2020-21

File Ref.No.KTU/JD(ACADEMICS)/2223/2019

APJ Abdul Kalam Technological University
Thiruvananthapuram

Abstract

Faculty Development Programme (FDP) for the academic Year 2020-21 - Selected - reg

ACADEMIC SECTION

U.O.No. 1660/2020/KTU Thiruvananthapuram, Dated: 25.11.2020

Read:-1. Notification dated 03/02/2020

2.U.O. No. 1600/2020/KTU dated 18.11.2020

ORDER

Proposals were invited for conducting Faculty Development Programme for the academic year 2020-21 from Institutions / professional bodies as per reference 1 cited above.

Vide reference 2, a Committee was constituted for scrutinizing the proposals. Considering the recommendations of the Committee, sanction is accorded by the Hon'ble Vice-Chancellor for conducting the Faculty Development Programme as detailed below (List attached).

The Institutions can conduct FDPs before August 2021. In the present scenario of Covid-19 pandemic, the Institutions can organize FDPs in online mode or in offline mode.

The Colleges shall engage the classes by the expert faculty listed in the proposal. There will be scrutiny regarding the conduct of FDPs by the APJAKTU authorities. The respective course coordinators are required to submit the report of the program as mentioned in the guidelines, after the completion of the program. They are also directed to submit original bills of all transactions made during the program including honorarium, TA, refreshments, reading materials, etc. attested by the Head of the Institution and statement of accounts audited by a Chartered accountant.

Encl:

1. List of FDP sanctioned for the academic year 2020-21
2. Budgetary provisions and instructions for conducting offline mode
3. Budgetary provisions and instructions for conducting online mode.

Sd/-

Dr. Bijukumar R *
Dean (Academic) in Charge

Copy to:-

1. The Principals concerned
2. The Finance Officer
3. VC/PVC/Registrar/Dean(Academics)/Dean(Research)

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

LIST OF FACULTY DEVELOPMENT PROGRAMMES SELECTED FOR THE ACADEMIC YEAR 2020-21

CIVIL ENGINEERING			
SL.NO.	**NAME OF THE HOST INSTITUTION**	**TITLE OF THE PROGRAMME**	**COORDINATORS**
1	ALBERTIAN INSTITUTE OF SCIENCE AND TECHNOLOGY	Forensics in Structural and Geotechnical Engineering	Liji Anna Mathew, Assoc. Prof Sheeja M K, Asst. Prof
2	MUSALIAR COLLEGE OF ENGINEERING AND TECHNOLOGY	Advances in Physical and Numerical Modelling in Geotechnical & Geoenvironmental Engineering	Dr. Rajeev Kumar P, Professor
3	TOC H INSTITUTE OF SCIENCE & TECHNOLOGY, ERNAKULAM	Emerging Trends in Structural Health Monitoring Procedures	Dr. Vasudev R, Assoc. Prof Lathi Karthi
4	MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY, NALANCHIRA	Recent Trends in Design, Construction and Maintenance of Concrete Pavements	Dr. Neethu Roy, Asst. Dean(R&D) Anitha I C, Asst. Prof
5	MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY, NALANCHIRA	Recent Advances in Seismic and Wind Load Analysis of Structures	Dr. Jisha S V, Asst. Prof Bindu Biju, Asst. Prof
6	MARIAN ENGINEERING COLLEGE, KAZHAKUTTAM	DE-HAB Demolition and rehabilitation of structures	Rani V, Assoc.Prof Dr. Narayanan S, HOD
7	MES COLLEGE OF ENGINEERING, KUTTIPURAM	Techniques for Disaster Management and Climate Change Adaptation Strategies	Vidhya Kanakaraj, Asst. Prof Humaida Alhadi, Asst. Prof
8	NSS COLLEGE OF ENGINEERING, PALAKKAD	Design Thinking and Creativity for Innovation	Dr. Bharati Raj J, Asst. Prof Dr. Keerthy M Simon, Asst. Prof
9	MAR BASELIOS INSTITUTE OF TECHNOLOGY AND SCIENCE	Sustainable Building Materials and Practices	Manju George, Asst. Prof Deepthy Varkey, Asst. Prof
10	SAINTGITS COLLEGE OF ENGINEERING , KOTTAYAM	State-of-the-Art Experimental And Numerical Techniques in Civil Engineering	Dr. Anitha Joseph, Professor Pinky Merin Philip, Asst. Professor
11	MAR BASELIOS CHRISTIAN COLLEGE OF ENGINEERING AND TECHNOLOGY, PEERMADE	Remote Sensing & GIS in Civil Engineering in the context of Recent Floods in Kerala	Dr. Manoj Nallanathel, Assoc.Profeesor & HOD Dr. Chithra, Assoc. Prof
12	KMCT COLLEGE OF ENGINEERING, KOZHIKODE	Recent Innovations in Civil Engineering	Jesmi Prakash A K, HOD
13	AMMINI COLLEGE OF ENGINEERING, MANKARA, PALAKKAD	Innovations in low cost construction technologies	Dr. Maruthu Kannan, Prinipal Anupama. S, Assistant Professor
14	FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY	Random Vibrations and its Applications in Earthquake Analysis	Dr. Asha Joseph, Assoc. Prof Dr. Unni Kartha G,Professor & HOD
15	SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY	Geosynthesis for Ground Improvement	Dr.Akhila M,Asst. Prof Dheeraj A D, Asst. Prof

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

PROCEEDINGS

APJAKTU - Academic - Faculty Development Programme - Administrative Sanction Accorded - Orders issued.

Academic Section

No: KTU/ASST(ACADEMIC)/1959/2018 Dated, , 30.04.2018

Read:- 1.Minutes of the Fifteenth Executive Committee Meeting held on 30.08.2017.

ORDER

Meeting of the Executive Committee held on 30.08.2017 vide the Agenda item No EC-015-006 has approved the guidelines for the conduct of Faculty Development Programme and resolved to invite proposals from affiliated colleges and other agencies to conduct the programme.

Rules and Regulations for conducting FDP are

1. As far as possible the FDPs are to be scheduled during the semester breaks without disturbing the normal academic activities and to ensure maximum faculty participation.
2. It is mandatory to have a fixed batch of 30 participants in each programme. Number of participants from the host institute is limited to 1/3rd of the total number of participants. The rest of the participants should be from other KTU affiliated colleges.
3. There should be minimum 6 hour training per day, excluding tea and lunch break.
4. It is compulsory for the participants to attend all the sessions of the programme. Otherwise the participant's certificate will not be awarded.
5. It is mandatory to submit the brief C. V of the resource persons highlighting their contribution in the concerned subject of FDP.
6. Minimum 50% of the resource persons should be from outside the host institute.
7. Honorarium to faculty/ External experts is limited to Rs.1000/ hour.
8. Honorarium to Faculty/ External Experts from IIT/ IIM/ National Institutes is limited to Rs.5000/- per day.
9. TA / Accommodation to external experts are as per University rules.
10. Local conveyance to resource persons is limited to Rs.1000/ day.
11. Honorarium to centre coordinator and course coordinator is Rs.3000/ day. This amount should be shared between them.
12. Honorarium to technical assistants for venue arrangements, purchase assistance, data entry etc. is limited to Rs 2000/day, applicable during the duration of the programme.
13. Stationeries, consumables, certificates printing, report printing, photography etc. is limited to Rs 15000/- per course.
14. Course / Training materials (Soft / hard copy / text book) is limited to Rs 1000 /- per

participant.

15. Working lunch and refreshments is limited to Rs250/- per day per participant.
16. Miscellaneous – Limited to Rs 10000/- per course.
17. The host institute may provide accommodation facility to the participants, if available. The charges if any, for this have to be borne by the participants themselves.
18. It is mandatory to provide the soft copies of the presentations made during the FDP to the participants.
19. If necessary, the host institute can collect nominal registration fee from participants subject to a maximum of Rs 500/ per participant.
20. After the completion of the programme the respective course coordinators are required to submit the hard as well as soft copy of the report of the programme to the University within 15 days of the completion of the programme. The report must include the participant list, registration forms, attendance sheet, feedback forms of the participants, media coverage of the programme, complete details of the resource persons, one group photo, soft copy of the presentations made during the programme and original bills of all transactions made during the programme including honorarium, TA, refreshments, reading materials etc. attested by the Head of the Institution.
21. **The payments will be in the form of reimbursement of the expenses based on the statements of accounts subject to a maximum amount of Rs 1.5 lakhs for 3-day programme and Rs 2 lakhs for 5-day programme.**

The Joint Directror (Academic) is authorised to scrutinise and sanction the bills and vouchers submitted in connection with the FDP programme.

Orders are issued accordingly.

Sd/-

Dr. J. SREEKUMAR *

Dean (Academic)

To

1. The Finance section.
2. Smt.Praseeda Lekshmi , Joint Director
3. SF/FC.

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

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

File Ref.No.KTU/ASST6(ACADEMIC)/3139/2020

APJ Abdul Kalam Technological University
Thiruvananthapuram

Abstract

APJAKTU - Academic - Faculty Development Programme conducted through online- Administrative Sanction Accorded

ACADEMIC SECTION

U.O.No. 1352/2020/KTU Thiruvananthapuram, Dated: 30.09.2020

Read:-UO No. KTU/ASST(ACADEMIC)/1959/2018 dated 30.04.2018

ORDER

Meeting of the Executive Committee held on 30.08.2017 vide the Agenda item No EC-015-006 has approved the guidelines for the conduct of Faculty Development Programme (FDP) and FDPs are being conducted as per the guidelines in the order read above. During the current situation of COVID 19 pandemic Hon'able Vice Chancellor has approved the guidelines for the conduct of Faculty Development Programme through online mode

- Each program should have 50 to 60 participants. Number of participants from the host institute is limited to 20 and the rest of the participants should be from other APJAKTU affiliated institutions.
- There should be minimum 6 training hour per day.
- It is compulsory that the participants shall attend all the sessions of the program. Otherwise the participant's certificate will not be awarded. Copy of the attendance statement and feedback forms shall be submitted to the University.
- Minimum 70% of the resource persons should be from outside the host institute.
- Honorarium to faculty/external experts is limited to Rs 1000/- hour and the honorarium to faculty from IIT/IIM/National Institutes is limited to Rs 5000/- per day.
- Honorarium to centre coordinator and course coordinator is Rs. 2000/- per day. This amount should be shared between them.
- Miscellaneous expenses are limited to Rs.1000/- per day. (including printing, stationary and consumables)
- Registration to the programme shall be done through online. However, permission letter from the respective Head of the institution should be obtained for participation.
- Online certificates can be issued to the participants. The certificates shall contain unique certificate number. The details of the certificates issued shall be intimated to

the University along with the claim form.

- It is mandatory to provide the soft copies of the course materials / presentations made during the FDP to the participants (through email)
- There will be random inspection/verification by the University to evaluate the FDP conduction process and other details. Hence online link of the programme should be send to academics@ktu.edu.in, well in advance
- The Joint Director (Academics) is authorized to scrutinise and sanction the bills and vouchers submitted in connection with the FDP programme.

Institutions can also conduct FDP in the normal mode, as per the guidelines mentioned in the order read above, after the Covid restrictions end.

Orders are issued accordingly.

Sd/-

Dr. Bijukumar R *
Dean (Academic) in Charge

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

Statement of Account

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY EDUCATIONAL INSTIT

C/O SCMS SCHOOL OF ENGINEERING & T

SCMS CAMPUS PALISSERY

PADUAPURAM P O ERNAKULAM

City	ERNAKULAM
State	KERALA
Country	INDIA
Zip	683582
Mobile No	918589054713
E-mail	SUBHA@SCMSGROUP.ORG

Statement Date : 02/06/2021 20:33

Records from 1 to 25. No more records available.

