount to the above bank account.

Signature of Principal Investigator:

Name:

Designation:

Signature of Head of Institution:

Name:

Office Address:

Seal

Annexure III

(Stamp paper Rs 200)

MEMORANDUM OF UNDERSTANDING [MOU]

BETWEEN

-Name of Self Financing Engineering College-

AND

APJ Abdul Kalam Technological University (KTU), THIRUVANANTHAPURAM

This Memorandum of Understanding is entered into at Thiruvananthapuram on this --- Day of Month Year

BETWEEN

-Name of Self Financing Engineering College- affiliated to APJ Abdul Kalam Technological University (herein after referred to as COLLEGE) which expression shall unless it be repugnant to the context or meaning thereof to be deemed to mean and include its successors and assigns, represented by The Principal, ---Name of college- place of college -, of the ONE PART.

AND

APJ Abdul Kalam Technological University, CET campus, Thiruvananthapuram-695016 (herein after referred to as KTU) which expression shall, unless it be repugnant to or inconsistent with subject or context thereof, include and be deemed to include their heirs, successors and assigns, represented by The Dean (Research), APJ Abdul Kalam Technological University, Thiruvananthapuram 695016 of the OTHER PART.

1. TERMS OF UNDERSTANDING

1.1. This memorandum of understanding lists out the terms of releasing and utilization of CERD research seed money fund sanctioned to a faculty of COLLEGE for the year ----------.

1.2. The scheme is constituted for the purpose of providing assistance in the form of grants to initiate research work in Engineering and Technology with particular relevance to the State of Kerala in the economic and industrial development.

1.3. Grant will be released to the principal investigator of the project through the Head of the institution.

1.4. The maximum duration of the project will be three years from the date of start of the project

1.5. On completion of the project, one copy of the final project report on the work done should be sent to the CERD along with the utilization certificate (UC) and statement of expenditure (SE).

1.6. The institute will maintain separate audited accounts for the project.

1.7. 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.

1.8. 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 CERD may designate a Scientist/Specialist or an Expert Panel to review the work done.

1.9. If the PI to whom the project has been sanctioned leaves the Institution, the Head of Institution/PI will inform the same to the CERD and in consultation with the CERD, evolve steps to ensure successful completion of the project, before relieving the PI.

1.10. Investigators must acknowledge the CERD in reports and technical/scientific papers published 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 Journals.

1. 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.

1.12. The knowledge generated from the project will be the property of the CERD and should be properly acknowledged. Transfer of technology generated shall be done in consultation with the CERD.

1.13. 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 other 50% is produced by the COLLEGE.

1.14. The equipment details must be entered in the stock register of the college and signed by the Investigator, Lab in charge and Principal.

1.15. The college should submit annually the status and details of earlier grants received from KTU with pending statement if any.

1.16. The grant amount should be deposited in a separate bank account in the name of the Principal investigator and Head of Institution jointly.

1.17. The interest accrued shall also be accounted in the project.

1.18. If the project is not completed within the time limit, the grant amount should be reimbursed along with interest accrued.

We agree to the terms and conditions stated above.

2. SCOPE OF MOU

Nothing in this Memorandum is intended to or shall be deemed to establish an exclusive relationship between the parties or to restrict any activities that either party would otherwise be able to undertake. Nothing in this Memorandum is intended to or shall be deemed to establish any partnership or joint venture between the parties or constitute any activities that either party would otherwise be able to undertake.

3. PERIOD

This MOU shall be perpetual. This agreement will be amended or modified by the University at any time.

4. DISPUTE RESOLUTION AND ARBITRATION

This memorandum of understanding shall be governed by the laws of Union of India and State of Kerala. Any dispute arising with this MOU shall be brought to the notice of the Vice-chancellors of the parties who shall try to resolve them, failing which legal reasoning be taken in the jurisdiction of court in Thiruvananthapuram.

The terms and conditions of this memorandum of understanding shall not be disclosed to any third parties by any party of this memorandum of understanding without the prior written consent of both parties.

5. FORCE MAJEURE

Without prejudice to accrued liabilities and rights, no party shall have any liability whatsoever to the other Party or be deemed to be in default by reason of delay or failure in performance under this memorandum of understanding to the extent that such delay or failure is caused by or arises from acts or circumstance or events beyond the reasonable control of that party, including but not limited to acts of god, acts or regulations of any governmental authority, war or national emergency, accident, fire, riot, strikes, lock-outs, industrial disputes, natural catastrophes or epidemics.

Each Party shall bear its own losses arising from such force majeure event(s), if any.

6. INTELLECTUAL PROPERTY

All prior information, design and data existing with either party before the signing of this MoU (pre-existing IP) shall be the sole property of the concerned party. All Intellectual Property including design information, designs, source codes and data generated through the collaboration under this MOU shall be as mutually agreed in writing and also as per the guide line of the funding agency, if such an agency is involved. Any IPR arising specifically out of this collaboration will be owned by both parties, except when mutually agreed in writing otherwise.

IN WITNESS WHEREOF, the parties hereto have caused this memorandum of understanding to be executed in duplicate, through their representatives at Thiruvananthapuram in the day and year first above written:

Now the memorandum of understanding witnesses as follows.

Principal
Name of College
University
Place

Dean (Research)
APJ Abdul Kalam Technological

Thiruvananthapuram 695016

Witness: 1

Signature :

Name :

Witness: 2

Signature :

Witness: 1

Signature :

Name :

Witness: 2

Signature :

SCMS School of Engineering and Technology, Ernakulam												
SL No	Name of Principal Investigator	Title of the project	Branch	Amount Sanctioned	Ist installment	2nd installment	Consumables	Equipment	Travel	Contingency		
1	Jayadevan P C Assistant professor	Analysis of Low Reynolds Flow (Stokes Flow) Through Micro Capillaries	ME	50,000	40,000	10,000	40,000	0	5000	5000		
2	Dr. Gibin George Assistant Professor	Development of eco-friendly packaging materials from agricultural wastes.	ME	70,000	60,000	10,000	10,000	50,000	5000	5000		
3	Dr. Albin Joseph Assistant Professor	Development of Floating type solar still desalination system integrated with direct absorption flat plate solar collector for improved productivity	ME	84,000	60,000	24,000	60,000	0	8000	16,000		
4	Meera Varghese Assistant Professor	Sea water intrusion modelling into some of the coastal aquifers in Thrissur district.	Civil Engineering	46,000	35,750	10,250	0	0	14,000	7000	testing charges 25,000	
5	Merin Mathew Assistant Professor	Catchment scale source apportionment of sediment yield into Vembanad Lake	Civil Engineering	160,000	110,000	50,000	40,000	0	20,000	20,000	Testing charges 80,000	
6	Dr. Praseeja A V Assistant Professor	Study of dispersion coefficient of contaminants through different types of soils and remediation using natural fibres	Civil Engineering	155,000	127,500	27,500	30,000	100,000	10,000	15,000		
7	Rahul R. Pai Assistant Professor	Fatigue studies and resilient behavior of crushed brick fly ash lime (CBFL) mix for use in base layer of flexible pavement	Civil Engineering	90,000	57,500	32,500	20,000	0	10,000	10,000	Testing charges 32,000	Experimental charges 18,000
8	Asha S Assistant Professor	Multimodal Ensemble Deep fake Detection using Visual-Audio-Textual features	CSE	159,000	130,000	29,000	5,000	130,000	12,000	12,000		

9	Dr. Geethu R. Assistant Professor	Developing cost effective and eco-friendly copper tin sulphide material for photovoltaic application	Science	75,000	50,000	25,000	40,000	5,000	10,000	20,000
10	Mary Catherine V G Assistant Professor	Touch Activated Soft Robotic Hand Control for Elderly Assistance	ECE	60,000	40,000	20,000	30,000	15,000	5,000	10,000

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/RESEARCH 3/1082/2022 Dated: 26.02.2023

From

The DEAN (Research)

To

The Principal,
SCMS College of Engineering and Technology, Ernakulam.

Sir,

Sub:- APJAKTU - CERD - Research Seed Money Scheme - Projects Selected for funding - reg:-

I am glad to inform you that the project proposals as listed in Annexure I are provisionally selected for funding under Research Seed Money (RSM) scheme of KTU.

The expenditure should be incurred as per the sanctioned budget heads and in accordance with terms and conditions given in Annexure II. Format of MOU to be furnished by the college is given as Annexure III.

The Principal Investigators may please be directed to forward request (in Annexure II) for releasing the fund with Bank Account details. The fund will be released only after settling pending accounts of the principal investigator in CERD, if any. Any request received after three months from the date of this letter will not be considered.

Yours faithfully
Dr. Shalij P.R *
DEAN (Research)

Copy To

1. Shri. Jayadevan P C, Assistant Professor in Mechanical Engineering.
2. Dr. Gibin George, Assistant Professor in Mechanical Engineering
3. Dr. Abin Joseph, Assistant Professor in Mechanical Engineering.
4. Smt. Meera Varghese, Assistant Professor in Civil Engineering.
5. Smt. Merin Mathew, Assistant Professor in Civil Engineering.
6. Dr. Praseeja A. V., Assistant Professor in Civil Engineering.
7. Shri. Rahul R Rai, Assistant Professor in Civil Engineering.
8. Smt. Asha S, Assistant Professor in computer Science and Engineering.
9. Dr. Geethu R, Assistant Professor in Science.

10. Smt. Mary Catherine V. G, Assistant Professor in Electronics and Communication Engineering.

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SCMS School of Engineering and Technology, Ernakulam												
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2	Dr. Gibin George Assistant Professor	Development of eco-friendly packaging materials from agricultural wastes.	ME	70,000	60,000	10,000	10,000	50,000	5000	5000		
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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

College of Engineering Trivandrum Campus, Thiruvananthapuram. Pin 695 016

Application for Research Seed Money

1. Title of the Research Proposal: Fatigue studies and resilient behavior of crushed brick – fly ash – lime (CBFL) mix for use in base layer of flexible pavement

2. Name & address & experience of Investigator
   (Mobile No. and e-mail are mandatory)

   Rahul R. Pai
   Assistant Professor, Dept. of Civil Engineering
   SCMS School of Engineering & Technology, Karukutty
   Email ID: rahul@scmsgroup.org
   Mob no: 9061996111
   Experience: 4 years of industrial experience in STRABAG International GmbH, 4 years of research experience as research fellow in DST funded project at NIT Surat, 3.5 years of teaching experience.

3. Teaching experience: 3 years & 6 months

4. Objectives of Research (150 words)

   i. To develop fatigue performance models for crushed brick – fly ash – lime (CBFL) mix from four-point beam fatigue test at various stress levels and subsequently predict the fatigue life of the mix.
   ii. To perform repeated load tri-axial test on the CBFL mix and determine the resilient modulus and permanent deformation of the mix.
   iii. To study the effect of curing period on the strength gain of CBFL mixes by conducting microstructural study involving X-Ray Diffraction (XRD) analysis and Scanned Electron Microscope (SEM) observations.
   iv. To develop correlation between the flexural strength and flexural modulus of the CBFL mix.

5. Broad Subject area / field of classification: Pavement Geotechnics

6. Project Type(s) (Basic Research / Applied Research / Developmental / Demonstration / Others: Developmental

7. Abstract (400 words)

Natural aggregates are indispensable for the construction, maintenance, and widening of highway projects. The construction of flexible pavement consumes around 15,000 tons of natural aggregates per km length of the road, leading to the inadequacy of the most essential construction component. The extraction of natural aggregates from quarries is a major concern as far as ecological balance is concerned. On the other hand, in a developing country like India, rapid industrialization is leading to the generation of large quantity of construction & demolition wastes as well as industrial wastes. Huge open dumps of these industrial wastes not only make the valuable land futile but also are a threat to the ecology and public health. This study mainly focuses on the fatigue behavior and resilient response of crushed brick – fly ash – lime (CBFL) mix for use as a base layer in flexible pavement. The fatigue response of cemented base layers is very essential in assessing the required maintenance frequency and the life cycle of bound layers in flexible pavement. Apart from the aforementioned studies, the effect of curing period on the strength gain of CBFL mixes will also be studied by conducting microstructural study involving X-Ray Diffraction (XRD) analysis and Scanned Electron Microscope (SEM) observations. The results from this study can be used to develop innovative design methodology and guidelines for the utilization of crushed bricks and fly ash in the cemented base layer of flexible pavement.