Union Bank of India

Branch	PALISSERY
Customer Id	137305091
Account No	345801010030000
Account Currency	INR
Account Type	Current Account
MICR Code	
IFSC Code	UBIN0558885

Statement Period From -02/06/2021 To 02/06/2021

Date	Remarks	Tran Id	UTR Number	Instr. ID	Withdrawals	Deposits	Balance
02/06/2021	Loan Account Payments For : 588807030000112	AA819510	-		37,500.00		21,29,318.69
02/06/2021	Loan Account Payments For : 588807030000111	AA818598	-		37,500.00		21,66,818.69
02/06/2021	Loan Account Payments For : 588807030000110	AA818519	-		37,500.00		22,04,318.69
02/06/2021	NEFT:S K PRASAD PNBH211535598608	S73455163	Sender No:PNBH211535598608			3,000.00	22,41,818.69
02/06/2021	NEFT:AJEES A P P153210110750414	S73325955	Sender No:P153210110750414			3,000.00	22,38,818.69
02/06/2021	NEFTO-PAWAN GOYAL 000290857095	S72944308	-	1	5,000.00		22,35,818.69
02/06/2021	NEFTO-YAYATI GUPTA 000290853260	S72908841	-	1	3,000.00		22,40,818.69
02/06/2021	NEFTO-ICT ACADEMY OF KERALA 000290849488	S72894353	-	1	3,000.00		22,43,818.69
02/06/2021	NEFTO-EBIN DENI RAJ 000290845065	S72858785	-	1	5,000.00		22,46,818.69
02/06/2021	NEFTO-AKSHI KUMAR 000290838600	S72839792	-	123	3,000.00		22,51,818.69
02/06/2021	NEFTO-K SATHEESH KUMAR 000290837242	S72826335	-	123	3,000.00		22,54,818.69
02/06/2021	NEFTO-PONNURANGAN KUMARAGURU 000290835959	S72808549	-	123	3,000.00		22,57,818.69
02/06/2021	NEFTO-AJEES A P 000290834739	S72794466	-	123	3,000.00		22,60,818.69
02/06/2021	NEFTO-K BALAN 000290817757	S72752398	-	123	3,000.00		22,63,818.69
02/06/2021	NEFTO-ANIL JOSEPH	S72732962	-	1123	3,000.00		22,66,818.69
02/06/2021	SALARY MAY2021	S72526918	-		63,61,380.00		22,69,818.69

For any queries, please get in touch with us on our 24 x 7 customer service help line no.1800 2222 44 #. Customers outside India need to dial +91 80 2530 2510.

This is a system generated output and requires no signature. Customers are requested to immediately notify the Bank of any discrepancy in the statement

TO AVAIL OUR LOAN PRODUCTS GIVE MISSED CALL AT 9619333333 OR SMS <ULOAN> TO 56161

02/06/2021	NEFTO-DIVYA P V 000290807752	S72703417	-	123	3,000.00		86,31,198.69
02/06/2021	NEFTO-S K PRASAD 000290801852	S72680731	-	123	3,000.00		86,34,198.69
02/06/2021	NEFTO-JIMMY THOMAS 000290798876	S72661260	-	123	3,000.00		86,37,198.69
02/06/2021	NEFTO-G V RAO 000290797930	S72652460	-	123	4,000.00		86,40,198.69
02/06/2021	NEFTO-S CHANDRAKARAN 000290796317	S72638254	-	123	4,000.00		86,44,198.69
02/06/2021	NEFT:RAZORPAY SOFTWARE PRIVATE LIMITED AXISCN00808	S71496638	Sender No:AXISCN0080 897585			2,200.00	86,48,198.69
02/06/2021	NEFTO-KUNJUNNI M 000290675470	S71292385	-	02034897	57,500.00		86,45,998.69
02/06/2021	SALARY FOR MAY	AA656760	-	02034899	38,596.00		87,03,498.69
02/06/2021	VARUN G MENON	AA565100	-	02034898	10,000.00		87,42,094.69

For any queries, please get in touch with us on our 24 x 7 customer service help line no.1800 2222 44 #. Customers outside India need to dial +91 80 2530 2510.
This is a system generated output and requires no signature. Customers are requested to immediately notify the Bank of any discrepancy in the statement
TO AVAIL OUR LOAN PRODUCTS GIVE MISSED CALL AT 9619333333 OR SMS <ULOAN> TO 56161

An ISO 9001:2015 Certified Institution

CAMPUS: VIDYA NAGAR, KARUKUTTY, ERNAKULAM-683576 PHONE: 0484- 2862900, 2450330
E-mail: sset@scmsgroup.org • Website: www.scmsgroup.org/sset

June 11, 2021

The Manager
Union Bank of India
Palissery Branch
Ernakulam-683 582

Dear Sir,

Sub: Request for transfer of funds from A/C No.588801010050045

Kindly transfer the amounts to the given below accounts from the above mentioned account:-

S/N	Account holder' Name	Account Number	Amount (Rs.)	IFSC
01	VARUN G. MENON	588802010003342	5000/-	UBIN0558885
02	VARUN G. MENON	588802010003342	1500/-	UBIN0558885
03	DEEPASREE VARMA	588802010004836	5000/-	UBIN0558885
04	DEEPASREE VARMA	588802010004836	1500/-	UBIN0558885
05	AKHILA M	402502010015266	3000/-	UBIN0540251
06	DHEERAJ A.D	752802010001766	3000/-	UBIN0575283

Also request you to provide a bank statement after effecting the above transactions.

Thanking you,

Yours faithfully,

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

Dr. PRAVEENSAL
PRINCIPAL

Transaction Details

UNION BANK OF INDIA
PALISSERY
SCMS COLLEGE OF ENGG AND TECH
VIDHYA NAGAR, PALISSERY
PHONE: 0484-2439029

TO:
MR THE PRINCIPAL S C M S SCHOOL OF ENGG & TECHNOLOGY
VIDYA NAGAR PADUVAPURAM P O
PALISSERRY KARUKUTTY
KARUKUTTY-683582
KERALA,INDIA
Village : 627965 -Karukutty

DATE: 11-06-2021

CUST ID : 261491070 EMAIL ID:madhavan@scmsgroup.org

STATEMENT OF ACCOUNT FOR THE PERIOD FROM 01-04-2021 to 11-06-2021 CAGEN-A/C NO: 588801010050045 CD GENRAL (CD GENRAL:INR

DATE	PARTICULARS	CHQ.NO.	WITHDRAWALS	DEPOSITS	BALANCE
				1,83,818.02	1,83,818.02Cr
03-04-2021	101/30000			2,43,000.00	4,26,818.02Cr
05-04-2021	MODERN SCIENTIFIC SOLUTIO ERNAKULAM,SERVICE BRANCH, ERNAKULAM	2032153	3,451.00		4,23,367.02Cr
05-04-2021	MODERN SCIENTIFIC SOLUTIO ERNAKULAM,SERVICE BRANCH, ERNAKULAM	2032168	942.00		4,22,425.02Cr
05-04-2021	MODERN SCIENTIFIC SOLUTIO ERNAKULAM,SERVICE BRANCH, ERNAKULAM	2029948	27,986.00		3,94,439.02Cr
05-04-2021	VITHAYATHIL MARKETING CHENNAI,SERVICE BRANCH, CHENNAI	2032181	1,505.00		3,92,934.02Cr
09-04-2021	GOPAKUMARP THRISSUR,SERVICE BRANCH THRISSUR	2032179	2,000.00		3,90,934.02Cr
13-04-2021	SRUTHY ROBERT	02032173	840.00		3,90,094.02Cr
13-04-2021	MR VINOJ PG	02032183	2,43,000.00		1,47,094.02Cr
13-04-2021	JENSON JOSEPH	02032185	1,785.00		1,45,309.02Cr
13-04-2021	JENSON JOSEPH	02032184	6,000.00		1,39,309.02Cr
19-04-2021	PN RAMACHANDRAN	02032187	6,661.00		1,32,648.02Cr
23-04-2021	Charges for PORD Customer Payment:UBINJ21113006194		2.95		1,32,645.07Cr
23-04-2021	NEFTO-DR RAGHUNATHAN RAJESH 000267809483	02032190	1,000.00		1,31,645.07Cr
23-04-2021	Charges for PORD Customer Payment:UBINJ21113009167		2.95		1,31,642.12Cr
23-04-2021	NEFTO-D G MADHU 000267808501	02032189	1,000.00		1,30,642.12Cr
23-04-2021	Charges for PORD Customer Payment:UBINJ21113011494		2.95		1,30,639.17Cr
23-04-2021	NEFTO-D KRISHNAKUMAR K 000267807222	02032188	1,000.00		1,29,639.17Cr
26-04-2021	KERALA CESS/S85297243/23-04-2021/ 2		0.03		1,29,639.14Cr
26-04-2021	KERALA CESS/S85330139/23-04-2021/ 2		0.03		1,29,639.11Cr
26-04-2021	KERALA CESS/S85315253/23-04-2021/ 2		0.03		1,29,639.08Cr
04-05-2021	345801010030000 SCMS SCHOOL OF ENGINEERING AND TEC ERNAKULAM,KALAMASSERY,ERNAKULAM			61,000.00	1,90,639.08Cr
04-05-2021	DAVIS MC	02032191	1,250.00		1,89,389.08Cr
11-06-2021	AS PER LTR NO.DATED11-6-2021	1	19,000.00		1,70,389.08Cr
	Cumulative Totals:		3,17,428.94	4,87,818.02	1,70,389.08Cr

The Min. Bal. Requirement For Current Account in Metro Br Rs 10000
The Min. Bal. Requirement For Current Account in Urban Br Rs 5000
The Min. Bal. Requirement For Current Account in Semi-Urban Br Rs 2500
The Min. Bal. Requirement For Current Account in Rural Br Br Rs 1000

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.

PAGE: 1

58880,powappsrv8,SK519200

UNION BANK OF INDIA
STATEMENT OF ACCOUNT FOR THE PERIOD FROM 01-04-2021 to 11-06-2021 A/C : 588801010050045

DATE	PARTICULARS	CHQ.NO.	WITHDRAWALS	DEPOSITS	BALANCE

FASTEST MODE OF FUNDS REMITTANCE-RTGS (UNION BULLET).
IFSC/MICR code for PALISSERYis UBIN0558885/682026004

Contact all India toll Free no. 1800 22 22 44 for your account related queries / services

कृते यूनियन बैंक ऑफ इंडिया
For UNION BANK OF INDIA
Manager
शाखा प्रबंधक / Branch Manager
पालिस्सेरी शाखा / Palissery Branch

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY
ERNAKULAM
683 582
KARUKUTTY

11/06/21.

APJKTU sponsored 5-day Faculty Development Programme on Research Trends in Social Network Analytics

SCMS School of Engineering and Technology, Kerala, India

Summary of the Amount Spent

Sl No:	Particulars	Honararium Paid (in Rupees)
1	Honararium to Dr K. Satheesh Kumar	3000
2	Honararium to Dr. Akshi Kumar	3000
3	Honararium to Dr. Ebin Deni Raj	5000
4	Honararium to Dr Vasudeva Varma	3000
5	Honararium to Dr.Ponnurangam Kumaraguru	3000
6	Honararium to Mr. Riji N Das	3000
7	Honararium to Dr. Yayati Gupta	3000
8	Honararium to Dr Ajees A P	3000
9	Honararium to Dr Varun G Menon	1500
10	Honararium to Ms. Deepasree Verma	1500
11	Honararium to Dr Pawan Goyal	5000
12	FDP Poster and Certificate Design- Amount paid to Mr. Yadukrishnan, Designer, Lyrics Blast	2025
13	Honararium paid to FDP Centre Coordinator Dr. Varun G Menon	5000
14	Honararium paid to FDP Course Coordinator Ms. Deepasree Varma	5000
		46025

UNION BANK OF INDIA
PALISSERY
SCMS COLLEGE OF ENGG AND TECH
VIDHYA NAGAR, PALISSERY
PHONE: 0484-2439029

TO: DATE: 28-07-2021

MR THE PRINCIPAL S C M S SCHOOL OF ENGG & TECHNOLOGY
VIDYA NAGAR PADUVAPURAM P O
PALISSERRY KARUKUTTY
KARUKUTTY-683582
KERALA,INDIA CUST ID : 261491070 EMAIL ID:madhavan@scmsgroup.org
Village : 627965 -Karukutty

STATEMENT OF ACCOUNT FOR THE PERIOD FROM 28-06-2021 to 28-07-2021 CAGEN-A/C NO: 588801010050045 CD GENRAL (CD GENRAL) INR

DATE	PARTICULARS	CHQ.NO.	WITHDRAWALS	DEPOSITS	BALANCE
				1,54,871.10	1,54,871.10Cr
28-06-2021	MS ASHA S	2032198	13,000.00		1,41,871.10Cr
28-06-2021	101 30000			61,000.00	2,02,871.10Cr
29-06-2021	DAVIS MC	02032102	1,950.00		2,00,921.10Cr
30-06-2021	CASH	02032104	3,000.00		1,97,921.10Cr
01-07-2021	MODERN SCIENTIFIC SOLUTIO	2032186	10,115.00		1,87,806.10Cr
	ERNAKULAM,SERVICE BRANCH, ERNAKULAM				
05-07-2021	DR NISHA L	02032103	19,915.00		1,67,891.10Cr
07-07-2021	MANOJKUMAR B	02032105	1,639.00		1,66,252.10Cr
07-07-2021	SHILPA PC	02032197	4,434.00		1,61,818.10Cr
14-07-2021	DR PRAVEENSAL CJ	02032107	31,840.00		1,29,978.10Cr
14-07-2021	JEEJA BABU	02032106	4,500.00		1,25,478.10Cr
14-07-2021	JEEJA BABU	02032108	9,150.00		1,16,328.10Cr
16-07-2021	SCMS			85,000.00	2,01,328.10Cr
19-07-2021	Charges for PORD Customer Payment:UBINJ21200544626		2.95		2,01,325.15Cr
19-07-2021	NEFTO-SHAIKH MOHEYUDHEEN 000322974329		2,000.00		1,99,325.15Cr
19-07-2021	NEFT:SHAIKH MOHEYUDHEEN P200210118149704			2,000.00	2,01,325.15Cr
	NEFT-RETURN P200210118149704 THE PRINCIPAL S C M S S				
	Account Does Not Exist				
	UTR No. P200210118149704				
	Sender Bank: CANARA BANK				
	Sender Branch: TIRUR / CNRB0000800				
19-07-2021	Charges for PORD Customer Payment:UBINJ21200796168		2.95		2,01,322.20Cr
19-07-2021	NEFTO-DR A SURENDRAN 000323188735	02032119	9,000.00		1,92,322.20Cr
19-07-2021	Charges for PORD Customer Payment:UBINJ21200796430		2.95		1,92,319.25Cr
19-07-2021	NEFTO-SUSMITHA S 000323188744	02032118	2,000.00		1,90,319.25Cr
19-07-2021	Charges for PORD Customer Payment:UBINJ21200796295		2.95		1,90,316.30Cr
19-07-2021	NEFTO-ARJUN HARIDAS 000323188747	02032117	2,000.00		1,88,316.30Cr
19-07-2021	Charges for PORD Customer Payment:UBINJ21200796670		2.95		1,88,313.35Cr
19-07-2021	NEFTO-KEERTHANA 000323188750	02032116	2,000.00		1,86,313.35Cr
19-07-2021	Charges for PORD Customer Payment:UBINJ21200797064		2.95		1,86,310.40Cr
19-07-2021	NEFTO-ARAVIND 000323188756	02032115	2,000.00		1,84,310.40Cr
19-07-2021	Charges for PORD Customer Payment:UBINJ21200796902		2.95		1,84,307.45Cr
19-07-2021	NEFTO-JERIN GEORGE 000323188757	02032114	2,000.00		1,82,307.45Cr
19-07-2021	Charges for PORD Customer Payment:UBINJ21200813230		2.95		1,82,304.50Cr
19-07-2021	NEFTO-LAL KB 000323188767	02032110	3,500.00		1,78,804.50Cr
19-07-2021	Charges for PORD Customer Payment:UBINJ21200815792		2.95		1,78,801.55Cr
19-07-2021	NEFTO-JAYAKRISHNAN 000323188764	02032111	3,000.00		1,75,801.55Cr
19-07-2021	Charges for PORD Customer Payment:UBINJ21200815918		2.95		1,75,798.60Cr
19-07-2021	NEFTO-ARATHI P PAI 000323188761	02032113	2,500.00		1,73,298.60Cr
Cumulative Totals:			1,29,572.50	3,02,871.10	1,73,298.60Cr

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UNION BANK OF INDIA
STATEMENT OF ACCOUNT FOR THE PERIOD FROM 28-06-2021 to 28-07-2021 A/C : 588801010050045

DATE	PARTICULARS	CHQ.NO.	WITHDRAWALS	DEPOSITS	BALANCE
19-07-2021	Charges for PORD Customer Payment:UBINJ21200817860		2.95		1,73,295.65Cr
19-07-2021	NEFTO-JIMMI THOMAS 000323188763	02032112	3,000.00		1,70,295.65Cr
20-07-2021	KERALA CESS/S52302092/19-07-2021/ 2		0.03		1,70,295.62Cr
20-07-2021	KERALA CESS/S52292825/19-07-2021/ 2		0.03		1,70,295.59Cr
20-07-2021	KERALA CESS/S52285969/19-07-2021/ 2		0.03		1,70,295.56Cr
20-07-2021	KERALA CESS/S52316232/19-07-2021/ 2		0.03		1,70,295.53Cr
20-07-2021	KERALA CESS/S48942196/19-07-2021/ 2		0.03		1,70,295.50Cr
20-07-2021	KERALA CESS/S52516957/19-07-2021/ 2		0.03		1,70,295.47Cr
20-07-2021	KERALA CESS/S52491172/19-07-2021/ 2		0.03		1,70,295.44Cr
20-07-2021	KERALA CESS/S52522789/19-07-2021/ 2		0.03		1,70,295.41Cr
20-07-2021	KERALA CESS/S52308614/19-07-2021/ 2		0.03		1,70,295.38Cr
20-07-2021	KERALA CESS/S52278816/19-07-2021/ 2		0.03		1,70,295.35Cr
20-07-2021	KERALA CESS/S52533806/19-07-2021/ 2		0.03		1,70,295.32Cr
26-07-2021	101 30000			95,000.00	2,65,295.32Cr
27-07-2021	APPLE COMPU DAIMIS	2032109	6,790.00		2,58,505.32Cr
	ERNAKULAM,SERVICE BRANCH, ERNAKULAM				
27-07-2021	Charges for PORD Customer Payment:UBINK21208069788		2.95		2,58,502.37Cr
27-07-2021	NEFTO-sateesh k peddoju 000327775963		5,000.00		2,53,502.37Cr
27-07-2021	Charges for PORD Customer Payment:UBINK21208071790		2.95		2,53,499.42Cr
27-07-2021	NEFTO-mainak adhikari 000327775966		3,000.00		2,50,499.42Cr

27-07-2021	Charges for PORD Customer Payment:UBINK21208074760		2.95		2,50,496.47Cr
27-07-2021	NEFTO-rajesh p barnwal 000327775968		3,000.00		2,47,496.47Cr
27-07-2021	Charges for PORD Customer Payment:UBINK21208077528		2.95		2,47,493.52Cr
27-07-2021	NEFTO-mayank aggarwal 000327775971		3,000.00		2,44,493.52Cr
27-07-2021	Charges for PORD Customer Payment:UBINK21208081206		2.95		2,44,490.57Cr
27-07-2021	NEFTO-preeti mishra 000327775973		2,000.00		2,42,490.57Cr
27-07-2021	Charges for PORD Customer Payment:UBINK21208083358		2.95		2,42,487.62Cr
27-07-2021	NEFTO-raja selvaraj 000327775975		5,000.00		2,37,487.62Cr
27-07-2021	Charges for PORD Customer Payment:UBINK21208088086		2.95		2,37,484.67Cr
27-07-2021	NEFTO-mahalingam 000327775977		3,000.00		2,34,484.67Cr
27-07-2021	Charges for PORD Customer Payment:UBINK21208090739		2.95		2,34,481.72Cr
27-07-2021	NEFTO-niyas narimukkil 000327775978		3,000.00		2,31,481.72Cr
27-07-2021	Charges for PORD Customer Payment:UBINK21208094880		2.95		2,31,478.77Cr
27-07-2021	NEFTO-anoop 000327775980		5,000.00		2,26,478.77Cr
27-07-2021	Charges for PORD Customer Payment:UBINK21208095932		2.95		2,26,475.82Cr
27-07-2021	NEFTO-jyothis publishers 000327775982		2,000.00		2,24,475.82Cr
27-07-2021	HONOURARIUM	02032121	12,000.00		2,12,475.82Cr
27-07-2021	NEFT:RAJESH P BARNWAL ICICP21208041309			3,000.00	2,15,475.82Cr
	NEFT-RETURN ICICP21208041309 THE PRINCIPAL S C M S S ACCOUNT DOES NOT EXIST UTR No. ICICP21208041309 Sender Bank: ICICI BANK LTD Sender Branch: DURGAPUR / ICIC0000188				
Cumulative Totals:			1,85,395.28	4,00,871.10	2,15,475.82Cr

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UNION BANK OF INDIA

STATEMENT OF ACCOUNT FOR THE PERIOD FROM 28-06-2021 to 28-07-2021 A/C : 588801010050045

DATE	PARTICULARS	CHQ.NO.	WITHDRAWALS	DEPOSITS	BALANCE

The Min. Bal. Requirement For Current Account in Metro Br Rs 10000
The Min. Bal. Requirement For Current Account in Urban Br Rs 5000
The Min. Bal. Requirement For Current Account in Semi-Urban Br Rs 2500
The Min. Bal. Requirement For Current Account in Rural Br Br Rs 1000

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.

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

Manager

IFSC/MICR code for PALISSERYis UBIN05588
58880,powappsrv8,AK763118 PAGE: 3

Dr. Anu V.R. <anuvr@scmsgroup.org>

Honorarium accepted voucher mail

Raja Selvaraj <rajasjc@gmail.com> Mon, Aug 2, 2021 at 11:41 AM
To: "Dr. Anu V.R." <anuvr@scmsgroup.org>
Cc: "Dr. Rajesh P Barnwal" <r_barnwal@cmeri.res.in>

Hello Madam,

I confirm that received honorarium amount. Please note that after vaccination I am unwell.

Sent from my iPhone

> On 31 Jul 2021, at 8:49 AM, Dr. Anu V.R. <anuvr@scmsgroup.org> wrote:
>
> [Quoted text hidden]
> <voucher template.docx>

Dated- 25th February, 2021

F. No.67- 81/IDC/GOC/POLICY-1/2020-21

All India Council for Technical Education
(A Statutory body under Ministry of HRD, Govt. of India)
Nelson Mandela Marg, Vasant Kunj, New Delhi-110070 Website: www.aicte-india.org

Grant for Organizing Conference - Sanction Letter

To

The Drawing and Disbursing Officer
All India Council for Technical Education
Nelson Mandela Marg, Vasant Kunj,
New Delhi-110070

Subject: Release of a sum of **Rs. 25,000/- (Rupees Twenty five thousand only)** as Grant-in-Aid to conduct Conference under the scheme **Grant for Organizing Conference (GOC)** for the year 2020-21 payable during the current financial year 2020-21-reg.

Sir,

With reference to the proposal submitted by the institute, this is to convey the sanction of the Council for payment of Rs. **25,000/-)Rupees Twenty five thousand only)** to conduct Conference under the scheme **Grant for Organizing Conference (GOC)**, as per details given below:

1.	Name and address of the Beneficiary Institute:	**SCMS School of Engineering & Technology, Vidya Nagar, Palissery, Kurukutty, Cochin, Ernakulam-District, Kerala-683582**
2.	Permanent ID of Institute:	**1-7925911**
3.	Title of Conference:	ICCME 2021
4.	Mode of Conference:	Online Conference
5.	Level of Conference:	International Level
6.	Name of Coordinator:	Dr. Sheeja Janardanan
	Name of Co-Coordinator:	Vidya Chandran
7.	Grant-in-aid Sanctioned:	**Rs. 50,000/-(Rupees Fifty thousand only)**
8.	Amount to be released during the year 2020-21 as 1st instalment (50% of grant sanctioned:	**Rs. 25,000/-(Rupees Twenty five thousand only)**
9.	Sanctioned grant-in-aid is debitable to:	**Major Head 601. 17 (a) Gen (GOC) Plan Head**

- The amount of the Grant shall be drawn by the Drawing and Disbursing Officer, All India Council for Technical Education, New Delhi on the Grant-in-aid bill and shall be disbursed to and credited to the account of Registrar/ Director/ Principal of the institute through RTGS.
- This grant-in-aid is being released in conformity with the terms & conditions as well as norms of the scheme as already communicated and also being communicated in this letter.

The instructions/ guidelines to be followed by college/ institution

I. Release of funds

a. The Principal/ Director of the institute and the Coordinator of the Conference are hereby requested to verify the correctness of the undermentioned bank account/ RTGS details submitted by them along with the Proposal, against which the grant is being released:

Dated- 25th February, 2021

F. No.67- 81/IDC/GOC/POLICY-1/2020-21

Institute PAN No.	Bank Name	Bank Branch Name	Bank Branch Address	Account Holder Name	Account Type	Account Number	IFSC Code
AADCP1668B	UNION BANK OF INDIA	Palissery	SCMS SCHOOL OF ENGINEERING & TECHNOLOGY,VIDYA NAGAR, SCMS CAMPUS, PALISSERY, PADUVAPURAM P O, ERNAKULAM--683576,KERALA.	SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY	Current Account	345801010030000	UBIN0558885

In case of any omission the same should be reported to AICTE immediately.

b. First instalment i.e. 50% of the grant sanctioned is being released as advance to the institute.
c. 2nd instalment will be released on receipt of requisite documents after successful conduct of conference.
d. This sanction is issued in exercise of the powers delegated to the Council and other terms and condition laid down in the guidelines of the scheme.