8. Scientific scope of the Research proposal (400 words)

In recent years, there has been a growing emphasis and interest all over the world towards promoting the use of marginal materials in road construction in order to improve the construction cost efficacy, reduce depletion of good quality aggregates and also to protect valuable land from the disposal of construction & demolition wastes as well as industrial wastes. Bulk utilization of crushed bricks and fly ash as potential pavement materials will significantly avert the issues related to its disposal. The innovative cemented crushed brick – fly ash – lime (CBFL) mix proposed in this study will not only solve the problems associated with the disposal of wastes and depletion of natural aggregates, but also enables to increase the service life of flexible pavement constructed with this cemented waste mix in base layer, without compromising the construction cost. The results from fatigue studies and resilient response of the CBFL mix will be very useful for recommending appropriate design for use of such cemented mixes in the base layers of flexible pavements.

9. Applications / Socioeconomic importance / Relevance, if any, for the utilization and management of the natural resources of the State)

- The technology of utilizing cemented crushed brick – fly ash – lime (CBFL) mix in base layer of flexible pavement can be disseminated among government agencies and contractors for effective utilization of these wastes and subsequently averting the issues related to its disposal.
- The results from this study can be used to develop innovative design methodology and guidelines for the utilization of crushed bricks and fly ash in the cemented base layer of flexible pavement.
- Trial flexible pavement sections with the CBFL mix (chosen based on the laboratory investigations) in the base layer can be constructed with the assistance of Public Works Department (PWD), Government of Kerala and the field performance of the trial sections can be evaluated to ascertain the benefits of implementing such wastes as a potential pavement material.

10. Scientific background of the project

a) Importance of the problem

Construction and demolition (C&D) wastes along with commercial and industrial wastes account for more than 80% of the waste materials. During the last few decades, it has been recognized with growing concern that C&D wastes are increasing year by year in large volumes and account for a large proportion of the waste materials present in landfills. Concrete, brick, and asphalt account for close to 50% by weight of all C&D wastes. Recycled crushed brick, recycled concrete aggregate, and excavated rock are however viable alternative materials for natural construction materials in engineering applications such as pavement base/subbase and other road construction applications. Utilization of natural aggregate resources for the construction of flexible pavement has led to uncontrollable quarrying in the state of Kerala. The recent landslides in Kerala which took the lives of many people is the aftermath of extensive quarrying activities. This has led to the urgent need of including innovative materials in the road construction. Crushed bricks and fly ash proposed in this project can be successfully utilized in flexible pavements with lower construction cost without compromising the strength and durability requirements. This will also lead to the protection of scarce natural aggregates resources and savings in disposal cost of construction & demolition wastes on valuable land. Thus it is a technology for sustainable development.

b) Related work already performed or in progress at other places in India or abroad.

In the past, researchers have evaluated the sustainability of C&D waste materials (Joel and Agbede 2011, Arulrajah et al. 2012) and some countries have been using recycled C&D materials in civil engineering applications, but there is still sufficient scope for wider engineering applications of such recycled materials. The reuse of

recycled C&D wastes in civil engineering infrastructure applications will result in a low carbon solution, considering that recycled materials have significant carbon savings compared with virgin quarried materials. C&D materials have been used in recent years in various civil engineering applications such as roads, embankments, pipe bedding, and backfilling. Various researchers have reported the physical and shear strength characteristics of unbound C&D wastes. Other researchers have studied the strength characteristics after cement-treatment of these waste materials, especially for the application of cement treated C&D wastes in pavement applications (Mohammadinia et al. 2016; Arulrajah et al. 2013) and fly ash–stabilized RAP aggregate (Li et al. 2007, 2011). The improvement in the engineering properties of unbound crushed bricks (CB), recycled concrete aggregate (RCA), and reclaimed asphalt pavement (RAP) when stabilized with general portland (GP) cement was also reported (Mohammadinia et al. 2016). The implementation of fly ash as a filler material and steel slag & copper slag as aggregates in lime-fly ash concrete for use as base layers of flexible pavement is substantiated by Pai et al. (2021, 2022).

Despite voluminous research on various laboratory parameters, very few studies are carried out to evaluate the fatigue response of C&D waste mixes, industrial waste mixes etc. Flexural strength and flexural modulus are the decisive parameters used to assess the fatigue performance of cemented base materials in the field under long-term traffic loading (Zhang et al. 2009). The failure of the cemented base layer in flexible pavement occurs due to the accumulation of flexural stresses and strains at the bottom of the base layer. Flexural modulus which measures the resistance of a material under bending stress is essential to predict the fatigue life of cemented base layers. Lower flexural modulus will result in the development of higher tensile stresses at the bottom of the cemented base layers, subsequently leading to bottom-up tensile cracking. The exposure of flexible pavement with cemented base layers to significant traffic volume will lead to fatigue damage of cemented base layers, ultimately reducing the flexural modulus (Yeo et al. 2002).

The crushed brick – fly ash – lime (CBFL) mix can be implemented as a cemented base layer in flexible pavement with full confidence only if the fatigue behavior and resilient response under the stresses prevailing under field traffic conditions are studied. The parameters such as resilient modulus, permanent deformation, flexural modulus and fatigue life obtained from the repeated load tri-axial test and four-point beam fatigue test performed in the laboratory under different stress levels prevailing in the field are essential for recommending appropriate design for use of such cemented mixes in the base layer of flexible pavements.

11. Details of any preliminary work done by the investigator

The strength characteristics of the crushed brick – fly ash – lime mix were evaluated for various mix proportions by performing unconfined compressive strength test and California bearing ratio test. The adopted mix proportions are given below.

Mix proportions adopted for strength tests

CB (% by dry weight)	FA (% by dry weight)	Lime (%)	Designation
30	70	5	30CB-70FA-5L
50	50	5	50CB-50FA-5L
70	30	5	70CB-30FA-5L

CB – crushed brick, FA – fly ash, L – lime

Details of UCS & CBR tests

The UCS tests were performed on all the aforementioned mixes of specimen size 100 mm diameter and 200 mm height cured for 0, 7, 14, 28 and 180 days as per IS 2720 Part 10, 2006. CBR tests were performed on specimens cured for 7 days and soaked for 4 days as per IS 2720 Part 16, 2016. The results of UCS and CBR tests are given below.

UCS test results

CBFL mix	0 day (MPa)	7 days (MPa)	14 days (MPa)	28 days (MPa)	180 days (MPa)
30 CB - 70 FA - 5L	0.29	1.89	3.52	5.81	7.26
50 CB - 50 FA - 5L	0.30	1.73	3.31	5.33	6.51
70 CB - 30 FA - 5L	0.31	1.50	3.10	4.95	5.82

CBR test results

CBFL mix	Soaked CBR (%)
30 CB - 70 FA - 5L	96
50 CB - 50 FA - 5L	84
70 CB - 30 FA - 5L	75

Even though all the three CBFL mixes satisfied the IRC criteria (IRC SP 20, 2002) of minimum UCS > 4.5 MPa after 28 days curing for use in base layer of flexible pavement, 70 CB + 30 FA stabilized with 5% Lime was chosen as the optimum mix, in order to maximize the utilization of crushed brick and minimize the utilization of fly ash which has considerable utility in construction industry. The fatigue behavior and resilient response of the chosen CBFL (70 CB – 30 FA – 5 L) mix will be evaluated in this particular project.

12. Detailed year-wise work plan (Indicate methods / Techniques to be used)

Detailed work plan of the project:

Sl. No.	Details of activities	Period in months											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Review of the relevant literature.												
2	Collection of raw materials												
3	Sample preparation												
4	Laboratory tests: Repeated load tri-axial test Four point beam fatigue test												
5	Microstructural analysis												
8	Compilation of results												
9	Report writing												

Methodology

The methodology adopted for the study is elaborated below:

(a) Preparation of specimen

The samples of 100 mm diameter and 200 mm height will be prepared for repeated load tri-axial test. The samples will be cured for 0, 7, 28, 180 and 270 days before conducting the test. The flexural strength test and fatigue life test will be performed on beam specimens of CBFL mix of size 100 mm x 100 mm x 400 mm cured for 28 days.

(b) Repeated load tri-axial test

The repeated load tri-axial (RLT) tests will be performed in a cyclic tri-axial test equipment to evaluate the resilient modulus and permanent deformation. The test will be performed for the stress levels stipulated by AASHTO (American Association of State Highway and Transportation Officials) T 307 (AASHTO 2000).

(c) Four-point beam fatigue test

Flexural strength tests of the 28 days cured beam specimens will be performed as per

the test procedure given by Austroads test method AGPT/T600 (Austroads 2018) using four-point beam fatigue test apparatus with dynamic actuator. The same test setup will be used for determining the flexural modulus and fatigue life of the beam specimens.

(d) Microstructural analysis

The strength enhancement of the optimum CBFL mix with curing period will be studied at the micro level using X-Ray Diffraction (XRD) analysis and Scanned Electron Microscope (SEM) images. The XRD and SEM analysis will be performed on 0, 7, 28, 90, 180 and 270 days cured specimens.

(e) Development of model & useful correlations

Fatigue performance models for various stress levels will be developed based on the results of four-point beam fatigue tests. Correlation between the flexural strength and flexural modulus will be developed using the results.

13. Particulars of equipment required

Sl. No.	Equipment name	Purpose in current project	Source of equipment
1	Repeated load tri-axial test apparatus	To determine the resilient response of the mix	NIT, Surat
2	Test setup for flexural strength test with dynamic actuator	To perform four-point beam fatigue test	NIT, Surat
3	X-Ray Diffraction (XRD) analysis	Micro-structural analysis	CUSAT, Kalamassery
4	Scanned Electron Microscope (SEM)	Micro-structural analysis	CUSAT, Kalamassery

Note: The specimens will be prepared in the laboratory facility provided at SCMS School of Engineering & Technology and the testing will be performed at NIT Surat and CUSAT, Kalamassery. Transportation cost will be incurred in the project to transport the specimens to the test facility.

14. Particulars of any other facilities required: NIL

15. Particulars of the facilities that will be provided by the institution where this project will be implemented

Sl. No.	Infrastructural Facility
1	Water & Electricity
2	Power Generator
3	AC rooms or AC
4	Telecommunication including e-mail & Fax
5	Administrative/ Secretarial Support
6	Information facilities like Internet/ Library
7	Computational facilities
8	Laboratory facilities for sample preparation & preliminary tests

16. Whether the project was submitted to any other organization for financial support: NO

17. Budget Details: Estimated expenditure

Sl. No.	Items	Amount (Rs.)	Justification
1	Consumables **(Do not exceed 20% of the total amount)**	20,000	
2	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)	NIL	The major testing will be performed at NIT Surat
3	Expense for micro-structural analysis - X-Ray Diffraction (XRD) analysis and Scanned Electron Microscope (SEM)	32,000	XRD analysis and SEM observations is required for the specimens of optimum CBFL mix cured for 0, 7, 28, 90, 180 and 270 days. Approximately 2 specimens will be analyzed for each curing period
4	Minor fabrication works	18,000	Fabrication of molds for casting beam specimens of CBFL mixes
5	Minor expenses required at test facility in NIT, Surat	10,000	Small repairing costs may be incurred for Repeated load tri-axial test apparatus & dynamic actuator during testing
6	Travel **(Do not exceed 10% of the total amount)**	10,000	Transportation cost of specimens to the test facility at NIT Surat and CUSAT, Kalamassery
7	Contingency **(Do not exceed 10% of the total amount)**	10,000	
	Total	1,00,000	

18. The sources of funding the project including funds from other agencies from which financial assistance is obtained/expected to be obtained, and the quantum of assistance from each agency: NIL

19. Quantum and nature of assistance expected from the APJAKTU: Full financial support

20. Name and address of the authority of Institution authorized to receive the grant

    SCMS School of Engineering & Technology
    Vidya Nagar, Palissery, Karukutty,
    Kerala 683 582