II. Limit of Funding

a. The grant from AICTE will be **one-third (limited to Rs. 50,000/-)** of the total expenditure incurred for organizing the Conference and rest amount i.e. two-third of total expenditure will be managed by institute itself.

III. Utilization of funds

a. Funds once released/sanctioned for organizing the particular Conference cannot be utilized for any other programme/ conference.
b. 10% of the funds sanctioned by AICTE should be utilized for registration fee of participants belonging to SC/ST category.
c. At least 15% and 25% participation from other states is must for onsite conference and online conference respectively.
d. Papers from host institution should not be more than 10% of the total papers.
e. Coordinator will maintain an electronic record of papers, participants, their institution & its location, to ensure that norm of Pan-India participation, overseas participants in International Conferences and papers from local faculty, are adhered to and also shared with AICTE.

IV. Maintenance of accounts

a. The institute shall strictly follow the provisions laid down in the scheme document and this sanction letter. All correspondence related to the conference must contain the number of this letter alongwith year of sanction of the conference failing which correspondence will not be entertained.
b. The institute shall maintain proper accounts of the expenditure out of the grant and the Council or its nominee shall have the right to check/ verify the account to satisfy that the fund has been utilized for the purpose for it was sanctioned.
c. Funds covered by this grant shall be kept separately and would not be mixed up with other funds, so as to know the amount of interest accrued on the grant.

V. Refund of grant to AICTE (by way of a demand draft in favour of Member Secretary, AICTE, New Delhi)

a. In case the event is cancelled, the fund released should be immediately refunded to AICTE with interest accrued thereon.

b. The grant shall be refunded to AICTE if the Letter of Approval (LOA) or Extension of Approval is not issued by AICTE to the institute for the academic year 2020-21.

c. The proposed/ approved Conference shall be conducted within 06 months from the date of receipt of grant. If conference is not conducted within stipulated time period, the released amount, alongwith interest accrued thereon, has to be necessarily returned to AICTE within one month, failing which penalty @ 18% will be levied.

d. Interest accrued on the grant released, shall be refunded to AICTE.

e. No payment is permissible against the conference **already conducted**. Institutions are liable to refund the grant if received after the conduct of conference and have no plan of conducting the conference ahead.

f. As AICTE needs adequate time for depositing the Demand Draft in the bank, the same be immediately dispatched to avoid any lapse of the validity period.

VI. Documents to be uploaded on AICTE Dashboard/ Portal

On receipt of grant:

The Acceptance Letter with dates of Conference, within 7 days from the date of receipt of the Sanction Letter duly signed and seal affixed by Coordinator and Head of the Institutions along with permission/clearance of Govt. of India for Organizing Conference.

After conduct of the Conference:

Institute has to fill up Report on AICTE dashboard/ portal and upload following documents:

a. Copy of proceedings of conference
b. Feedback of the participants.
c. Geotagged photographs (maximum 15) of the conference.

VII. Submission of documents by institute after conduct of conference

The following documents must be submitted to AICTE within a period of one month, from the date of conduct of Conference:

a. Utilization Certificate and Statement of Accounts in prescribed format duly audited by the Chartered Accountant in the case of a private institution and by the Finance Officer/Account Officer in respect of government/government- aided institution.
b. Supporting bills/documents on account of expenses incurred for the purpose duly attested by the Head of the Institute.
c. Soft copy of final report submitted on portal as mentioned above (in section VI).

VIII. General instructions

a. Any change in the programme for holding Conference, change of Coordinator name, Venue and Date should be effected only after prior approval of the Council, failing which the sanction for the grant already issued would be treated as automatically withdrawn.

b. The assets acquired wholly or substantially of the All India Council for Technical Education's grants shall not be disposed or encumbered or utilized for the purposes other than those for which it was given without proper sanction of the Council and should, at any time the Institution ceased to function, such assets shall revert to the All India Council for Technical Education.

c. The beneficiary institute will make best efforts to promote the scheme by mentioning the sponsorship/ support from AICTE, carrying the Logo of AICTE in conference and other means.

d. The grantee Institution shall observe all financial norms and guidelines as prescribed by the AICTE/ Government of India from time to time. GOI GFR rules (@https://doe.gov.in/order-circular/general-financial-rules2017-0) should be followed during utilization of grant.

Dated- 25th February, 2021

F. No.67- 81/IDC/GOC/POLICY-1/2020-21

e. In respect of international conference, additional guidelines at **Annexure-I** have to be followed.

f. In respect of Online/ e-Conference, additional guidelines at **Annexure-II** have to be followed.

g. This Sanction Letter may be treated as Offer Letter for all purposes.

Yours sincerely,

17/3/21

Dr. Neeraj Saxena
Advisor (IDC)

Copy forwarded for information and necessary action to:

1. **Name and Address of the Coordinator**
   Dr. Sheeja Janardanan
   SCMS School of Engineering & Technology,
   Vidya Nagar, Palissery, Kurukutty, Cochin,
   Ernakulam-District, Kerala-683582

2. **The Registrar / Director / Principal**
   SCMS School of Engineering & Technology,
   Vidya Nagar, Palissery, Kurukutty, Cochin,
   Ernakulam-District, Kerala-683582

3. **Guard File**

2019-20

Government of Kerala

Department of Environment & Climate Change

4th Floor, KSRTC Bus Terminal, Thampanoor, Thiruvananthapuram- 695 001
Ph: 0471-2326264 (Off)
E-mail: envt.dir@kerala.gov.in web: www.envt.kerala.gov.in

PROCEEDINGS OF THE DIRECTOR

Present: Mir Mohammed Ali IAS

Sub: Research and Development - Project Proposal entitled "Micro Plastic Pollution: Source characterization, transport modeling and assessment of impact on fish population in Kadambrayar river and Vembanad backwater region"– Grant – in – aid- Sanctioned-1st Installment released- Order issued.

DIRECTORATE OF ENVIRONMENT & CLIMATE CHANGE

No. DoECC/AEO1/R&D/2879/2019 dated 10.03.2020

Read:

(1) G.O. (Rt) No. 105/2019/ Envt. Dated 30.10.2019.
(2) Proposal received from Dr.Nisha L, Associate Professor, Department of Civil Engineering, SCMS School of Engineering and Technology
(3) Minutes of the R&D Committee meeting held on 5-6th August 2019.
(4) Triparty agreement executed on 03.02.2020.

ORDER

As an implementation mechanism for the state plan scheme ''Environmental Research and Development'', Government vide G.O cited (1) have authorized Director, Directorate of Environment and Climate Change to release the funds to the agencies undertaking the projects. Vide paper (2) cited a proposal entitled "Micro Plastic Pollution: Source characterization, transport modeling and assessment of impact on fish population in Kadambrayar river and Vembanad backwater region" received under R&D scheme and the same was selected by the R&D committee meeting held on 05.08.2019 & 6.08.2019.

Vide paper read (1) Govt. have accorded Administrative Sanction for a total amount of Rs.13,09,000/- for 2 year with first installment of Rs.5,23,600/-. Vide paper read (4) above, Directorate of Environment and Climate Change, the Principal, SCMS School of Engineering and Technology, the Principal Investigator of the project; have executed a Triparty agreement in the prescribed format.

Approval is hereby accorded for the research project entitled "Micro Plastic Pollution: Source characterization, transport modeling and assessment of impact on fish population in

Kadambrayar river and Vembanad backwater region" for a period of 2 years with Dr. Nisha L, Associate Professor, Department of Civil Engineering, SCMS School of Engineering and Technology. The terms and conditions and directions contained in the agreement executed vide paper read (4) and the guidelines of scheme should be complied with scrupulously by the Institution and Principal Investigator and timely submission of prescribed documents shall be ensured.

In accordance with the approved modalities, terms and conditions and as per the agreement read (3) above, the grant shall be released in 3 installments, at the rate of 60:20:20 respectively. Therefore sanction is accorded for the release of **Rs. 5,23,600/- (Rupees Five Lakh Twenty three Thousand and Six Hundred only)** to the Principal, SCMS School of Engineering and Technology as the First Installment of grant for the project in the subject matter with Dr. Nisha L, Associate Professor, Department of Civil Engineering, SCMS School of Engineering and Technology. The Principal Investigator and to credit the amount to the bank account - **A/C No. 345801010030000 IFSC Code: UBIN0558885**. The expenditure shall be met from the Head of account **"3435-03-103-99 -Research and Development- (Plan- Voted)"** in the current year's budget.

The Principal Investigator has to furnish the progress report, Expenditure Statement and Utilization Certificate (in KFC Form 44) to the Directorate within 30 days from end of first year.

Sd/-
Director

To

Dr. Nisha L, Associate Professor, Department of Civil Engineering,
SCMS School of Engineering and Technology.

Copy to:

1. The Accountant General (A&E/Audit), Thiruvananthapuram
2. The District Treasury Officer, Thiruvananthapuram
3. Principal, SCMS School of Engineering and Technology.
4. Accounts section
5. Bill Copy
6. Stock file.

Forwarded By Order

Administrative Officer

20822
18/11/19

GOVERNMENT OF KERALA

Abstract

Environment Department - Directorate of Environment & Climate Change- Annual Plan 2019-20 - Implementation of Plan Schemes - Administrative Sanction accorded - Orders issued.

ENVIRONMENT (A) DEPARTMENT

G.O.(Rt)No.105/2019/Envt Dated, Thiruvananthapuram, 30/10/2019

Read: 1. Letter No.DoECC/A1/1080/2018 dated 25.09.2019 from the Director, Directorate of Environment & Climate Change.
2. Minutes of the meeting of Departmental Working Group held on 30.09.2019.

ORDER

As per the letter read above, the Director, Directorate of Environment & Climate Change has submitted various proposals for according Administrative Sanction under Annual Plan 2019-20 for implementation of Plan Schemes by utilizing current year's budget provision.

2) The Departmental Working Group of Environment Department held on 30.09.2019 scrutinized the proposals in detail and recommended the following schemes for Administrative Sanction as detailed in the minutes read above, subject to specific conditions. The details of the scheme and component wise break up are as follows :

I) **Environmental Research & Development**
(New Research & Development Projects)
Head of Account :3435-03-103-99(P)

Sl. No	Item under Scheme and Components	Period	Total Amount (in Rs)	Amount for this year (in Rs)
1	Micro plastic pollution: Source characterization, transport modeling & assessment of impact on fish population in Kadambrayar river and Vembanad backwater region	2 years	13,09,000/- (1st year: 5,23,600/-) (IInd year: 7,85,400/-)	5,23,600/-
ii)	Novel, cost effective and eco-friendly cellulose nanofiber (CNF)- based Polyelectrolyte microfiltration filter for small	2 years	21.984 Lakh (1st year: 11,54,200/-)	11,54,200/-

	scale waste water purification. Subject to the condition that the technology is commercially exploited in due course.		(II[nd] year: 10,44,200/-)	
iii)	Species inventory, distribution and exploitation pattern of fish faunal resources of kole wetlands.	2 years	13,32,000/- (1[st] year: 7,47,000/-) (II [nd] year: 5,85,000/-)	7,47,000/-
iv)	Investigation of shoreline stability along the Kerala coast using geospatial technologies for sustainable coastal protection measures.	3 years	13.2 Lakh (1[st] year : 5,28,000/-) (2[nd] year: 5,28,000 /-) (3[rd] year : 2,64,000/-)	5,28,000/-
v)	Sustainable green composites based on waste and natural resources. Subject to the condition that the technology is commercially exploited in due course.	2 years	16,76,000/- (1[st] year: 12,26,000/-) (II [nd] year: 4,50,000/-)	12,26,000/-
vi)	Development of desalination system using selectively patterned absorber	2 years	13,75,000/- (1[st] year: 5,50,000/-) (2[nd] year: 8,25,000/-)	5,50,000/-
vii)	SubTerFish: Diversity, distribution and threads to Kerala's subterranean fishes.	2 years	25,00,000/- (1[st] year: 11,00,000/-) (II [nd] year: 14,00,000/-)	11,00,000/-
viii)	Assessment, mapping and preparation of database on spacial distribution, status and baseline features of granite and	1 year	31,32,200/- (Thiruvanantha puram-	18,79,320/-

	other crystalline rock quarries in Thiruvananthapuram, Kollam and Pathanamthitta districts.		10,82,400/- Kollam-9,67,400/- & Pathanamthitta - 10,82,400/-)	
ix)	Mapping the spacial distribution of rock quarries in Ernakulam, Kottayam & Idukki districts of Kerala.	1 year	30,17,200/- (Ernakulam-10,82,400/-) (Kottayam & Idukki-19,34,800/-)	18,10,320/-
x)	Mapping spacial distribution of quarries in Malappuram district.	1 year	10,82,400/-	6,49,440/-
xi)	Mapping spacial distribution of quarries in Thrissur, Palakkad & Kozhikode districts.	1 year	31,37,200/-	18,82,320/-
	Total			**1,20,50,200/-**

II) Climate Change

Head of Account :3435-04-104-98(P)

Sl. No	Item under Scheme and Components	Period	Total Amount (in Rs)	Amount for this year (in Rs)
i)	Studies on effect of climatic changes on the morphology, phenology and reproductive biology of some endemic ephemerals of south Western Ghats.	2 years	9,37,200/- (1st year : 4,91,000/-) (2nd year: 4,46,200/-)	4,91,000/-
ii)	Exploration of harmful algal blooms (HABs) in the sacred rivers of Achankovil, Pamba & associated reservoirs with special reference to climate change and anthropogenic influences.	3 years	14,42,320/- (1st year : 5,33,940/-) (2nd year-: 4,73,440/-) (3rd year: 4,34,940/-)	5,33,940/-

iii)	Drought mitigation through enhanced water retension in ponds: a field experiment in Vadakarapathy Panchayath, Palakkad district.	1 year	14,50,000/- (as per G.O. (Rt)No.28/17/Envt dated 23-02-2017 AS had been accorded for Rs.34.50 Lakh for 2 years. Balance amount is 14.50 Lakh)	14,50,000/-
	Total			**24,74,940/-**
	Grand Total (I + II)			**1,45,25,140/-**

3) Having considered the above proposals with reference to the recommendations of the Working Group in detail, Government are pleased to accord Administrative Sanction to the Directorate of Environment & Climate Change for implementation of the above projects as recommended by the Working Group for a total amount of **Rs.145.25140 Lakh (Rupees One Hundred and Forty Five Lakh Twenty Five Thousand One Hundred and Forty only)** by debiting the expenditure from the respective head of accounts during the year 2019-20.

4) The Director of Environment & Climate Change will strictly monitor the implementation of plan schemes at each stage and they will furnish physical and financial progress reports to Government before 10th of every month.

5) The above sanction is subject to the following further conditions :

(1)Tender/e-tender and other required formalities shall be followed wherever necessary.
(2)Store Purchase Rules shall be strictly adhered to.
(3) For civil works PWD schedule of rates shall be followed.
(4)The funds releasing will be based on actual requirement.

(By order of the Governor)
VALSA .V
ADDITIONAL SECRETARY

To

The Director, Directorate of Environment & Climate Change, Thiruvananthapuram.
The Director, Institute of Climate Change Studies, Kanjikuzhy, Kottayam.
The Principal Accountant General (A&E/Audit) Kerala, Thiruvananthapuram.
The Finance Department.
The Planning and Economic Affairs Department.

The State Planning Board, Thiruvananthapuram.
The Director, Information & Public Relations (Web & New Media) Department,(for uploading in the Government Website)
Stock file/ Office copy.

Forwarded/By order

Section Officer

SRISTI

Honey Bee Network

Society for Research and Initiatives for Sustainable Technologies and Institutions

birac
Ignite Innovate Incubate

SITARE-Students Innovations for Translation & Advancement of Research Explorations
GYTI-Gandhian Young Technological Innovation Awards 2020

Gandhian Young Technological Innovation Award
GYTI

Artificial Deep Learning Brain Actuated Lower Limb Exoskeleton For Paralysed

Vinoj P.G
(SCMS School Of Engineering & Technology, Kerala)

Guide: Dr. Sunil Jacob

GIAN

November 5, 2020

CSIR

Prof Anil K Gupta
Founder, Honey Bee Network, SRISTI, GIAN & NIF
CSIR Bhatnagar Fellow, Visiting Faculty, IIMA & IITB

Deepa B. <deepab@scmsgroup.org>

Fwd: Congratulation for SITARE - Gandhian Young Technological Innovation Awards 2020

1 message

Vinoj P.G. <Vinojpg@scmsgroup.org>
To: "Deepa B." <deepab@scmsgroup.org>

Wed, Jul 28, 2021 at 11:37 PM

Dear Vinoj P.G,

SITARE-Gandhian Young Technological Innovation awards 2020

Congratulations from Honey Bee Network, Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) and GYTI Team!

We are happy to inform you that your entry with project ID: **BT/BIRAC/SIT ARE-GYTI0144/01/19** titled: **Artificial Deep Learning Brain Actuated Lower Limb Exoskeleton For Paralysed** has been selected for the SITARE- Gandhian Young Technological Innovation (GYTI) Award 2020. On this joyous occasion, we invite you for the award function.

As you are aware, SRISTI has joined hands with BIRAC to give fifteen awards of Rs 15 lac each to students for two years for life sciences related applications having high translational potential. The *awards* in other engineering disciplines and *appreciation* in all disciplines don't carry any financial award but include only the citation and trophy (Date of award function will be announced soon).

Also kindly furnish us a **letter from your departmental head/mentor** where you carried out your project stating that the said work is your original contribution and you are legitimate recipient of the recognition for the purpose as per the attached format [NOC from Supervisor/Head of the Institute] by evening of **August 9, 2020**. ***It is essential to avoid any conflict of interest in this matter in future.***

For making your posters and innovation book kindly send us:

1. Poster Content (about 80 to 100 words)
2. Book Content (about 250 to 280 words)
3. Photograph of prototype (High resolution pics)
4. Photograph of team or individual as applicable (High resolution pics)
5. Video of the innovation (YouTube/other link) if any
6. NOC (Format attached)

Please send the above details to gyti.techpedia@sristi.org with a copy to techpedia@sristi.org. In case of any query, you may contact the GYTI team (+91-9099258492) (Office Time). While communicating in mail, please mention your project title in the mail body along with the names of the team members. Mention "SITARE-Gandhian Young Technological Innovation (GYTI) Awards 2020" in the subject of your mail.

It is our hope that these awards will spur the students to pursue entrepreneurial ventures wherever possible and also motivate them to develop solutions for unmet social needs. SRISTI has a BioNEST incubator viz., SRISTI Innovation Sanctuary for Inclusive Innovations and enterprises (SIIE). Those

of you who will like to join the SIIE may also write to us so that the induction process for that can also b started.

We expect you to volunteer for the Honey Bee Network. It gives voice, visibility and velocity to creative and innovative communities/individuals from/for grassroots. The Network works for recognizing, respecting and rewarding innovations in education, technology (including food), culture and institutions.

You can set up an HBN innovation club in your campus to search, spread and celebrate innovations *from* and *for* grassroots and sense or scout the unmet social needs. We also will like you to ***send abstracts of all UG, PG and doctoral research projects at your institute and nearby technology institutions***. Sometimes, this helps us in giving wild card entry to good projects even if they have not applied. As you may already be aware, through such pooling, we have put together information of more than 200,000 such engineering projects by the students at techpedia.in . It helps in promoting originality, innovation and industrial, ecological and social connect apart from collaborative culture. If a student has to search what has been done before, will he/she go to the websites of 7500 colleges. This database reduces transaction costs of the whole world to know which problems Indian tech youth cares about.

Why do HBN, SRISTI and GIAN contribute towards making open access knowledge available to tech youth like you? Because we want to promote open-source, collaborative culture in the country. Pl be a part of HBN and spread the culture of creativity, compassion and collaboration to make India a global leader in sustainable technologies.

Regards

Team Techpedia

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Home

TECHPEDIA SRISTI
AES Boy's Hostel Campus
Nr. Gujarat University Library and SBI Bank
Navrangpura
Ahmedabad-380 009
India
Cell:+91-7043461139
Tel: 079-27912792, 27913293
http://www.sristi.org
http://techpedia.sristi.org
Society for Research and Initiatives for Sustainable Technologies and Institutions
SRISTI- Developmental Voluntary Organization

NOC_GYTI_2020.doc
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Society for Research & Initiatives for
Sustainable Technologies & Institutions

A Voice of Creative Grassroots Innovators and Traditional Knowledge Holders

Ref. No. BIRAC SRISTI PMU – 2020/007 December 31, 2020

Subject: Sanction Letter of SITARE GYTI Award

To,

Awardee: Vinoj P.G
Supervisor Dr. Sunil Jacob
Institute Name: SCMS School of Engineering & Technology, Kerala

You have been granted a sum of Rs. 15,00,000/- to further work on Project "**Artificial Deep Learning Brain Actuated Lower Limb Exoskeleton For Paralysed**".

You need to sign an agreement called Grant Award Letter Agreement (GALA) which must contain the relevant Annexures for Specific objective, Plan of work (Activities, Time Period & Milestones) and Output. The GALA had already been sent to you. The budget utilization in all phases must be as per the signed GALA and in all cases GALA guidelines will be followed.

Project Period: 2 Years (3 Semester; 1 Semester = 8 months)

Release of The Grant: In three instalments

vii. 33% (Rs. 5,00. 000/-) after the signing of GALA
viii. Next 67% (Rs. 10, 00, 000/-) in other two instalments of around 33% each after every eight months on completion of at least 80% of that semester's work as per milestones.

You are required to submit the following:

xiii. Progress Report after every eight months.
xiv. Audited Expenses Report (Utilization Certificate – UC & Statement of Expenditure - SOE) after every eight months and at the end of the project period.
xv. Compiled Project Report along with compiled UC of all phases at the end of the project period.
xvi. The next phase will be released after the approval of review committee meeting.

You are also required to return the unutilized grant at the end of the project period. The budget utilization will be done under GALA guidelines.

On successful completion of the project work, you will be issued a Project Completion Certificate from SRISTI.

Thanking you

BIRAC SRISTI PMU

SRISTI
AES Boys Hostel Campus,
Near Gujarat University Library & SBI bank,
Navrangpura, Ahmedabad - 380 009

SRISTI

સૃષ્ટિ
એઇએસ બૉયઝ હોસ્ટેલ કેમ્પસમાં,
ગુજરાત યુનિવર્સિટી લાઇબ્રેરી અને SBI બેંક નજીક,
નવરંગપુરા, અમદાવાદ-૩૮૦ ૦૦૯

Ph No: 079-2791 3293, 2791 2792, web: www.sristi.org, Email: info@sristi.org, honeybee@sristi.org
"SRISTI" Trust Regd.No. F/3538/AHMEDABAD (BOMBAY PUBLIC TRUST ACT1950)

GRANT AWARD LETTER AGREEMENT

THIS AGREEMENT made on this ....4th..... day of DECEMBER..... 2020 at SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY,KARUKUTTY,KERALA (TIME:11:30 AM)....by and between...**Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI)...** hereinafter called as **SITARE Partner** (which expression shall wherever the context so admits include its successors and assignees), a non-profit organization having its office at ...AES Boys Hostel Campus, Near Gujarat University Library & SBI, Navrangpura, Ahmedabad-380009, Gujarat, India of the **First** Part

And

Shri.___VINOJ P G_____S/D/o __P P GEORGE_____ resident of _ERNAKULAM,KERALA_____ ,studying at ___ SCMS SCHOOL OF ENGINEERING ANDTECHNOLOGY,KARUKUTTY,KERALA (Institute/University)and having the Project:" Artificial Deep Learning Brain Actuated Lower Limb Exoskeleton For Paralyzed";hereinafter called **AWARDEE** of the **Second** Part:

WHEREAS all the parts are hereinafter referred to as "Parties";

Whereas,SITARE Partner is an organization set up with the objective ofstrengthening the capacity of grassroots and student, inventors, innovators and ecopreneurs in the area of conserving biodiversity and developing eco-friendly solution to local problems; is engaged *inter alia* in the area search, documentation, experimentation, development, diffusion of sustainable technologies and Techpedia, a Sristi initiative aims at putting the problems of micro, small and medium enterprises, informal sector, grassroots innovators and other social sectors on the agenda of the young technology students across the country.