21. Whether grant under this scheme had been availed earlier by the investigator: (If so, provide details): NIL

22. Details of projects already undertaken by the Principal Investigator with any other funding agency: NIL

References

1. Austroads (2018). “Flexural beam test methods for cemented materials.” *AGPT/T600.* Sydney, Australia.
2. Arulrajah, A., Piratheepan, J., Bo, M.W., Sivakugan,N. (2012), “Geotechnical characteristics of recycled crushed brick blends for pavement sub-base applications, Can. Geotech. J. 49: 796–811
3. Arulrajah, A., Piratheepan, J., Disfani, M. M., and Bo, M.W. (2013), “Geotechnical and geoenvironmental properties of recycled construction and demolition materials in pavement subbase applications.” J. Mater. Civ. Eng., 10.1061/(ASCE)MT.19435533.0000652, pp. 1077–1088
4. Joel, M. and Agbede ,I. O.(2011),”Mechanical-cement stabilization of laterite for use as flexible pavement material”I, J. Mater. Civ. Eng., pp. 146–152 (2011)
5. Li, L., Benson, C. H., Edil, T. B., Hatipoglu, B., and Tastan, O. (2007). “Evaluation of recycled asphalt pavement material stabilized with fly ash.” *In Proc., GeoDenver*. 1–10. Reston, VA: ASCE.
6. Li, X., and Dong, M. (2011). "Experimental Research on Pavement Performance of Cement-Stabilized Base Recycled Mixture.", Applied Mechanics and Materials Vols. 94(96): 31-37.
7. Mohamadinia, A., Arulrajah, A., Sanjayan, J., Disfani, M. M., Bo, M. W., and Darmawan, S. (2016). “Stabilization of demolition materials for pavement base/subbase applications using fly-ash and slag geopolymers: laboratory investigation.” J Mater Civ Eng. 28(7): 04016033. https://doi.org/10.1061/(ASCE)MT.1943-5533.0001526.
8. Pai, R. R., Bakare, M. D., Patel, S., and Shahu, J. T. (2021a). “Structural evaluation of flexible pavement with steel slag-fly ash-lime in base layer,” J. Mater. Civ. Eng. 33(6): 04021097. https://doi.org/10.1061/(ASCE)MT.1943-5533.0003711.
9. Pai, R. R., Bakare, M. D., Patel, S. and Shahu, J. T. (2022). “Asserting the applicability of copper slag and fly ash as cemented base materials in flexible pavement from a full-scale field study.” Journal of Materials in Civil Engineering, 10.1061/(ASCE)MT.1943-5533.0004123.
10. Yeo, R., Vuong, B., and Alderson, A. (2002). “Towards National Test Methods for Stiffness and Fatigue Characterisation of Stabilised Materials, Report RC2028-002 for Austroads.” ARRB Transport Research.
11. Zhang, P., Li, Q.F., and Huang, C.K. (2009). “Grey relational analyzing anti-cracking performance of semirigid base courses.” Journal of Grey System. 18(4): 355-364.

Declaration

Certified that the details furnished above are correct to the best of my knowledge and belief and that the amount of financial assistance, if granted, will be utilized for the purpose for which it is granted within the time prescribed by APJAKTU. I also undertake to abide by the rules and other conditions prescribed by the grantee.

Rahul · R · Pai

Name and Signature of the Investigator

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY * ERNAKULAM 683 582 * KARUKUTTY

(Office seal)

Name and Signature of Head of the Institution

Place: Karukutty

Date: 28.04.2022

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/RESEARCH 3/1082/2022 Dated: 26.02.2023

From

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To

The Principal,
SCMS College of Engineering and Technology, Ernakulam.

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Yours faithfully
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DEAN (Research)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

CENTRE FOR ENGINEERING RESEARCH AND DEVELOPMENT

College of Engineering Trivandrum Campus
Thiruvananthapuram. Pin 695 016

Application format for Research Seed Money

1. **Title of the Research Proposal:**
   Study of dispersion coefficient of contaminants through different types of soils and remediation using natural fibres

2. **Name & address & experience of Investigator**
   Dr. Praseeja A V
   Assistant Professor
   SCMS School of Engineering and Technology
   Karukutty, Ernakulam
   praseeja@scmsgroup.org, 8592089108

3. **Teaching experience** - 7 years

4. **Objectives**

   1. To develop an experimental laboratory model for analyzing the contaminant transport mechanism through different types of soils.
   2. To determine the dispersion coefficient of different contaminants through various soil types.
   3. To analyse the effectiveness of natural fibres for controlling the distribution of contaminants in saturated soils.

5. **Broad Subject area / field of classification**

   Environmental Engineering/Groundwater contamination

6. **Project Type(s)** (Basic Research / Applied Research / Developmental / Demonstration / Others

Applied research

7. **Abstract :** Recent industrial and social developments in our country created a huge pollution problem in various components of the environment. The air pollutants, water pollutants, solid and hazardous waste will finally reach the soil and penetrate to the ground water. To study the

movement of these pollutants through the soil in dry, partially saturated and fully saturated conditions, an experimental model has to be developed. This study includes the design and analysis of a laboratory scale experiment set up to find the contaminant transport mechanisms and corresponding coefficients, when various contaminants are transported through different types of soils. Also includes the analysis of capacity of natural fibres to control the groundwater pollution.

8. Scientific scope of the Research proposal

Ground water protection is now receiving increasing attention in industrialized countries as the value of the resource is becoming better understood. Scientific studies should be performed and technical efforts should be given to identify proper remedial measures and thereby, improve the quality of groundwater systems. Field investigations, that are usually performed to assess these parameters, are very expensive and time-consuming. Besides, the success of remedial design depends on the ability to predict the subsurface distribution of the contaminants and its transfer of phases. Hence it is necessary to develop an experimental setup for analysing the transport mechanism of different contaminants in both longitudinal and lateral direction through various types of soil to identify a better solution to protect groundwater.

9. Applications / Socio-economic importance

The physical outcome of this study is to quantitatively estimate the transport parameter of contaminant through soil, especially the dispersivity and distribution coeffecient. The identification of transport parameters helps to find an appropriate remedial measure to reduce groundwater contamination. The socio-economic importance of this work is to recommend a sustainable measure to reduce the effect of groundwater contamination caused by the industrial dyes emitted from textile industries.

As the controlling or remediating strategies are applied to the natural formations, these should essentially be environmental friendly and sustainable. Moreover, these adopted measures should be implemented easily without much investment. Hence, these factors turn the focus eventually to natural materials which can control/ remediate transport of contaminants through soil. From literatures, many natural fibres are found to be least expensive and good in sorption of various contaminants, biodegradable and can be used as remedial measure to reduce groundwater contamination. Hence it is proposed to identify a natural fibre, if found suitable based on current investigation, can be recommended as an environmental friendly solution to control the migration of dyes from a contaminated site. If found suitable, it will become a viable solution for controlling the migration of dye so that it will not reach the groundwater sources.

10. Scientific background of the project

Groundwater contamination occurs when man-made products or chemicals get into the groundwater and become unsafe and unfit for human use. Materials from the ground surface can

move through the soil and end up in the groundwater. During their downward transport through road materials and soils, contaminants in the aqueous phase interact with the solid phase. Since the groundwater migrates from areas of higher hydraulic head toward lower hydraulic head, transporting dissolved solutes through the combined processes of advection and dispersion. The advective transport of a component is carried by flow of a fluid, and diffusive and dispersive flux is contributed by molecular diffusion and mechanical dispersion.

A general form of mass transport in one dimension can then be described as:

$$\frac{\partial(\theta C)}{\partial t} = \frac{\partial}{\partial z}[(\theta D \frac{\partial C}{\partial z}) - q C] \quad (1)$$

where D_d is the diffusion coefficient of a porous medium. where $J = \theta C$ is mass flux, C is contaminant concentration, and q is the volumetric darcian flux of water.

Equation 1 describes the processes of advection, diffusion, and mechanical dispersion. This equation can be further generalized to incorporate terms for chemical reactions and sorption effects.

a) Importance of the problem

Water is an essential resource for the existence of life and a major concern for sustainable development. The textile industry is one of the anthropogenic activities that pollute soil and water bodies. Therefore, the present work aims to undertake an experimental study to understand the transport behaviour of dyes through subsurface soil and eventually reaches groundwater. The textile dyes significantly compromise the water quality and imparts many environmental issues. Hence it is essential to understand the transport mechanism of dye through the soil inorder to properly remediate without reaching the groundwater.

b) Related work already performed or in progress at your organization or in the state.

Water quality analysis works were carried out in the Water institute in our institution. The work was extended to both UG and PG projects in which numerical modelling studies were conducted to simulate the transport mechanism of various contaminants through soil. The main limitation behind the numerical modelling studies was the assumption of values in the transport mechanism of contaminants, especially the dispersion and diffusion coefficients. Hence to overcome those drawbacks, it is essential to develop an experiment setup for determining values of important factors contributing to the transport process of contaminants through soil.

c) Related work already performed or in progress at other places in India or abroad.

1. Literatures based on laboratory simulation of contaminants through soil

Kechavarzi et al. (2008) carried out experiments to investigate the effect of macro-heterogeneity on LNAPL flow and distribution in the unsaturated zone by simulating LNAPL spills in layered

soil systems consisting of sands with various textures. It reveals the importance of the initial water pressure and saturation distribution in unsaturated layered soil formations for the correct prediction of LNAPL infiltration and drainage.

Li et al. (2009) investigated the effect of column lengths on retardation factor both experimentally and numerically for caesium transport in crushed granite. This study examined the validity of break through curves from packed granite columns with different lengths and flow rates. Results shows that in order to reduce the influence of structural dispersivity on the determination of retardation factors, the equivalent pore volume of column supporting materials should be smaller than those of packed porous medium.

Berlin et al. (2015) conducted flow-through experiment and developed a one dimensional numerical model to simulate the effect of volatilization, dissolution, adsorption and microbial degradation of benzene transport in an unsaturated subsurface system. The degradation effect of benzene is repr esented as a retardation factor in modelling. An equation has been developed for representing the decreasing concentration of dissolved oxygen due to the bacterial utilization for the contaminant degradation.

2.Literatures based on application of cellulose-based materials / Coir Geotextiles in various remediation techniques.

Praveen et al. (2008) presents a viable and cost - effective technology using coir geotextile, for the removal of organic matter from wastewater

Karan et al. (2011) reviews different oil spill clean-up methods over water bodies with special emphasis on the phenomenon of oil sorption, methods of oil spill cleanup, characteristics of oil sorbent materials, fluid flow through fibrous materials, types of fibre materials for making sorbents and test methods for oil sorbents. It is suggested to concert efforts to structure suitable fibre assemblies for their use as environment-friendly oil sorbents

Mukkulath and Thampi (2012) has conducted a pilot plant study by utilizing coir geotextile media of both woven and non-woven type as attachment media for the biofilters for low volume organic rich industrial wastewater. It is observed that non woven geotextile is better for removing nitrate and phosphate from sample waste water.

11. Details of any preliminary work done by the investigator

Laboratory studies for understanding the saturation distribution of hydrocarbons through various soil medium was conducted by the principal investigator **(Praseeja and Sajikumar, 2020)**. The work highlighted an experimental study using Coir Geotextile (CG) layer (natural fibre) to control the migration of LNAPL in the unsaturated zone and highlighted the effective application of CG layer in the case of laterite soils than sandy soils. The experiment was conducted in a flow cell of

length 1.20m, height 1.20m and 0.10m depth was filled with soil up to a height of 1.10m from the bottom of the tank. Here diesel is taken as the LNAPL to simulate its flow behaviour. Twenty different trials of experiments were conducted for assessing the effectiveness of natural fibre (coir geotextile - CG) in controlling the NAPL migration through different types of soils, in both dry and wet conditions. The images of each trial were captured and the LNAPL saturation was analysed using the image analysis technique (IAT).

The data obtained from laboratory simulation includes (i) the LNAPL migration (in-transfer) rate, (ii) the initial saturation value (iii) LNAPL saturation as it migrates through the soil in time intervals until the migration stops, (iv) the pressure values before and during the spill, (v) the control action of the CG layer under various soil conditions. Based on these outcomes, the actual period of containment of LNAPL in the real field case is to be investigated numerically **(Praseeja and Sajikumar, 2021)**. For numerically modelling the migration of a multiphase liquid in the unsaturated zone, it was necessary to study the transport mechanisms and the interactions between different phases (air, water, oil) within the zone through laboratory flow-through experiment.