WHEREAS, BIRAC has entrusted the SITARE Partner with implementation of the SITARE Scheme including necessary processing of the proposals, organizing various meetings and training programs, execution of the decisions taken, disbursement of funds, monitoring the physical and financial progress of the Project and to obtain reports and returns and clarifications as required from time to time from the Awardee.

Whereas to promote and encourage young students for embracing translational research to develop innovative products and technologies addressing unmet needs, SITARE Partner under the SITARE Scheme has established two components of the

GYTI) and Residentialworkshops called as Biotech Innovation Ignition School (BIIS) administered through the Project Management Unit at SITARE Partner.

WHEREAS Awardee has been selected for SITARE-Gandhian Young Technological Innovation Award for the research Project entitled "Artificial Deep Learning Brain Actuated Lower Limb Exoskeleton For Paralyzed" , hereinafter referred to as PROJECT and Appended herein as Annexure-1

WHEREAS all the Annexures to this Agreement shall be read as integral part of the Agreement.

NOW THEREFORE the Parties on valid consideration and mutual covenants enter into this GRANT AWARD LETTER AGREEMENT, hereinafter referred to as "GALA" as provided hereunder:

1. RESPONSIBILITIES OF THE AWARDEE

(a) The Awardee shall:

i. Carry out the activities of the Project and confirm to the specified objectives, outputs, milestones, and targets;

ii. Meet the resources on the Project activities to the extent as agreed to, as per details given in **Annexure 1**;

iii. Submit a utilization certificate and statement of accounts duly audited and/or certified by a chartered accountant for the expenditure incurred on the Project for the half year, ending 30th September and 31st March, to SITARE Partner, within a month of 30th September and 31st March for respective half year, in the format provided by SITARE Partner;

iv. Submit a milestones progress report to SITARE Partner as per the timeline and participate in the meetings organized by SITARE Partner to review the progress of the Project, as and when called for;

v. Obtain all the necessary requisite approvals, clearance certificates, permissions and licenses from the Government/local authorities for conducting its operations in connection with the Project;

vi. Keep the drawls from the grant assistance ina separate no-lien account in the name of the Awardeewith a scheduled bank, the payments from which account shall be subject to verification by SITARE Partner. It shall also obtain and furnish to SITARE Partner a letter from the said bank foregoing the right of set off or lien in respect of such account.

vii. Utilize the amounts sanctioned by SITARE Partner for the Project only for the purposes as specified in the Project and shall not entrust the implementation of the Project to another agency or divert the grant-in-aid assistance;

viii. Abide by the decision of SITARE Partner to modify the objectives, outputs, milestones, targets, funding as also the foreclosure of the Project or of its components after mutual discussion;

ix. Acknowledge the assistance of Scheme of BIRAC while publishing or presenting in any manner the details of the Project, its progress or its success.

x. In the case of any ambiguity or conflict or inconsistency between this Agreement and any other associated agreement(s) entered into between Awardee and SITARE Partner on the same subject matter, the provisions of this Agreement shall take precedence.

(b) The Awardee warrants that:

i. It shall obtain prior consent of SITARE Partner in writing before entering into any agreement or arrangement with any other party, national or international, on the Project having overlapping objectives or having impact on Intellectual Propertyfor the Project duration;

ii. It is under no contractual restrictions or legal disqualifications or other obligations which will prohibit the Awardee from entering into this agreement or which will interfere with the execution of this agreement; and

iii. Each and every one of the statement and particulars herein contained in this agreement and in the relevant and supporting documents to this agreement are correct;

(c) The Awardee acknowledges and agrees that:

i. The duties, responsibilities and functions assigned or entrusted to it as specified in the Project document shall be deemed to be the duties, responsibilities and functions assigned and entrusted under this Agreement and unless for reasons beyond control under normal circumstances any undue delay, failure or default in performance of the duties, responsibilities and functions as specified in the Project shall be deemed to be a default under this Agreement;

ii. It shall, at all times, indemnify and keep indemnified SITARE Partner against any claims or suits in respect of any losses, damages or compensation payable in consequences of any accident, death or injury sustained by any other third party resulting from or by any act, omission or operation conducted by or on its behalf;

iii. It shall, at all times, indemnify and keep indemnified SITARE Partner against all claims/damages etc. by any infringement of any Intellectual Property Rights (IPR) while -undertaking its responsibilities/work under the Project and this Agreement; and

iv. It shall notify SITARE Partner of any material change in its status and/or shareholding, in particular where such change would have an impact on performance of the obligations under the Project and this Agreement. SITARE Partner shall reserve the right to reconsider further funding assistance in such circumstances of change of control.

2. FINANCIAL ARRANGEMENTS

The financial arrangements under this Agreement are as here under

i. The total fund approved by BIRAC and granted by SITARE Partner on behalf of BIRAC towards the Project is Rs. __15___ lakhs (Rupees _Fifteen lakhs only___) only on the terms and conditions detailed in this Agreement.

ii. The detailed breakup of the financial assistance is given in **Annexure 2.**

iii. All financial assistance by SITARE Partner will be released as grant award. SITARE Partner shall release the first instalment after signing of the Agreement and subject to the fulfilment of the terms and conditions for such release. Further release of funds shall be subject to satisfactory progress against the objectives, outputs, milestones and targets specified in the Project as determined by SITARE Partner and on submission of statement of accounts/ audited statement of accounts and utilization certificates

iv. The Awardee shall ensure that the funds of the Project are actually utilized only for the Project and as expressly provided in this Agreement. Re-appropriation of funds from one budget head to another shall not be effected without the specific written approval of SITARE Partner;

v. The Awardee shall refund immediately any funds out of grant disbursed to it for the Project remaining unutilized with it on completion of the Project to SITARE PARTNER along with detailed accounts of funds received, utilized and unutilized;

vi. The capital assets acquired for the Project through SITARE Partner's grant shall not be disposed of without the specific prior written permission of the SITARE Partner. The Awardee shall take adequate care towards custody, safekeeping, and insurance and utilization access of such property at its own cost.

vii. The Methods of controlling the disposal/ granting access/resuming possession of such capital assets acquired for the Project will be at the discretion of the SITARE Partner in the event of completion, foreclosure or termination; and

viii. The manpower engaged in the Project are not the employees of SITARE partner and provision of grant-in-aid does not create any liability, explicit or implicit, on SITARE Partner in respect of the manpower engaged in the Project.

3. SITARE STEERING COMMITTEE (SSC)

SITARE Partner will constitute a SITARE STEERING COMMITTEE (SSC) comprising of eminent expert(s) from the relevant field based on specific aspects of the Project. SSC will assess the progress of the Project in conformity with the outputs, milestones, targets and objectives as contained in the Agreement will make recommendations accordingly and will provide mentorship and handholding services.

4. RESULTS OF THE PROJECT

i. The deliverables from the Project are defined and are included in the Project details at **Annexure 1.**

ii. Intellectual Property (IP) shall be the property of the Awardee. It is the responsibility of the Awardee to protect any IP generated during the conduct of the Project. It shall bear the expenditure involved in protecting such IP. During the Project Duration, the Awardee shall not assign or transfer the IP to any third party directly or indirectly without prior written consent from SITARE Partner.

5. PROJECT DURATION

The Awardee shall complete the Project within the stipulated period of 24 months after the date of execution of this Agreement or as per the corresponding order(s) issued by SITARE Partner from time to time.

6. CONFIDENTIALITY

i. During the tenure of the Agreement, both the Parties, undertake to maintain strict confidentiality and refrain from disclosure thereof, of all or any part of the information and data exchanged/generated from the Project under this Agreement for any purpose other than in accordance with this Agreement. It shall be the responsibility of both the Parties to ensure maintenance of such confidentiality in respect of their behalf and on behalf of their employees, representatives and associates involved in the Project.

ii. The Parties shall not have any obligation of confidentiality with respect to any information that:
   a. is in the public domain by use and/or publication at the time of its disclosure by the disclosing party; or
   b. was already in possession of the recipient prior to receipt from the disclosing party; or
   c. is properly obtained by the recipient from a third party with a valid right to disclose such information and such third party is not under confidentiality obligation to the disclosing party; or
   d. was disclosed to any third party on a non-confidential basis prior to commencement of the Project; or
   e. is required by public authority, by law or decree.

7. FORECLOSURE AND TERMINATION

i. In case, during the tenure of the Project, it is found that the Project or any Project component is not likely to lead to successful completion, SITARE Partner may decide to foreclose the Project or the Project component as warranted. The decision of the SITARE Partner shall be final in all respects. TheGrantee shall immediately refund any funds unutilized out of SITARE Partners disbursements, after deducting the legally committed expenses to third party vendors, to SITARE Partner, along with detailed accounts of funds received, utilized and unutilized. The entire outstanding amount as on the date of foreclosure will become due and payable immediately.

ii. The Granteemay, before the completion of the Project, terminate this Agreement by giving three months' notice in writing to SITARE Partner. SITARE Partnermay also terminate this Agreement by written notice for committing breach of any term of this Agreement and either not rectifying it to the satisfaction of SITARE Partner or not satisfying SITARE Partner about its inevitability within a reasonable period. In the event of termination of the Agreement, no further disbursement shall be made by SITARE Partner and the Awardeeshall be liable to return immediately the amount of grantalready availed of from SITARE Partner with simple interest at the rate of 12 (twelve) per cent per annum within 30 (thirty) days of termination of the Agreement.

In case of failure to repay, without prejudice to any other rights under this agreement, the amount can be recovered by initiating any procedure available in Law.

8. *FORCE MAJEURE*

The Parties shall not be held responsible for non-fulfillment of their respective obligations in successful completion of the Project under this Agreement due to the exigency of one or more of the *force majeure* events such as but not limited to acts of God, war, flood, earthquakes, strikes not confined to the premises of the Party, lockouts beyond the control of the Party claiming *force majeure*, epidemics, riots, civil commotion etc. lying beyond the reasonable control of and not brought about at the instance of the Party claiming to be affected by such event and which has caused the non-performance or delay in performance; provided on the occurrence and cessation of any such event the Party affected has given a notice in writing to the other Party within one month of such occurrence or cessation. If the *force majeure* conditions continue beyond six months, the Parties shall jointly decide about the future course of action on the Project. The validity of the claim of *force majeure*shall be determined by SITARE Partner after due enquiry and the decision in this regard shall be final.

9. DISPUTE RESOLUTION

In the event of any dispute or difference between the Parties hereto upon or in relation to or in connection with this Agreement, such dispute or difference shall be resolved amicably by mutual consultation. If the dispute is not resolved, then shall be referred to (Please insert the standard Arbitration clause of SITARE Partner as applicable)

10. EFFECTIVE DATE AND TENURE OF THE AGREEMENT

i. The Agreement shall be effective from the date of its signing by both the Parties. The Agreement shall be valid for till _24___ months or till full utilization/refund of the Grant award, whichever is later. It can be extended if agreed to by both the Parties.

ii. Two copies of the Agreement shall be signed by both the Parties and one copy each shall remain in the custody of each Party.

iii. Any failure or delay on the part of SITARE Partner to exercise the right or power under the Agreement shall not operate as waiver thereof.

11. AMENDMENTS TO THE AGREEMENT

No amendment or modification of this Agreement shall be valid unless the same is made in writing by both the Parties or their authorized representatives and specifically stating the same to be an amendment of this Agreement. The modifications / changes shall be effective from the date on which they are made / executed unless otherwise agreed to.

12. SEVERABILITY

In case any one or more of the provisions or parts of a provision contained in this Agreement shall, for any reason, be held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provision or part of a provision of this Agreement; and this Agreement shall, to the fullest extent lawful, be reformed and construed as if such invalid or illegal or unenforceable provision, or part of a provision, had never been contained herein.

13. NOTICES AND JURISDICTION

i. All notices and other communications required to be served on the SITARE PARTNERincluding for violation of the terms of this Agreement shall be considered to be duly served if the same shall have been delivered by registered mail at its address as below.

ii. Similarly, any notice to be given to Awardee shall be considered as duly served if the same shall have been delivered by registered mail at its address as below:

Subject to the provisions of Clause 10 hereof, the Courts at shall have exclusive jurisdiction in all matters concerning this Agreement including any matter arising therein.

14. NO JOINT VENTURE

Nothing contained in this Agreement will be construed as creating a joint venture, agency, partnership or employment relationship between the Parties hereto, nor will any party have the right, power or authority to create any obligation or duty, express or implied, on behalf of the other Party.