Principal Investigator has worked on the application of natural fibres to improve the water quality parameters **(Praseeja et al. 2022)**. The specific objectives of this study includes the water quality analysis of Periyar river due to the Kerala Floods 2018 and its remediation using natural fibre.

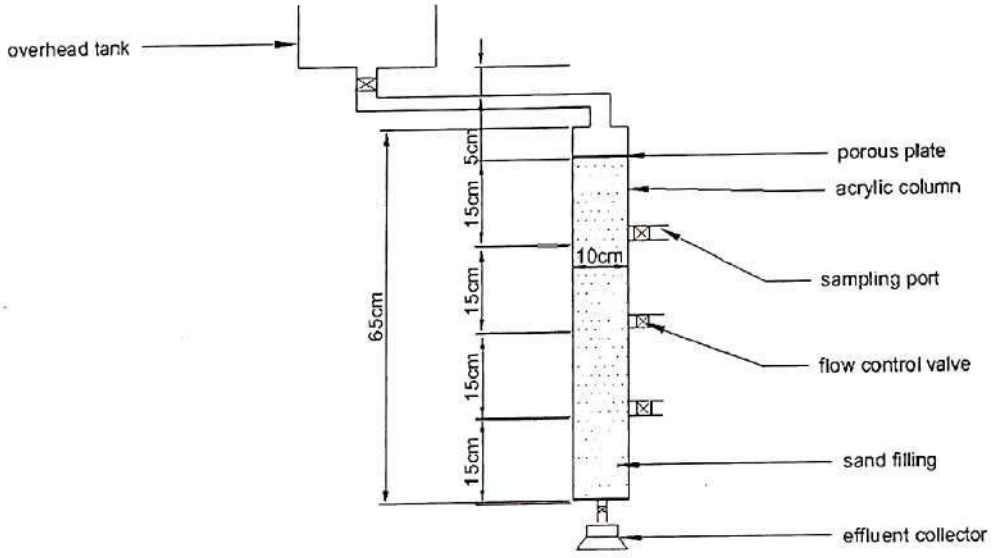
12. Detailed year wise work plan (Indicate methods / Techniques to be used)

Activity	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24
Purchasing and assembling of equipments								
Soil testing								
Calibration of the setup								
Conduct of experiment								
Water sample analysis								
Result analysis								
Journal paper submission								
Report Preparation								

13. Particulars of equipment required

Sl. No	Required equipments	Specifications	No.of units
1	Batch Column setup	Material- plexi glass (for measuring both longitudinal and transverse dispersivity)	2
2	Overhead Tank	continuous storage of water for both vertical and horizontal setup (10 litres)	1
3	Peristaltic Pump	continuous supply of water (flow rate 0.002 -50ml/min)	2
4	Flow meter	Measuring flow rate	2
5	Flow control valves	To control flow	12
6	Chemical Reagents	Water quality analysis	

The proposed experimental set up to analyse the contaminant transport is given below.



14. Particulars of any other facilities required Nil

15. Particulars of the facilities that will be provided by the institution where this project will be Implemented

Sl No	Infrastructural Facility	Yes/No/ Not Required/ Full or Sharing Basis
1	Environmental Engg. Lab facility to analyse water samples	Yes
2	Geotechnical Engg. Lab facility for analysing the soil properties	Yes
3	Water and electricity	Yes
4	Power generator	Yes
5	Telecommunication including email	Yes
6	Administrative support	Yes
7	Information facilities like internet and library	Yes
8	Transportation	No

16. Whether the project was submitted to any other organization for financial support: No

17. Budget Details: Estimated expenditure

Sl No	Items	Amount (Rs)			Justification
		1st year	2nd year	Total	
1	**Consumables**	15000	15000	30000.00	Chemical reagents for water quality analysis
2	**Equipment** 1.Batch Column setup 2.Overhead Tank 3.Peristaltic Pump 4.Flow meter 5.Flow control valves	100000		1,00,000.00	Two flow setup –for measuring longitudinal and transverse dispersivity
3	**Travel**	5000	5000	10000.00	For sample collection and water sampling
4	**Contingency**	7500	7500	15000.00	Few water sampling tests to be done in external labs
	Total			**1,55,000.00**	

18. The sources of funding the project including funds from other agencies from which financial assistance is obtained/expected to be obtained, and the quantum of assistance from each agency :

Nil

19. Quantum and nature of assistance expected from the CERD KTU: Full financial Support

20. Name and address of the authority of Institution authorized to receive the grant

SCMS School of Engineering and Technology, Vidya Nagar, Palissery, Karukutty, Kerala 683582

21. Whether grant under this scheme had been availed earlier by the investigator: No

22. Details of projects already undertaken by the Principal Investigator with any other funding Agency: Nil

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1. Berlin, M., Vasudevan, M., Kumar, G.S. and Nambi, I.M., 2015. Numerical modelling on fate and transport of petroleum hydrocarbons in an unsaturated subsurface system for varying source scenario. Journal of Earth System Science,124(3),pp.655-674
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3. Kechavarzi, C., Soga, K., Illangasekare, T. and Nikolopoulos, P., 2008. Laboratory study of immiscible contaminant flow in unsaturated layered sands.Vadose Zone Journal,7(1), pp.1-9
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7. Praseeja, A.V. and Sajikumar, N., (2021) Numerical simulation on LNAPL migration in vadose zone and its prevention using natural fibre. *Experimental and Computational Multiphase Flow*, pp.1-14.
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9. Praveen, A., Sreelakshmy, P.B. and Gopan, M., 2008. Coir geotextile-packed conduits for the removal of biodegradable matter from wastewater.Current science,95(5), pp.655-658.

Declaration

Certified that the details furnished above are correct to the best of my knowledge and belief and that the amount of financial assistance, if granted, will be utilised for the purpose for which it is granted within the time prescribed by CERD KTU. I also undertake to abide by the rules and other conditions prescribed by the grantee.

Prasad AV

Name and Signature

of the Investigator

Name and Signature of

Head of the Institution

SCHOOL OF ENGINEERING AND TECHNOLOGY * KARUKUTTY * ERNAKULAM 683 582

(Office seal)

Place: Ernakulam

Date: 29/4/22

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/RESEARCH 3/1082/2022 Dated: 26.02.2023

From

The DEAN (Research)

To

The Principal,
SCMS College of Engineering and Technology, Ernakulam.

Sir,

Sub:- APJAKTU - CERD - Research Seed Money Scheme - Projects Selected for funding - reg:-

I am glad to inform you that the project proposals as listed in Annexure I are provisionally selected for funding under Research Seed Money (RSM) scheme of KTU.

The expenditure should be incurred as per the sanctioned budget heads and in accordance with terms and conditions given in Annexure II. Format of MOU to be furnished by the college is given as Annexure III.

The Principal Investigators may please be directed to forward request (in Annexure II) for releasing the fund with Bank Account details. The fund will be released only after settling pending accounts of the principal investigator in CERD, if any. Any request received after three months from the date of this letter will not be considered.

Yours faithfully
Dr. Shalij P.R *
DEAN (Research)

Copy To

1. Shri. Jayadevan P C, Assistant Professor in Mechanical Engineering.
2. Dr. Gibin George, Assistant Professor in Mechanical Engineering
3. Dr. Abin Joseph, Assistant Professor in Mechanical Engineering.
4. Smt. Meera Varghese, Assistant Professor in Civil Engineering.
5. Smt. Merin Mathew, Assistant Professor in Civil Engineering.
6. Dr. Praseeja A. V., Assistant Professor in Civil Engineering.
7. Shri. Rahul R Rai, Assistant Professor in Civil Engineering.
8. Smt. Asha S, Assistant Professor in computer Science and Engineering.
9. Dr. Geethu R, Assistant Professor in Science.

10. Smt. Mary Catherine V. G, Assistant Professor in Electronics and Communication Engineering.

* This is a computer system (Digital File) generated letter. Hence there is no need for a physical signature.

SCMS School of Engineering and Technology, Ernakulam												
SL No	Name of Principal Investigator	Title of the project	Branch	Amount Sanctioned	Ist installment	2nd installment	Consumables	Equipment	Travel	Contingency		
1	Jayadevan P C Assistant professor	Analysis of Low Reynolds Flow (Stokes Flow) Through Micro Capillaries	ME	50,000	40,000	10,000	40,000	0	5000	5000		
2	Dr. Gibin George Assistant Professor	Development of eco-friendly packaging materials from agricultural wastes.	ME	70,000	60,000	10,000	10,000	50,000	5000	5000		
3	Dr. Albin Joseph Assistant Professor	Development of Floating type solar still desalination system integrated with direct absorption flat plate solar collector for improved productivity	ME	84,000	60,000	24,000	60,000	0	8000	16,000		
4	Meera Varghese Assistant Professor	Sea water intrusion modelling into some of the coastal aquifers in Thrissur district.	Civil Engineering	46,000	35,750	10,250	0	0	14,000	7000	testing charges 25,000	
5	Merin Mathew Assistant Professor	Catchment scale source apportionment of sediment yield into Vembanad Lake	Civil Engineering	160,000	110,000	50,000	40,000	0	20,000	20,000	Testing charges 80,000	
6	Dr. Praseeja A V Assistant Professor	Study of dispersion coefficient of contaminants through different types of soils and remediation using natural fibres	Civil Engineering	155,000	127,500	27,500	30,000	100,000	10,000	15,000		
7	Rahul R. Pai Assistant Professor	Fatigue studies and resilient behavior of crushed brick fly ash lime (CBFL) mix for use in base layer of flexible pavement	Civil Engineering	90,000	57,500	32,500	20,000	0	10,000	10,000	Testing charges 32,000	Experimental charges 18,000
8	Asha S Assistant Professor	Multimodal Ensemble Deep fake Detection using Visual-Audio-Textual features	CSE	159,000	130,000	29,000	5,000	130,000	12,000	12,000		

9	Dr. Geethu R. Assistant Professor	Developing cost effective and eco-friendly copper tin sulphide material for photovoltaic application	Science	75,000	50,000	25,000	40,000	5,000	10,000	20,000
10	Mary Catherine V G Assistant Professor	Touch Activated Soft Robotic Hand Control for Elderly Assistance	ECE	60,000	40,000	20,000	30,000	15,000	5,000	10,000

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

CENTRE FOR ENGINEERING RESEARCH AND DEVELOPMENT

College of Engineering Trivandrum Campus
Thiruvananthapuram Pin 695 016

Application for Research Seed Money

1. Title of the Research Proposal: Catchment scale source apportionment of sediment yield into Vembanad Lake

2. Name & address & experience of Investigator (Mobile No. and e-mail are mandatory) : Merin Mathew,
: Assistant Professor (KTU ID: KTU-F30130),
: Civil Engineering Department,
: SCMS School of Engineering and Technology,
: Vidya Nagar, Palissery, Karukutty,
: Ernakulam - 683576, Kerala.
: Experience: 6 Years, 2 months
: Mob No. 9847498570
: Email id: merinmathew@scmsgroup.org

3. Teaching experience: 6 Years, 2 months (Date of Joining: 01/03/2016)

4. Objectives of Research:

i. Sampling and chemical characterization of suspended sediments flowing into the Vembanad Lake.
ii. Sampling and chemical characterization of topsoil from potential source regions of suspended sediments in the catchment of Vembanad Lake.