15. GOVERNING LAW

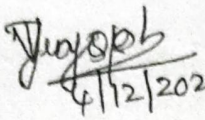
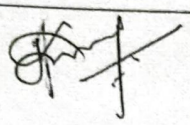
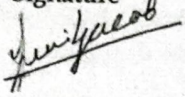
This Agreement shall be governed and interpreted in accordance with the laws of India.

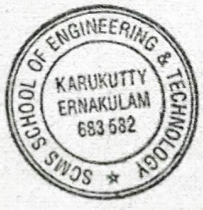
IN WITNESS WHEREOF the Parties hereto through its duly authorized representatives have signed this Agreement on the day, month and year mentioned hereinbefore.

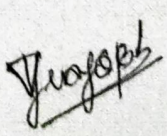
Parties

For and on behalf of the SITARE PARTNER	
Signature	
Name: RAMESH PATEL	
Designation: SECRETARY	
Seal	
Witnesses	
Signature	Signature
Place	Place Ahmedabad
Date	Date
Name	Name DR. RICHA GUPTA
Dr. Meyhu Beroot	
Address	Address SRISTI

For and on behalf of "Awardee"

Signature  4/12/2020	
Name VINOJ P G	
Designation Research Scholar, SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY, KARUKUTTY, ANGAMALY	
Witnesses	
Signature 	Signature 
Place: KARUKUTTY	Place: KARUKUTTY
Date: 04/12/2020	Date: 4-12-2026
Name Dr. PRAVEENSAL C.J.	Name Dr Sunil Jacob
Address DR. PRAVEENSAL C.J. PRINCIPAL SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY	Address Director SCMS Centre for Robotics SCMS School of Engineering & Technology
Seal of the Institute with Name	**Seal**





Annexure 2

BUDGET DETAILS

Budget Heads:

Head	Amount (in lakhs)
Development of Prototype (including outsourcing activity)	5
Travel	2
Incubator Rentals	2.20
Manpower	2.16
Consumables	2
Training and conferences	1.14
Contingency	0.50

Budget Justification:

1. Development of Prototype (including outsourcing activity) : 5 Lakhs

- EEG/EMG, Pressure, Accelerometer and gyroscope sensors,cables,Controller boards,shields,Actuators,Motors and Other electronic Components: **3 Lakhs**
- Design and Manufacture of Exoskeleton,EEG headset,PCB fabrication: **2 Lakhs**

2. Travel, Total: 2 Lakhs

- Travel Budget will be utilized for meeting doctors, patients and subject experts

3. Incubator Rentals: 2.20 Lakhs

- Incubator rental for SSET, Karukutty: 5000 Rupees per month for 24 Months:1.20 lakhs
- Utilization of Fab Lab at SSET, Karukutty for facilities like 3D printer, CNC machine, Laser cutter, Electronics Test bench: 1 lakh

4. Manpower: 2.16 Lakhs

- The manpower budget is utilized by recruiting Technical assistant, having proficiency in hardware and software design and prototyping. Salary for the technical assistant(18,000 Rupees per month for 12 months =2.16 Lakhs)

5. **Consumables: 2 Lakhs**

- Medical grade Components like EEG-EMG electrode pads, skin preparation spray, silicon rubber: 1 lakh
- carbon fiber,3D printing material, Acrylic sheets,batteries,Drill bits etc.: 1 lakh

6. **Training and Conferences: 1.14 Lakhs**

- Training and Conferences budget will be utilized for attending Training and Conferences related to Biomedical Assistive Technologies

7. **Contingency: 0.50 Lakhs**

- Contingency Fund is utilized for patent filing, medical committee approval, to cover unforeseen risks during patient usability testing.

Total: 15 Lakhs

SRISTI

Honey Bee Network

Society for Research and Initiatives for Sustainable Technologies and Institutions

SITARE-Students Innovations for Translation & Advancement of Research Explorations
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birac
ignite Innovate Incubate

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GYTI

Artificial Deep Learning Brain Actuated Lower Limb Exoskeleton For Paralysed

Vinoj P.G
(SCMS School Of Engineering & Technology, Kerala)

Guide: Dr. Sunil Jacob

GIAN

November 5, 2020

CSIR

Prof Anil K Gupta
Founder, Honey Bee Network, SRISTI, GIAN & NIF
CSIR Bhatnagar Fellow, Visiting Faculty, IIMA & IITB

Project Report

ON

Artificial Deep Learning Brain Actuated Lower Limb Exoskeleton For Paralyzed

BIRAC- SITARE

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PHD Scholar: VINOJ P.G

Research Guide: Dr. Sunil Jacob

Institute: SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY

UNIVERSITY: APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, KERALA

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Abstract: Due to partial or full paralysis due to stroke, the majority of patients are compelled to rely upon parental figures and caregivers in residual life. With post-stroke rehabilitation, different types of assistive technologies have been proposed to offer developments to the influenced body parts of the incapacitated. In a large portion of these devices, the clients neither have control over the tasks nor can get feedback concerning the status of the exoskeleton. Additionally, there is no arrangement to detect user movements or accidental fall. Rehabilitation is the natural remedy for recovering from paralysis and enhancing the quality of life. Brain Computer Interface (BCI) controlled assistive technology is the new paradigm, providing assistance and rehabilitation for the paralysed. But, most of these devices are error prone and also hard to get continuous control because of the dynamic nature of the brain signals. Moreover, existing devices like exoskeletons bring additional burden on the patient and the caregivers and also results in mental fatigue and frustration. In Phase1 the proposed framework tackles these issues utilizing a Brain-Controlled lower limb exoskeleton (BCLLE) in which the exoskeleton movements are controlled based on user intentions. An adaptive mechanism based on sensory feedback is integrated to reduce the system false rate. The BCLLE uses a flexible design which can be customized according to the degree of disability. The exoskeleton is modelled according to the human body anatomy, which makes it a perfect fit for the affected body part. The BCLLE system also automatically identifies the status of the paralyzed person and transmits information securely using Novel-T Symmetric Encryption Algorithm NTSA to caregivers in case of emergencies. The exoskeleton is fitted with motors which are controlled by the brain waves of the user with an electroencephalogram EEG headset. The EEG headset captures the human intentions based on the signals acquired from the brain. The brain-computer interface converts these signals into digital data and is interfaced with the motors via a microcontroller. The microcontroller controls the high torque motors connected to the exoskeleton joints based on user intentions. Classification accuracy of more than 80 is obtained with our proposed method which is much higher compared with all existing solutions. In phase 2 of our work we created Artificial Muscle Intelligence with Deep Learning (AMIDL) system. AMIDL integrates user intentions with artificial muscle movements in an efficient way to improve the performance. Human thoughts captured using Electroencephalogram EEG sensors are transformed into body movements, by utilising microcontroller and Transcutaneous Electrical Nerve Stimulation (TENS) device. EEG signals are subjected to pre-processing, feature extraction and classification, before being passed on to the affected body part. The received EEG signal is correlated with the recorded artificial muscle movements. If the captured EEG signal falls below the desired level, the affected body part will be stimulated by the recorded artificial muscle movements. The system also provides a feature for communicating human intentions as an alert message to caregivers, in case of emergency situations. This is achieved by offline training of specific gesture and online gesture recognition algorithm. The recognised gesture is transformed into speech, thus enabling the paralysed to express their feelings to relatives or friends. Experiments were carried out with the aid of healthy and paralysed subjects. The AMIDL system helped to reduce mental fatigue, miss-operation, frustration, and provided continuous control. The thrust of lifting the exoskeleton is also reduced by using lightweight wireless electrodes. The proposed system will be a great communication aid for the paralysed to express their thoughts and feelings with dear and near ones, thereby enhancing the quality of life.

INDEX TERMS Artificial Muscle Intelligence, Assistive technologies, BCI, EEG, Exoskeleton, Healthcare, Intelligent solutions, Deep Learning System, Paralyzed, Stroke.

1. Introduction

The recent survey by reeve foundation revealed the impact of paralysis on world population, affecting approximately 5.4 million people [1, 2]. The survey also identified stroke (33.7%) as the major cause for paralysis. Paralysis is the increasing interest and involvement in the field of post stroke rehabilitation. Exoskeleton-assisted technologies have emerged as a reliable means for rehabilitation of the affected upper and lower limbs [3]. Exoskeleton movements were controlled using sensors like gyroscopes, accelerometers, and potentiometers. Recently the focus is on controlling exoskeleton using Brain Computer Interface (BCI) [4]. Javier et al. demonstrated upper limb movement of the paralyzed using EEG signals [5]. A closed loop is established between human thought and movement of paralyzed limbs using non-invasive BCI [6]. Android feedback based BCI training is employed to enhance brain rhythms during motor imagery task. The realistic feedback is realized in training sessions using humanoid robots [7]. Humanoid robot is navigated in a real-time indoor environment based on human intentions. The asynchronous BCI system was designed using two level classifiers [8]. Co-operation and coordination of dual robotic arm is demonstrated using an EEG based system. SSVEP (Steady-State Visual Evoked Potentials) are utilized to improve the user concentration level [9]. Electromyography (EMG) sensors are also used to control exoskeleton movements, EMG returns the information regarding human muscular activity [10]. The motor adaptability of the upper limb is predicted using resting state functional connectivity. The system could identify effectiveness of robotic upper limb rehabilitation in different patients [11]. However, the system does not investigate real time human behaviours and thoughts. The clinical trials to investigate the effectiveness of BCI training sessions on stroke patients with upper limb paralysis are carried out. The results of the trial indicate that BCI based assistive devices are effective for post stroke rehabilitation [12]. Human intentions measured through cortical potentials were used to control upper-limb exoskeleton movements. The BMI system eliminated the need for recalibration but resulted in large false positive rates [13]. The Grasping feature is incorporated into the assistive device for amputees using non-invasive EEG control. The participants were able to grasp the objects, but resulted in low success rate without sufficient training [14]. Brain activity is modulated to control robotic arm with multiple degrees of freedom. The system demonstrated the effective control of robotic arm with few training sessions, but increased the latency periods during certain operations [15]. Hybrid BMI system based on sensorimotor cortical desynchronization (ERD) and electromyography (EMG) activity was designed to control upper limb movements. The integration of BMI, NMES and

exoskeleton improved the system accuracy, but increased the system complexity [16]. The linear control of upper limb is demonstrated using motor imagery based BCI and Functional Electrical Stimulation (FES), support is provided to the arm using passive exoskeleton. The generated limb movement is evaluated to identify the precise positioning [17]. The self-induced EEG variations based on ERD/ERS is utilized for controlling upper limb movements. Distinguishable patterns are obtained for left and right-hand movements in both motor imagery and motor execution experiments [18]. Online robot control using motor imagery based BCI is designed with high classification accuracy. The mental imagination of hand movement is detected for controlling the robot movements [19]. An integrated platform consisting of BCI controlled exoskeleton, functional electrical stimulation (FES) with proprioceptive feedback is developed. Goal directed motor task is used for training and subjects could complete the task with minimum latency period [20]. In our previous works [21-23], we have demonstrated an alternative technology to exoskeletons using non-invasive brain signals. Also, exoskeletons with feedback mechanisms have also been implemented by us [22]. The paralyzed body part is stimulated using Transcutaneous Electrical Nerve Stimulation (TENS) device and Microcontroller [24]. Because of the dynamic and uncertain nature of brain signals, most of the BCI systems result in miss-operation, mental fatigue and it is hard to produce continuous control. The proposed system is designed to address the above gaps in research.