5. Broad Subject area/ field of classification:

Water Resources Conservation and Management - Wetlands

6. Project Type(s) (Basic Research / Applied Research / Developmental / Demonstration /Others: Applied Research

7. Abstract:

Kerala's largest wetland ecosystem, the Vembanad Lake, has been playing a significant role in the socio-economic and cultural history of Kerala. However environmental and ecological deterioration of this second largest Ramsar wetland in India, mostly due to anthropogenic interventions, has been a concern over the recent decades. Among several other factors, increased siltation is a major issue that needs to be addressed for the health and sustainability of Vembanad lake. Data from Central Water Commission (CWC) shows increased sediment load in the rivers draining into Vembanad lake {1} which is also corroborated by a recent study by KUFOS {2} that revealed progressive shallowing of backwater due to siltation in recent years. Though siltation is identified as a threat to the wetland, limited understanding is available on the potential sources/activities and geographic zones contributing to the sediment yield. Man-made alterations in the catchment such as deforestation, urbanization, agriculture, and mining and land cover modifications are some of the potential sources contributing to the sediment load into Vembanad. Quantification of the relative contribution from these different sources to in-stream sediment is of major interest to target sediment mitigation best management practices (BMPs) in the highlands. The present research proposal aims at using a sediment fingerprinting technique {3,4,5,6} to provide information on the sources of suspended sediment in the Vembanad lake catchment. This technique is based on two major assumptions: first, potential sources of suspended sediment are distinguishable on the basis of selected geochemical element fingerprinting properties, and second, the relative source contributions of different sources to suspended sediment can be determined with the comparison of fingerprinting properties in the suspended sediment and the source material samples. The procedure will employ multivariate statistical techniques to compare the fingerprint properties in suspended sediment and potential sources of sediment to obtain quantitative information on relative contributions from different sources. The proposed study will focus on one major river draining into the main body of Vembanad Lake namely, Muvattupuzha River. Identification of potential sediment source regions and analysis of land-use land cover characteristics within the catchment of these rivers will be carried out using satellite remote sensing data. Time integrated suspended sediment sampling will be carried out in the mentioned rivers and complete characterization of suspended sediments will include its size distribution as well as chemical composition. Representative source samples will be collected as surface scraps from different sub-catchment areas susceptible to the mobilization of sediment by water erosion. Source apportionment of suspended sediments will then be carried out using a multivariate mixing model {7,8}. This will help to effectively implement

best management practices within the Vembanad watershed to control sediment erosion and siltation of Vembanad Lake.

8. Scientific scope of the Research proposal:

Siltation of the Vembanad wetland can result in the reduction of its carrying capacity and heavy biodiversity losses, consequently impacting the communities settled around the environs. The economic activities carried out in and around the backwater include fishing, shrimp farming, clam picking, rice cultivation, duck rearing, and backwater tourism and any degradation of this wetland system will be devastating in the socioeconomic perspective of Kerala. Though high sediment yield has been monitored in many recent studies and the impact of siltation is understood, the understanding is limited on the sources yielding sediments into the lake. Unless the source regions are identified and their sediment yield is accurately estimated, it is not possible to implement any mitigation measures. The research proposed here will be the first attempt in the state to scientifically estimate the nature of suspended sediments flowing into Vembanad and apportion the sources contributing to it. The successful completion of this study, which is based on Muvattupuzha River basin will be helpful to replicate in other four major rivers draining into the main body of Vembanad Lake namely, Achenkovil River, Manimala River, Meenachil River, and Pampa River.

9. Applications / Socioeconomic importance / Relevance, if any, for the utilization and management of the natural resources of the State):

Understanding the sources and estimating their respective contribution toward suspended sediment yield into Vembanad Lake is essential for devising best management practices for controlling and mitigating of siltation of the wetland. The findings from this project will help in conserving Vembanad Lake and protecting the livelihood and sustainability of communities dependent on it. By conducting this study, the following sectors will be benefited:

1) Kerala Water Authority- Heavy sediment yield is a major issue in treating water at KWA treatment plants in the mentioned rivers. Reduction in the suspended sediments will be therefore beneficial for KWA.

2) Inland fisheries- Increased siltation and shrinking of Vembanad impose stress on the fish resource thereby affecting the community dependent on fisheries. This proposal, therefore, is also beneficial to prevent future damage to the fisheries sector.

3) Backwater Tourism - Backwater tourism is a major revenue for Kerala. The sustainability of this sector depends on managing the siltation of the lake.

4) Urban local bodies around Vembanad- Reduction in the water holding capacity of Vembanad Lake due to siltation can induce flooding in the neighboring urban areas. Mitigation of increased sediment yield from the catchment is therefore beneficial for urban local bodies to avoid such scenarios.

10. Scientific background of the project

a) Importance of the problem

Vembanad-Kol wetland is a multi-functional ecosystem supporting rich biodiversity as well as the livelihoods of dependent communities. It is the lifeline for 1.6 million people and a variety of flora and fauna and constitutes the second largest wetland system in India. Recent studies have indicated shallowing and shrinkage of Vembanad lake with one of the major reasons being the siltation induced by high sediment yield from the catchment area. If this continues, in addition to the ecological and socio-economic impacts, the lake will have reduced water holding capacity which increases the flooding potential of neighboring settlements. As climate change impacts such as extreme rainfall events and sea-level rise are becoming real for Kerala along with unregulated land-use alterations and excessive erosion in the highlands, the future of Vembanad Lake will definitely depend on better management practices (BMPs) in its catchment. The proposed project, therefore, is of high importance as it will support the development of policies and define BMPs for the health and sustainability of Vembanad Lake.

b) Related work already performed or in progress at your organization or in the state.

A study conducted by KUFOS founds that there is sharp depth shrinkage for the lake from 8 to 9 meters depth in the 1930s to the present 1.6 to 4.5 meters depths. They also states that the southern part of the lake is likely to disappear in one or two decades [2]. This finding is also supported by the study conducted by NCESS and MoES on 2016; the estuarine area has a shrinkage of 12.28 km^2 (6.93%) during 1973 to 2015 time period [9].

In 2011 a study was conducted in the surface sediments of Vembanad Lake by Institute for Ocean Management, Anna University; they have collected sediment samples from 47 stations in the lake and examined the organic carbon, sediment texture and heavy metal content like Al, Fe, Mn, Cr, Zn, Ni, Pb, Cu, Co and Cd. The results of the study has shown that the sediment was heavily polluted in northern arm and moderately polluted in the extreme end

and port region of the southern arm of the lake. Also the statistical analysis shown a significant spatial variation for all sediments but only negligible seasonal variation [10].

c) Related work already performed or in progress at other places in India or abroad.

Several studies has been conducted in the field of sediment source apportionment, at various parts of the world. Sediment fingerprinting techniques will help to acquire valuable information on the sources of suspended sediment, which helps in adopting integrated management plan. Sediment fingerprinting study conducted in Pleasant Valley watershed in South Central Wisconsin in 2014 revealed that agriculture and stream banks are important sources of suspended sediment (45 to 97%) [3].

Using traditional methods it is difficult to identify the source of sediments in water bodies but sediment source fingerprinting or tracing procedures was a better alternative for this problem. The increase in fine grained sediment flux is creating a lot of ecological issues which extends up to a threat of extinction of water bodies itself. A review paper on sediment source fingerprinting as an aid to catchment management [4] explains several aspects of fingerprinting techniques like sediment source classification catchment source and target sediment sampling, tracer selection, grain size issues, tracer conservatism, source apportionment modelling, and assessment of source predictions using artificial mixtures.

A modified sediment fingerprinting study was conducted in Somerset Levels in England during 2009 [5], they incorporated a modified mass balance model by Monte Carlo approach for representing the uncertainty in surrounding source and sediment sampling, also weightings has given to account the source variability and discriminatory power of individual tracer properties and prior information. The sensitivity tests conducted by them confirmed that the precision of source apportionment was improved by incorporating this weightings and prior information into the mixing model.

In the eastern part of Alabama, USA a source apportionment study was conducted during 2018 [6] to find the relative contribution from different sources of suspended sediment in an urbanized watershed. By analysing the sediment samples from river and top soil from various parts of the catchment, they have determined that the construction sites were the dominant sources of suspended sediment in the watershed. They suggested that both spatial and temporal variability in suspended sediment sources has to be considered while developing sediment control management strategies.

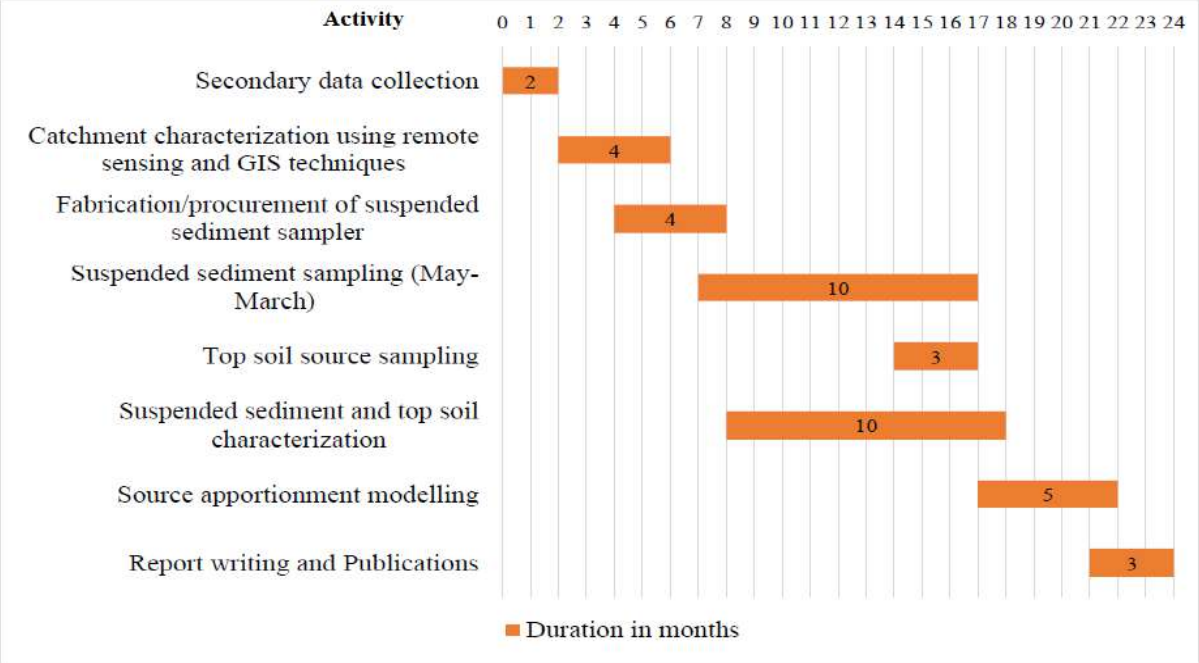
Since fine grained sediment are the key component in geochemical flux, to collect these suspended sediment samples a time integrated sampling methodology was followed by Phillips et. al, 2000 [7]. They are using a simple sediment sampler, utilizing ambient flow to induce sedimentation by settling. This sampler can be installed in small streams in unattended conditions and can collect time-integrated suspended sediment samples. The sampler will collect a maximum of 71% of the input sample mass. The field trials with this equipment has showed that the particle size composition and total carbon content of the sediment collected by the sampler were representative statistically of the ambient suspended sediment. A review paper on the suspended sediment sampling methods [8] the author has highlighted the advantages of time integrated sediment sampler.

- **Summary of literature review**

Vembanad-Kol wetlands are under the threat of getting extinct within two decades and one of the major reason for this is the sediment deposit. Even though there are so many management practices are adopted at the catchment area of Vembanad Lake, they are not considering this sediment load. So for implementing a best management practice (BMP) the real contributor of sediment has to be identified. Heavy metal analysis and species extension studies are taking place, but a sediment fingerprinting study is lacking; by conducting this study this gaps can be rectified.

11. Details of any preliminary work done by the investigator: Nil

12. Detailed year-wise work plan (Indicate methods / Techniques to be used):



Methodology:

I) Suspended sediment sampling and chemical characterization: suspended sediments will be collected from 2 sites (the point where river joining the Vembanad lake) using the time-integrated suspended sediment sampler developed by Phillips et al. {7} for ten months (May to March). The suspended sediment collected will be oven-dried and sieved into two particle sizes of range 63-212 micrometer (fine sand) and <63 micrometers (silt and clay). Then particle size analysis will be carried out using hydrometer and pipette, and chemical characterization for geochemical elements (selection of geochemical elements will be decided based on the source) using inductively coupled plasma mass spectrometry (ICP-MS).

II) Catchment characterization through satellite data analysis: The physical characteristics like catchment geometry, slope, aspect, change in land use/land cover and geomorphological properties of the catchment of one major river (Muvattupuzha River) draining into Vembanad lake will be studied using Remote sensing (Landsat TM) and Geographic Information System (GIS) techniques. Based on the land use pattern various source areas will be identified and the topsoil sampling points for each source area in each catchment will be fixed.

III) Topsoil sampling and chemical characterization: The topsoil (0 - 2.5 cm) {3} samples will be collected from each source area in each catchment. Similar to the suspended sediment; the topsoil collected from each source will be oven-dried and sieved into two particle sizes of range 63-212 micrometer (fine sand) and <63 micrometers (silt and clay). Then particle size analysis will be carried out using hydrometer and pipette, and chemical characterization for geochemical elements (selection of geochemical elements will be decided based on the source) using inductively coupled plasma mass spectrometry (ICP-MS).

13. Particulars of equipment required:

Sl. No.	Equipment Name	For which purpose it would be utilized in current project	Source of equipment
1	Time-integrated suspended sediment sampler	Suspended sediment sampling	To be fabricated in the institution
2	Spade	Topsoil sampling	Available at the institution
3	Drying oven	Suspended sediment and topsoil drying	Available at the institution

4	Sieve analysis equipment, hydrometer and pipette	Particle size analysis	Available at the institution
5	Inductively coupled plasma mass spectrometry (ICP-MS)	Chemical characterization of suspended sediment and topsoil	Available at Sophisticated Test and Instrumentation Center (STIC)

14. Particulars of any other facilities required: Nil

15. Particulars of the facilities that will be provided by the institution where this project will be implemented:

Sl. No.	Infrastructural Facility	Yes/No/ Not Required/ Full or Sharing Basis
1.	Workshop facility	Yes
2.	Water & Electricity	Yes
3.	Power Generator	Yes
4.	AC Room or AC	Yes
5.	Telecommunication including e-mail & Fax	Yes
6.	Transportation	No
7.	Administrative/ Secretarial Support	Yes
8.	Information facilities like Internet/ Library	Yes
9.	Computational facilities	Yes
10.	Laboratory Space /Furniture	Yes
11.	Laboratory facilities	Yes
12.	Any other special facility being provided	Fabrication facility

16. Whether the project was submitted to any other organization for financial support:

Nil

17. Budget Details: Estimated expenditure: Rs. 2,03,480/-

Sl. No.	Items	Amount (Rs)
1	Consumables **(Do not exceed 20% of the total amount)**	40,000/-
2	~~Equipment~~ **(Sample analysis cost)** (~~For Private self-financing Colleges, 50% of the actual Equipment cost subject to the maximum of sanctioned amount shall be borne by the college~~)	1,23,480
3	Travel **(Do not exceed 10% of the total amount)**	20,000/-
4	Contingency **(Do not exceed 10% of the total amount)**	20,000/-
	Total	2,03,480/-

Budget details:

Sl. No.	Item	Rate (Rs.)	Amount (Rs.)			Justification
			1st year	2nd year	Total	
1	**Consumables**					
	Fabrication materials	Rs. 10,000/- per sampler	20,000		20,000	• Time-integrated suspended sediment sampler
	Sampling labour charges		10,000	5,000	15,000	• Sampler installation and recollection from sampling points
	Stationery items		5000		5000	• Printing, Photostat, Sample collection bags
2	~~**Equipment**~~ **(Sample Analysis Cost)**					
	Chemical characterization of suspended sediment and topsoil using ICP-MS	Rs. 708/- for initial element and Rs. 142/- for subsequent elements		1,23,480	1,23,480	• Top soil sample from various locations. • Suspended sediment sample from 2 locations during 10 months (25 elements)
3	**Travel**		5,000	15,000	20,000	• Travel along the study area several times for data collection and sampling
4	**Contingency**		5,000	15,000	20,000	• Expecting damages or missing of the suspended sediment sampler due to scoring action in river
	TOTAL		**45,000**	**158,480**	**203,480**	

18. The sources of funding the project including funds from other agencies from which financial assistance is obtained/expected to be obtained, and the quantum of assistance from each agency: Nil

19. Quantum and nature of assistance expected from the APJAKTU: Full financial support

20. Name and address of the authority of Institution authorized to receive the grant:

SCMS School of Engineering and Technology, Vidya Nagar, Palissery, Karukutty, Ernakulam - 683576, Kerala.

21. Whether grant under this scheme had been availed earlier by the investigator: (If so, provide details): No

22. Details of projects already undertaken by the Principal Investigator with any other funding agency: Nil

- **References:**

[1] Cwc.gov.in. 2018. HYDROLOGICAL DATA (UNCLASSIFIED) BOOK. [Online] Available at: <http://www.cwc.gov.in/sites/default/files/ihd2018.pdf> [Accessed 28 October 2021].

[2] Kufos.ac.in. 2019. Vibrant-Vembanad-Report_compressed.pdf. [Online] Available at: <http://kufos.ac.in/wp-content/uploads/2021/01/Vibrant-Vembanad-Report_compressed.pdf> [Accessed 28 October 2021].

[3] Lamba, J., Karthikeyan, K. G., & Thompson, A. M. (2015). Apportionment of suspended sediment sources in an agricultural watershed using sediment fingerprinting. Geoderma, 239-240, 25–33. https://doi.org/10.1016/j.geoderma.2014.09.024

[4] Collins, A., Pulley, S., Foster, I., Gellis, A., Porto, P., & Horowitz, A. (2017). Sediment source fingerprinting as an aid to catchment management: A review of the current state of knowledge and a methodological decision-tree for end-users. Journal of Environmental Management, 194, 86-108. doi:10.1016/j.jenvman.2016.09.075

[5] Collins, A., Walling, D., Webb, L., & King, P. (2010). Apportioning catchment scale sediment sources using a modified composite fingerprinting technique incorporating property weightings and prior information. Geoderma, 155(3-4), 249-261. doi:10.1016/j.geoderma.2009.12.008

[6] Malhotra, K., Lamba, J., Srivastava, P., & Shepherd, S. (2018). Fingerprinting Suspended Sediment Sources in an Urbanized Watershed. Water, 10(11), 1573. doi:10.3390/w10111573

[7] Phillips, J.M., Russell, M.A., Walling, D.E., 2000. Time-integrated sampling of fluvial suspended sediment: a simple methodology for small catchments. Hydrol. Process. 14 (14), 2589–2602.

[8] Perks, M. T. 2014. "Suspended sediment sampling." In Geomorphological techniques, edited by L. E. Clarke. London: British Society for Geomorphology

[9] Nair K. N, Babu D. S. S. (2016). "Spatial Shrinkage of Vembanad Lake, South West India during 1973-2015 using NDWI and MNDWI." International Journal of Science and Research, 5(7), ISSN (Online): 2319-7064; 1394-1401

[10] Selvam, A. P., Priya, S. L., Banerjee, K., Hariharan, G., Purvaja, R., & Ramesh, R. (2011). 'Heavy Metal Assessment using geochemical and statistical tools in the surface sediments of Vembanad lake, southwest coast of India." Environmental Monitoring and Assessment, 184(10), 5899–5915. https://doi.org/10.1007/s10661-011-2389-8

Declaration

Certified that the details furnished above are correct to the best of my knowledge and belief and that the amount of financial assistance if granted, will be utilised for the purpose for which it is granted within the time prescribed by APJAKTU. I also undertake to abide by the rules and other conditions prescribed by the grantee.

Merin Mathew

Name and Signature
of the Investigator

Name and Signature of
Head of the Institution

DR. PRAVEENSAL C. J.
PRINCIPAL
SCMS SCHOOL OF ENGINEERING & TECHNOLOGY

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY
KARUKUTTY
ERNAKULAM
683 576

(Office seal)

Place: Karukutty

Date: 30/04/2022

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/RESEARCH 3/1082/2022 Dated: 26.02.2023

From

The DEAN (Research)

To

The Principal,
SCMS College of Engineering and Technology, Ernakulam.

Sir,

Sub:- APJAKTU - CERD - Research Seed Money Scheme - Projects Selected for funding - reg:-

I am glad to inform you that the project proposals as listed in Annexure I are provisionally selected for funding under Research Seed Money (RSM) scheme of KTU.

The expenditure should be incurred as per the sanctioned budget heads and in accordance with terms and conditions given in Annexure II. Format of MOU to be furnished by the college is given as Annexure III.

The Principal Investigators may please be directed to forward request (in Annexure II) for releasing the fund with Bank Account details. The fund will be released only after settling pending accounts of the principal investigator in CERD, if any. Any request received after three months from the date of this letter will not be considered.

Yours faithfully
Dr. Shalij P.R *
DEAN (Research)

Copy To

1. Shri. Jayadevan P C, Assistant Professor in Mechanical Engineering.
2. Dr. Gibin George, Assistant Professor in Mechanical Engineering
3. Dr. Abin Joseph, Assistant Professor in Mechanical Engineering.
4. Smt. Meera Varghese, Assistant Professor in Civil Engineering.
5. Smt. Merin Mathew, Assistant Professor in Civil Engineering.
6. Dr. Praseeja A. V., Assistant Professor in Civil Engineering.
7. Shri. Rahul R Rai, Assistant Professor in Civil Engineering.
8. Smt. Asha S, Assistant Professor in computer Science and Engineering.
9. Dr. Geethu R, Assistant Professor in Science.

10. Smt. Mary Catherine V. G, Assistant Professor in Electronics and Communication Engineering.

* This is a computer system (Digital File) generated letter. Hence there is no need for a physical signature.

SCMS School of Engineering and Technology, Ernakulam												
SL No	Name of Principal Investigator	Title of the project	Branch	Amount Sanctioned	Ist installment	2nd installment	Consumables	Equipment	Travel	Contingency		
1	Jayadevan P C Assistant professor	Analysis of Low Reynolds Flow (Stokes Flow) Through Micro Capillaries	ME	50,000	40,000	10,000	40,000	0	5000	5000		
2	Dr. Gibin George Assistant Professor	Development of eco-friendly packaging materials from agricultural wastes.	ME	70,000	60,000	10,000	10,000	50,000	5000	5000		
3	Dr. Albin Joseph Assistant Professor	Development of Floating type solar still desalination system integrated with direct absorption flat plate solar collector for improved productivity	ME	84,000	60,000	24,000	60,000	0	8000	16,000		
4	Meera Varghese Assistant Professor	Sea water intrusion modelling into some of the coastal aquifers in Thrissur district.	Civil Engineering	46,000	35,750	10,250	0	0	14,000	7000	testing charges 25,000	
5	Merin Mathew Assistant Professor	Catchment scale source apportionment of sediment yield into Vembanad Lake	Civil Engineering	160,000	110,000	50,000	40,000	0	20,000	20,000	Testing charges 80,000	
6	Dr. Praseeja A V Assistant Professor	Study of dispersion coefficient of contaminants through different types of soils and remediation using natural fibres	Civil Engineering	155,000	127,500	27,500	30,000	100,000	10,000	15,000		
7	Rahul R. Pai Assistant Professor	Fatigue studies and resilient behavior of crushed brick fly ash lime (CBFL) mix for use in base layer of flexible pavement	Civil Engineering	90,000	57,500	32,500	20,000	0	10,000	10,000	Testing charges 32,000	Experimental charges 18,000
8	Asha S Assistant Professor	Multimodal Ensemble Deep fake Detection using Visual-Audio-Textual features	CSE	159,000	130,000	29,000	5,000	130,000	12,000	12,000		

9	Dr. Geethu R. Assistant Professor	Developing cost effective and eco-friendly copper tin sulphide material for photovoltaic application	Science	75,000	50,000	25,000	40,000	5,000	10,000	20,000
10	Mary Catherine V G Assistant Professor	Touch Activated Soft Robotic Hand Control for Elderly Assistance	ECE	60,000	40,000	20,000	30,000	15,000	5,000	10,000

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

College of Engineering Trivandrum Campus, Thiruvananthapuram. Pin 695 016

Application format for Research Seed Money

1. **Title of the Research Proposal:**

Sea water intrusion modelling into some of the coastal aquifers in Thrissur district.

2. **Name & address & experience of Investigator:** Meera Varghese

(Mobile No. and e-mail are mandatory)

Assistant Professor
Department of Civil Engineering
SCMS School of Engineering and Technology, Karukutty
meeravarghese@scmsgroup.org
7306254267

3. **Teaching experience** : 2 years 9 months

4. **Objectives of Research** :

i)To analyse the water quality data obtained from selected wells along coastal areas of Thrissur district
i)To develop a flow and transport model on sea water intrusion in the selected study area
iii) To predict the extent of sea water intrusion after a period of 50 years
iv) To understand the effect of pumping on sea water intrusion

5. **Broad Subject area / field of classification**: Groundwater hydrology (Environmental Engineering)

6. **Project Type(s) (Basic Research / Applied Research / Developmental / Demonstration /Others:**

Applied Research

7. **Abstract:**

The existence of seawater intrusion severely limits the development and management of fresh groundwater resources in coastal aquifers. Underutilization of the existing groundwater resource means that important fresh water is lost as it flows naturally to the sea on the other hand and incase of overutilization of resources leads to water table depletion. Many models have been created over the years to illustrate and analyses the problems of seawater intrusion. They might be as simple as analytical solutions or as complicated as numerical models. Thrissur is experiencing a number of environmental issues as a result of population growth, rapid urbanization, and land reforms, including flooding, groundwater pollution from industrial effluent discharge, and seawater intrusion, etc. There is an immediate need to investigate the causes of seawater intrusion and possible solutions. This research aims at the simulation of seawater intrusion in some of the coastal areas of Thrissur district through Finite element flow and mass transport (FEFLOW)model and examines the impact of increased pumping scenarios on extent of seawater intrusion

8. **Scientific scope of the Research proposal:**

Seawater intrusion is a major hydrological problem in many coastal regions all around the world. It is usually defined as the intrusion of sea water into fresh groundwater areas in coastal aquifer locations. This phenomenon will occur when the natural equilibrium state established between fresh- and seawater is disturbed as a result of natural or artificial effects, which in turn results in the deterioration of freshwater resources affecting human beings, animals and agriculture and industrial resources within the contaminated zones. Over exploitation of coastal aquifer disturbs the natural steady state established between fresh- and saltwater. When the freshwater level is drawn down due to excessive pumping, the freshwater and seawater boundary moves towards inland with the subsequent salinization of areas previously located within the freshwater zone. Seawater intrusion is characterized by its invisibility, frequent dynamic changes, harmful effects, hard or even impossible reversibility and challenging management.

9. **Applications / Socioeconomic importance / Relevance, if any, for the utilization andmanagement of the natural resources of the State):**

As of 2011 India census, Thrissur city had a population of 315,957. Acute water scarcity being faced in the hilly areas in summer period due to drying up of dug wells and hand pumps. Dug wells in midland region get dried up if monsoon is delayed or if there are no summer showers. The increased dependence on bore wells in midland areas leads to drying up of dug wells in lateritic mounds and slopes, which affects the drinking water needs of those areas. In certain coastal areas, the salinity has been observed more during high tides and less during low tides and increasing from February to May. In the present research the focus is to study the extent of sea water intrusion in coastal areas of Thrissur district and predict whether it will affect the water security of the study area in near future.

10. Scientific background of the project

a) Importance of the problem

Clean drinking water is one among the basic necessities of all human beings. Saline water intrusion into house hold wells is an emerging problem in most of the coastal areas. People find it difficult to use salty water for their day today activities and hence sometimes the wells are discarded completely. Predicting salinity intrusion into coastal aquifers help the government agencies to take proper precautionary measures for saving the water bodies

b) Related work already performed or in progress at your organization or in the state.

Nil

c) Related work already performed or in progress at other places in India or abroad.

CP Kumar et al (2007) did modeling of a coastal aquifer in goa using FEFLOW. This work was done by groundwater hydrology division of National Institute of Hydrology. The objective of the study was to stimulate the sea water intrusion in the coastal regions of Goa and to evaluate the impact of further ground water development on seawater intrusion. Outcome of the study includes the

present status of seawater intrusion in the area, impact of ground water development on the extend of seawater intrusion. The methodology adopted for the study comprises of collection of meteorological, measurement of groundwater level in observation wells lithological, geochemical data measurements in observation wells, salinity measurement in observation wells, model conceptualization, calibration and simulation

Gaps identified:

From the literatures, it is observed that salt water intrusion modelling has not been done in Thrissur district. So this initiative will help to better manage the ground water resources of the study area

11. Details of any preliminary work done by the investigator

Site has been visited and 10 observation wells were finalized along the coastal areas. The water quality details for the past 10 years has been collected from Kerala Ground water Department

12. Detailed year-wise work plan (Indicate methods / Techniques to be used)

ACTIVITY	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24
Data collection from Ground water Board								
Site visit								
Data preparation and model conceptualization								
Determination of boundary conditions and numerical modelling								
Data collection post Monsoon								
Calibration, prediction, simulation and conclusion								
Preparation of research paper								
Preparation of report								

Methodology

- Problem identification and selection of software
- Collection of relevant data Pre and Post monsoon period
- Analysis of collected data
- Model conceptualization and data preparation
- Determination of initial and final boundary conditions
- Modelling for a numerical solution using FEFLOW application

- Calibration of model • Predictive simulations
- Interpretations and conclusions

13. Particulars of equipment required

Sl. No	Equipment name	Purpose
1	Nil	

14. Particulars of any other facilities required

Facility required	Parameters	Purpose
Water testing	Coliform colonies	Bacteriological Analysis
	Fe	Water quality analysis
	Mg	Identification of salinity source
	Cl	Identification of salinity source

15. Particulars of the facilities that will be provided by the institution where this project will be implemented

Sl.No	Infrastructure facility	Yes/No
1	Workshop facility	Yes
2	Water & Electricity	Yes
3	Telecommunication including e-mail & Fax	Yes
4	Transportation	Yes
5	Information facilities like Internet/ Library	Yes
6	Laboratory Space /Furniture	Yes

16. Whether the project was submitted to any other organization for financial support: Nil

17. Budget Details: Estimated expenditure

	Items	Rate (Rs)	Amount (Rs)			Justification
			1st year	2nd year	Total	
1	Data collection Water quality and level data from Ground water Department		27500	27500	55000	
2	a. Equipment • Containers	50/container	1000		1000	• For water sampling
	b. Analysis of samples Coliform, Iron, Magnesium	1200/sample	12000	12000	24000	• For water Testing
3	Travel **(Do not exceed 10% of the total amount)**		7000	7000	14000	• For sample collection
4	Contingency **(Do not exceed 10% of the total amount)**		7000		7000	
	Total		54500	46500	101000	

18. The sources of funding the project including funds from other agencies from which financial assistance is obtained/expected to be obtained, and the quantum of assistance from each agency : Nil

19. Quantum and nature of assistance expected from the APJAKTU : Full financial support

20. Name and address of the authority of Institution authorized to receive the grant

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY
VIDYA NAGAR, PALLISSERY, KARUKUTTY
KERALA 683582

21. Whether grant under this scheme had been availed earlier by the investigator: (If so, provide details) : Nil

22. Details of projects already undertaken by the Principal Investigator with any other funding agency Nil

References

1. K.S Anil kumar and C.P. Priju(2015),Study on Saline Water intrusion into the Shallow Coastal Aquifers of Periyar River Basin, Kerala using Hydrochemical and Electrical Resistivity Methods, International conference journal on water resources and ocean engineering.

2. C.P Kumar(may 2016),Seawater intrusion in coastal aquifers, EPRA International Journal of Research and Development (IJRD),Volume :1,Issue :3

3. Fei Ding and Takao Yamashita(2014) ,Seawater modelling of coastal aquifer in the liao dong bay coastal plain, China, Journal of marine and technology,Vol:22.

4. Vanessa Rodriguez and Anibal perez(2018), Saline intrusion on coastal aquifer, Vol:2, Issue:5.

Declaration

Certified that the details furnished above are correct to the best of my knowledge and belief and that the amount of financial assistance, if granted, will be utilized for the purpose for which it is granted within the time prescribed by APJAKTU. I also undertake to abide by the rules and other conditions prescribed by the grantee.

MEERA VARGHESE

Name and Signature
of the Investigator

(Office seal)

Name and Signature of
Head of the Institution

Place: KARUKUTTY

Date: 29.4.2022

Phone No 04842439029 Custome

नाम 901093716 M/S CERD RSM KTU RESE
Name

खाता क्र.
A/c. no.
588802010008174 (SB GENERAL)

Cust Id : 901093716

Village : 627965 -Karukutty

MICR Code : 683026004
IFSC Code : UBIN0558885

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आन्ध्रा Andhra कार्पोरेशन Corporation

यूनियन बैंक ऑफ इंडिया Union Bank of India

भारत सरकार का उपक्रम A Government of India Undertaking

आन्ध्रा Andhra कार्पोरेशन Corporation

शाखा / Branch : PALISSERY

शाखा का पता / Branch Address : SCMS COLLEGE OF ENGG AND TECH
VIDHYA NAGAR, PALISSERY PALISSERY-683582

शाखा का फोन नं. / Branch Phone No.:

खाता क्र. / Account No.: 588802010008174
(SB GENERAL)

In the Name of :

नाम / Name i) M/S CERD RSM KTU RESEARCH 3 1082 2022 05

ii)

iii)

पेशा / Occupation ASST PROFESSOR DEPT OF CIVIL ENGG

पता / Address KARUKUTTY

खाता खोलने की तारीख Date of Opening A/c 10-03-2023

Issue date:23-03-2023

Sr No: 2

KERALA INDIA

IFSC Code : UBIN0558885

SCMS SCHOOL OF ENGG AND TECH

Pin : 683576 KERALA INDIA

नामांकन पंजीकृत / Nomination Registered: हाँ Y / नहीं N

लेखाकार Accountant

दिनांक Date	विवरण Particulars	सोल आयडी SOL ID	चेक नं. CHQ. No.	निकाली गयी राशि DEBIT	जमा की गयी राशि CREDIT	जमाकर्ता के खाते में शेष राशि BALANCE	लेखाकर आद्याक्षर INITAL
18-11-2023	By NEFT:Director of Treasuries accou	47380			100000.00	100000.00 Cr	

Branch Phone No : 04842439029

N

Please visit your branch to avail facility of Nomination in your accounts including locker, to avoid inconvenience to your legal heirs in settlement of claims after you. Nomination can be changed,modified, cancelled by you any time during your lifetime

नवीनतम संशोधन / Latest Amendments

1. निष्क्रिय खाते के संबंध में / About Dormant Accounts

- लगातर 12 माह तक परिचालित न हुए बचत खाते को निष्क्रिय खाते रुप में वर्गीकृत कर दिया जायेगा. निष्क्रिय खाते में परिचालन की अनुमति नहीं होगी. खाते को सक्रिय कराने के लिये ग्राहक कृपया शाखा प्रबंधक से संपर्क करे तथा निष्क्रिय खाते को पुन: सक्रिय कराये बिना उस पर कोई चेक जारी न करें.
- Saving Banks Accounts, which are inoperative for a continuous period of 12 months will be classified as Dormant. Operations will not be allowed in Dormant Account. Customers are requested to contact the Branch Manager for re-activating the account and are requested not to issue any cheques on Dormant Account before they are reactivated.

2. चेक पर परिवर्तन / अधिलेखन के संबध में / About Alterations / Overwritings on cheques

- चेक पर कोई परिवर्तन / संशोधन न किया जाए. आदाता के नाम, रकम (पुन:वैधीकरण की दुष्टि से दिनांक में परिवर्तन को छोडकर) आदि में परिवर्तन के लिये नया चेक प्रयोग करें.
- No changes/corrections should be carried out on the cheques. For any change in the payee's name, the amount (other than date for validation purpose) etc, fresh cheque forms should be used.

यूनियन बैंक Union Bank of India

शाखा / Branch :	PALISSERY	Issue date:23-03-2023
शाखा का पता / Branch Address :	SCMS COLLEGE OF ENGG AND TECH	Sr No: 1
शाखा का फोन नं. / Branch Phone No.:	VIDYA NAGAR, PALISSERY PALISSERY-683582	KERALA INDIA
खाता क्र. / Account No.:	[redacted]29	IFSC Code : UBIN0558885
In the Name of :	588802010008177	
नाम / Name i)	(SB GENERAL)	
ii)	M/S CERD RSM KTU RESEARCH 3 1082 2022 06	
iii)		
पेशा / Occupation	ASST PROF DEPT OF CIVIL ENGG	SCMS SCHOOL OF ENGG AND TECH
पता / Address	KARUKUTTY	Pin : 683576 KERALA INDIA
खाता खोलने की तारीख Date of Opening A/c	10-03-2023	

नामांकन पंजीकृत / Nomination Registered: हाँ Y / नहीं N

लेखाकार Accountant

दिनांक Date	विवरण Particulars	सोल आयडी SOL ID	चेक नं. CHQ. No.	निकाली गयी राशि DEBIT	जमा की गयी राशि CREDIT	जमाकर्ता के खाते में शेष राशि BALANCE	लेखाकार आद्याक्षर INITAL
18-11-2023	By NEFT:Director of Treasuries accou	47380			127500.00	127500.00 Cr	

दिनांक Date	विवरण Particulars	सोल आयडी SOL ID	चेक नं. CHQ. No.	निकाली गयी राशि DEBIT	जमा की गयी राशि CREDIT	जमाकर्ता के खाते में शेष राशि BALANCE	INITAL
18/11/2023							
08-02-2024 To cash		58000	67302	20000.00		20000.00 Cr	

यूनियन बैंक ऑफ इंडिया Union Bank of India

भारत सरकार का उपक्रम A Government of India Undertaking

आन्ध्रा Andhra | कार्पोरेशन Corporation

शाखा / Branch : PALISSERY

शाखा का पता / Branch Address : SCMS COLLEGE OF ENGG AND TECH VIDHYA NAGAR, PALISSERY PALISSERY-683582 KERALA INDIA

शाखा का फोन नं. / Branch Phone No.:

खाता क्र. / Account No.: 588802010008182 (SB GENERAL)

In the Name of :

नाम / Name i) M/S CERD RESEARCH SEED MONEY KTU RESEARCH 3 1082 2022

ii)

iii)

पेशा / Occupation

पता / Address SCMS SCHOOL OF ENGG AND TECH VIDHYA NAGAR PALISSERY KARUKUTTY Pin : 683576 KERALA INDIA

खाता खोलने की तारीख Date of Opening A/c 10-03-2023

Issue date:23-03-2023

Sr No: 1

IFSC Code : UBIN0558885

नामांकन पंजीकृत / Nomination Registered: हाँ Y / नहीं N

लेखाकार Accountant

Branch Phone No : 04842439029

N

Please avail Nomination facility of Nomination in your accounts including locker, to avoid inconvenience to your legal heirs in settlement of claims after you. Nomination can be changed,modified, cancelled by you any time during your lifetime

नवीनतम संशोधन / Latest Amendments

1. निष्क्रिय खाते के संबध में / About Dormant Accounts

- लगातर 12 माह तक परिचालित न हुए बचत खाते को निष्क्रिय खाते रुप में वर्गीकृत कर दिया जायेगा. निष्क्रिय खाते में परिचालन की अनुमति नहीं होगी. खाते को सक्रिय कराने के लिये ग्राहक कृपया शाखा प्रबंधक से संपर्क करे तथा निष्क्रिय खाते को पुन: सक्रिय कराये बिना उस पर कोई चेक जारी न करें.
- Saving Banks Accounts, which are inoperative for a continuous period of 12 months will be classified as Dormant. Operations will not be allowed in Dormant Account. Customers are requested to contact the Branch Manager for re-activating the account and are requested not to issue any cheques on Dormant Account before they are reactivated.

2. चेक पर परिवर्तन / अधिलेखन के संबध में / About Alterations / Overwritings on cheques

- चेक पर कोई परिवर्तन / संशोधन न किया जाए. आदाता के नाम, रकम (पुन:वैधीकरण की दुष्टि से दिनांक में परिवर्तन को छोडकर) आदि में परिवर्तन के लिये नया चेक प्रयोग करें.
- No changes/corrections should be carried out on the cheques. For any change in the payee's name, the amount (other than date for validation purpose) etc, fresh cheque forms should be used.

यूनियन बैंक ऑफ इंडिया Union Bank of India

शाखा / Branch : PALISSERY Issue date:23-03-2023

शाखा का पता / Branch Address : SCMS COLLEGE OF ENGG AND TECH Sr No: 1
VIDHYA NAGAR, PALISSERY PALISSERY-683582 KERALA INDIA

शाखा का फोन नं. / Branch Phone No.: 04842439029 IFSC Code : UBIN0558885

खाता क्र. / Account No.: 588802010008178

In the Name of :

नाम / Name i) (SB GENERAL)

ii) M/S CERD RESEARCH SEED MONEY KTU RESEARCH 3 1082 2022

iii)

पेशा / Occupation

पता / Address SCMS SCHOOL OF ENGG AND TECH VIDHYA NAGAR PALISSERY
KARUKUTTY Pin : 683576 KERALA INDIA

खाता खोलने की तारीख Date of Opening A/c 10-03-2023

नामांकन पंजीकृत / Nomination Registered: हाँ Y / नहीं N

लेखाकार Accountant

दिनांक Date	विवरण Particulars	सोल आयडी SOL ID	चेक नं. CHQ. No.	निकाली गयी राशि DEBIT	जमा की गयी राशि CREDIT	जमाकर्ता के खाते में शेष राशि BALANCE	लेखाकर आद्याक्षर INITAL
18-11-2023	By NEFT:Director of Treasuries accou	47380			57500.00	57500.00 Cr	
07-01-2024	By 588802010008178:Int.Pd:01-10-2023	58880			191.00	57691.00 Cr	

UNION BANK OF INDIA
PALISSERY
SCMS COLLEGE OF ENGG AND TECH
VIDHYA NAGAR, PALISSERY
PHONE: 04842439029

DATE: 12-01-2024

TO:
M/S CERD RESEARCH SEED MONEY KTU RESEARCH 3 1082 2022 10
SCMS SCHOOL OF ENGG AND TECH
VIDHYANAGAR PALISSERY
KARUKUTTY-683576
KERALA, INDIA
Village : 627965 -Karukutty

CUST ID : 901093778 EMAIL ID:CATHIE8969@GMAIL.COM

STATEMENT OF ACCOUNT FOR THE PERIOD FROM 01-04-2023 to 11-01-2024 SBGEN-A/C NO: 588802010008180 SB GENERAL ISB GENERAL INR

DATE	PARTICULARS	CHQ.NO.	WITHDRAWALS	DEPOSITS	BALANCE
					0.00
11-10-2023	MUMBAI,SERVICE BRANCH, MUMBAI NEFT:Director of Treasuries account for RBI285232 UTR Number RBI2852329103748 Sender Account 01585701041 Sender IFSC RBISOGOKLEP Sender Bank RESERVE BANK OF INDIA Sender Branch THIRUVANANTHAPURAM			40,000.00	40,000.00Cr
Cumulative Totals:		0	40,000.00	40,000.00Cr	

The Min. Bal. Requirement in (Urban Br.) For SB Account is Rs 500 (without Cheque book) and Rs 1000/-(with Cheque book.

Unless constituent notifies the bank immediately of any discrepancy found by him in his statement of Account,it will be taken that he has found the account correct.

To strengthen your Aadhaar, update your Aadhaar if 10 years old

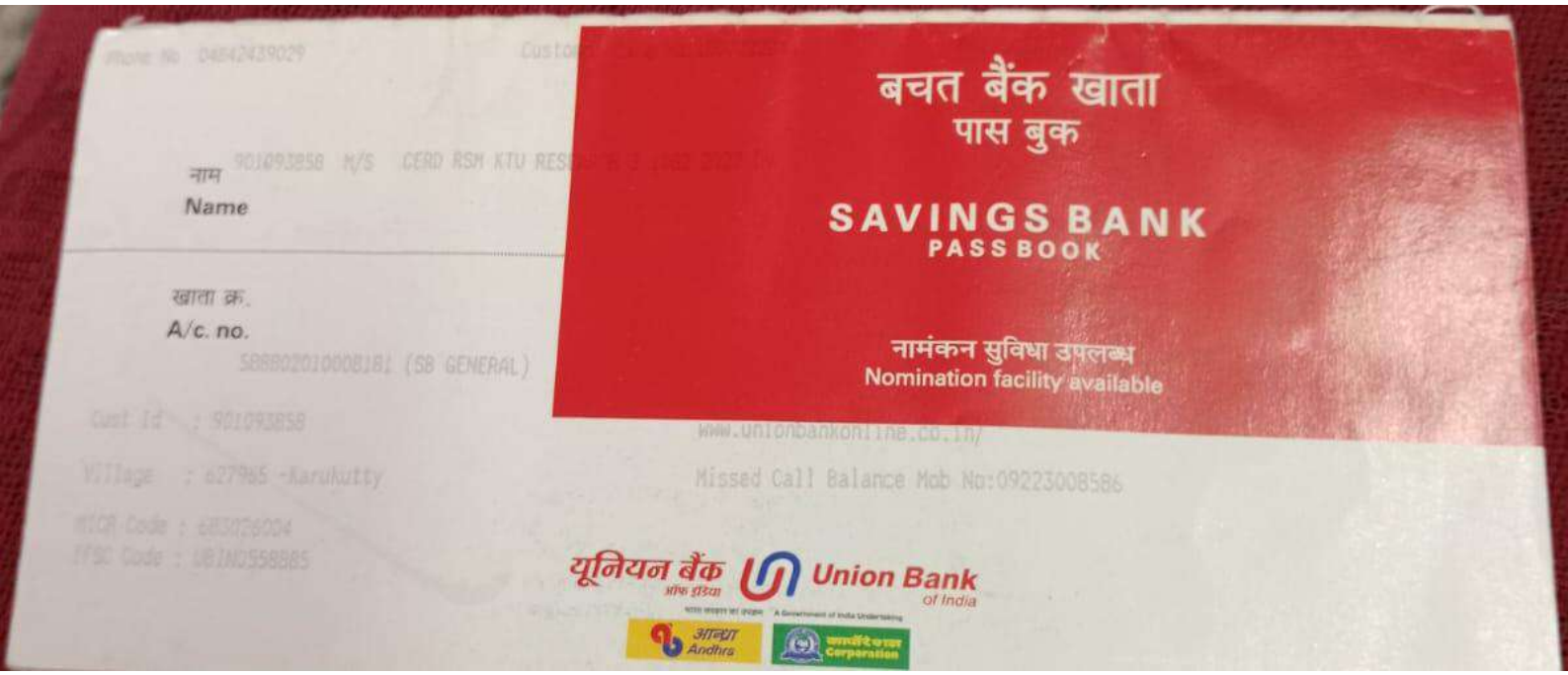
FASTEST MODE OF FUNDS REMITTANCE-RTGS (UNION BULLET).
IFSC/MICR code for PALISSERYis UBIN0558885/683026004

Contact all India toll Free no. 1800 22 22 44 for your account related queries / services
Please visit your branch to avail facility of Nomination in your accounts including locker, to avoid inconvenience to your legal heirs in settlement of claims after you. Nomination can be changed,modified, cancelled by you any time during your lifetime

Manager
कृत यूनियन बैंक ऑफ इंडिया
FOR UNION BANK OF INDIA
लेखा / Accountant
पालिशेरी शाखा / Palissery Branch

IFSC/MICR code for PALISSERYis UBIN05588
58880,powappsrv15,BV584038

PAGE: 1


बचत बैंक खाता
पास बुक
SAVINGS BANK
PASS BOOK
नामंकन सुविधा उपलब्ध
Nomination facility available
नाम
Name
खाता क्र.
A/c. no.
Missed Call Balance Mob No:09223008586
यूनियन बैंक
Union Bank
of India
आन्ध्रा
Andhra

दिनांक Date	विवरण Particulars	सोल आयडी SOL ID	चेक नं. CHQ. No.	निकाली गयी राशि DEBIT	जमा की गयी राशि CREDIT	जमाकर्ता के खाते में शेष राशि BALANCE	लेखाकार आद्याक्षर INITAL
18-11-2023	By NEFT:Director of Treasuries accou	47380			50000.00	50000.00 Cr	