In the phase 1 of the proposed work, we use a gyroscope in the BCI headset to control the directions along with only two mental commands. This reduces the load on the system and increases the speed of the exoskeleton. The exoskeleton interfaced with the brain is controlled based on the decoded brain signals. In correspondence to the mental commands recognized, the high torque motors connected to the joints of the exoskeleton are activated. The exoskeleton is made using carbon fibre which makes it light and hence user-friendly. The exoskeleton replicates the movement of a healthy functioning leg using all the joints. Sensory feedback is introduced to reduce the system false rate. The user intentions given to the system are converted to motor actions. If the produced motor action is not sufficient to trigger the actual limb movement, an adaptive algorithm is used to make the corrective action. The status of the paralyzed and emergency rescue information is transmitted wirelessly to the corresponding caregivers. NTSA encryption and decryption algorithm is used to transmit the information securely to the intended user without interference. Walsh– Hadamard transform is used for feature extraction of brain signals. The extracted features along with Hadamard coefficients are transmitted wirelessly from brain to the lower limb via Bluetooth. At the receiver side using

the Hadamard coefficients, the original brain signals are reconstructed. The feature extraction and reconstruction is implemented for all five different user intentions. The Brain-Controlled Lower Limb Exoskeleton (BCLLE) analyses the human thoughts and transforms it into different movements on a unique lower limb structure. The contributions of our phase1 research are,

- A Brain-Controlled Lower-Limb Exoskeleton (BCLLE) in which the exoskeleton movements are controlled based on user intentions.
- An adaptive mechanism based on sensory feedback integrated with the exoskeleton to reduce the system false rate.
- A flexible design for the exoskeleton which can be customized according to the degree of disability.
- Artificial skin incorporated with sensors which can provide a sense of touch to the body parts of users.
- Automatic identification of the status of the paralyzed person and secure transmission of information to caregivers in case of emergencies

In the phase2 of the research, AMIDL is designed to reduce miss-operation, user fatigue and to enhance user capabilities. In the proposed work, human intentions are monitored in real-time employing 16 channel EEG sensors. TENS machine is integrated with Muscle Inspired Algorithm (MIA) to produce movements on the upper limb. Subjects are relieved from the task of carrying exoskeleton structure. The system is designed to perform six different movements on the affected upper limb. The different hand postures used to trigger the rehabilitation process are Release, Grasp, Rollup, Roll down, Rollup Release and Rollup grab. In the offline phase, Artificial Muscle movements corresponding to each posture are recorded to create the database. The decoded EEG signals are transformed into muscle activation signals in a real-time environment. The captured EEG signal is converted into frequency domain using Walsh Hadamard Transform (WHT) for feature extraction. The extracted features along with WHT coefficients are utilized for the classification of different limb movements. The activation signal is then correlated with the recorded muscle movements. The signal with superior characteristics is passed on to the upper limb electrodes for inducing motion. In case of ambiguity or inadequate EEG signal, the periodic activation of the affected body part will be taken care of by the artificial muscle movements. If the activation is executed by brain signal, the produced gesture is recognized and passed on to the caregiver as voice command. Thus, AMIDL transforms human thoughts into different movements on the unique upper limb

structure. The EEG activated movements are utilized for communicating paralyzed person's emergency needs to the caregivers. The contributions of our research are,

• An Artificial Muscle Intelligence with Deep Learning (AMIDL) system without exoskeleton structure, in which movements of paralyzed body parts are controlled based on user intentions.

• An adaptive mechanism based on recorded muscle movements is integrated with the system to enhance continuous control and facilitate rehabilitation.

• Designed flexible assembly, which can be customized according to the degree of disability.

• Communication aid is incorporated in the system using gesture recognition

• The subject concentration is improved by using multimedia feedback

2. Literature Survey

In this section, we discuss a few existing devices controlled by Brain-Computer Interface designed specifically for paralyzed people. But the problem with most of them is that the users are unable to get continuous control over the device. The users are required to have a high level of concentration to get sufficient control on the device, which results in mental fatigue and frustration. Additionally, there is no arrangement to take care of the miss-operations. The subjects are also burdened with the task of carrying the load of exoskeleton on the affected body parts. Our research focuses on overcoming these major problems and provides an efficient and flexible solution, which can enhance the post stroke recovery process. Our system also provides a communication aid for the paralyzed to express their feelings. The assistive rehabilitation devices and its EEG control techniques are systematically reviewed and the major gaps are identified [25]. Three-dimensional robotic assistance using motor imagery task for upper limb rehabilitation is demonstrated with multi-joint exoskeleton. Desynchronization of sensorimotor oscillations in the β-band is measured to control the different robotic hand movements [26]. Different upper limb exoskeletons like Track hold [27] and Armeospring [28] are employed to track upper limb movements. Both these devices have integrated passive robots with virtual reality environments to help patients carry out their daily routine activities. Control of assistive robots are improved by integrating electroencephalography (EEG) and electrooculography (EOG). This hybrid approach called brain/neural-computer interaction (BNCI) is adopted to control grasping movements of a hand exoskeleton [29]. Multimodal signal approach is further used to enhance the control system for external devices connected to

the upper limb. EEG and EMG signals are integrated to improve the classification accuracy and to reduce the false positive rate [30]. Upper limb robotic orthosis, FES, and wireless BCI are combined in an efficient way on account of EEG signals. EMOTIV EEG device is employed to measure EEG signal, which is used to control grasp/release of an object [31]. An integrated passive robotic system is developed for assisting the paralyzed. The system employs a robotic device which compensates gravitational effects to allow exercise, virtual engines to facilitate interaction and EEG to monitor brain activities. The three components are coordinated in real-time to enhance the rehabilitation process [32]. The effects of BCI therapy on post stroke rehabilitation is analysed based on motor imagery tasks. The analysis is performed by measuring coherence of EEG in different regions of the brain and the best result for motor recovery is obtained for the activation of lesion hemisphere [33]. The online BCI coupled with hand exoskeleton is employed to address the issues related to proprioceptive feedback on the regulation of cortical oscillations. The results show an enhancement in SMR desynchronization with proprioceptive feedback during flexing and extending fingers of the exoskeleton [34]. Multimodal architecture based on BCI, exoskeleton and an active vision system is proposed to enhance BCI control and rehabilitation process. The VR environment coupled with biofeedback helps to reduce mental fatigue and improve user interactions [35]. Few studies have also been conducted in related areas recently [36-42] Feng et al proposed another interesting system using optimal haptic communications [43]. Baoguo Xu et al. [44] proposed a three-dimensional animation to guide upper limb movements using EEG signals. Feature extraction is carried out by Harmonic Wavelet Transform (HWT) and linear discriminant analysis (LDA) classifier was utilized to classify the patterns for controlling the upper limb movements. MR-compatible robotic glove operates pneumatically and doesn't cause any disturbance to functional Magnetic Resonance imaging (fMRI) images during rehabilitation process [45]. The resistance to mechanically actuated movements in an exoskeleton robot is measured based on spasticity. The relevant guidelines for practical neuro-rehabilitation robot design based on degree of spasticity and resistance is established [46]. In most of the design it is hard to get continuous control on the exoskeleton due to the nonstationary nature of the EEG signal. Moreover, the subjects experience metal fatigue and frustration due to lack of superior control. None of the devices in the literature focused on providing communication aid for the paralyzed. Our research focuses on solving these issues in an efficient manner using the AMIDL system proposed in this paper. Table 1 shows the comparisons between AMIDL and existing systems in the literature

Method Reference No., year	No. of subjects	Type of control	Type of EEG signal	Device Assigned	Task	Accuracy/ success rate
Ref [14], 2016	2 amputees	EEG -based control	Motor imagery Low frequency-time domain feature	Prosthetic hand	Grasping objects	63.6%
Ref [15], 2016	13 healthy subjects	EEG-based control	ERD/ERS	Arm exoskeleton	Reach and grasp tasks	77.8%
Ref [12], 2017	64 stroke patients	EEG-based control	Motor imagery 5–30 Hz EEG signal	Hand exoskeleton	Hand open/closed	79.4%
Ref [17], 2016	7 healthy subjects	EEG-based control	7–30 Hz EEG signal	ArmeoSpring and FES	left hand, right hand, and feet	79.6%
Ref [16], 2016	7 stroke patients	EEG-based control	ERD	ArmeoSpring exoskeleton	Wrist extensor/flexor	80.7%
Ref [13], 2016	3 chronic stroke patients	EEG-based control	MRCPs	MAHI exoskeleton	Elbow flexion/extension	81.3%
Ref [11], 2018	19 healthy subjects	EEG-based control	15–25 Hz EEG signals	Robotic Arm	Upper limb movement/reaching	83.5%
Ref [18], 2016	4 healthy subjects	EEG-based control	ERD/ERS	Custom upper limb exoskeleton	Left/right hand and left hand versus both feet	84.29%
Proposed System, AMIDL	20 subjects	EEG and EMG based control	Motor Imagery ERD/ERS with multimedia feed back	TENS device with EMG Electrodes	left or right hand movements	87%

Table 1. Proposed system comparisons with existing system (Sorted by success rate)

3. Methodology

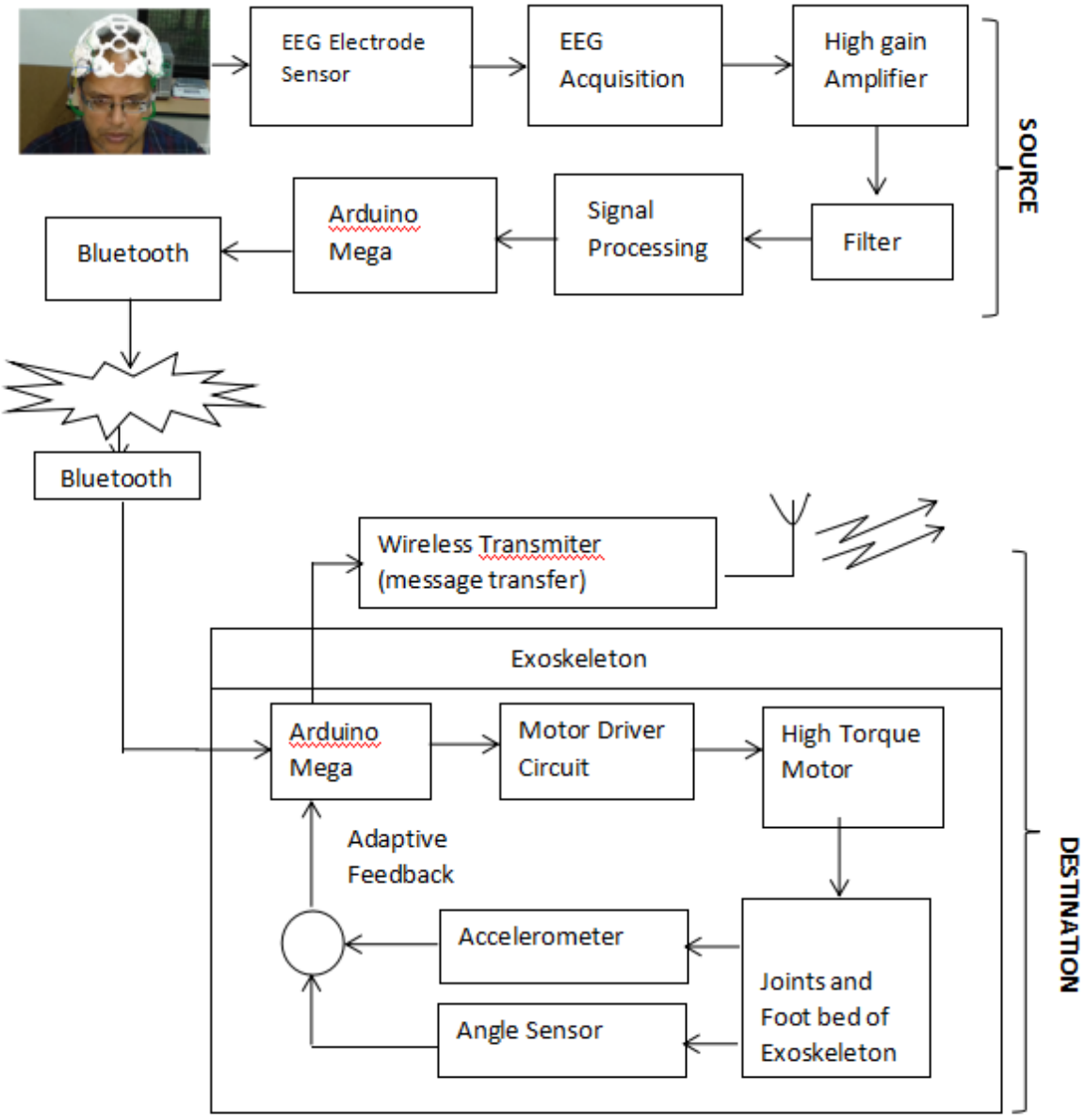


FIGURE 1. System architecture for Brain Actuated Multidimensional Exoskeleton

The architecture of the proposed system is presented in figure 1. The system design comprises an exoskeleton that replicates a lower limb, which is made using carbon fiber. The exoskeleton has total six degrees of freedom including both legs, one on each side of the pelvic bone, one on each knee and one on each ankle. Thus three degrees of freedom on each leg making it total of six degrees of freedom on the entire exoskeleton. Each joint of the lower limb is actuated using high torque motors. The movement of the exoskeleton is facilitated by controlling the degree of rotation of the motors. This exoskeleton is strapped onto the abdomen as well as foot region for improving the stability and balance of the person. Support is also provided on the back side of the ankle region. The angle sensors are placed on the joints to provide feedback

regarding the status of exoskeleton. This sensor is also used to validate whether the applied force is sufficient to stabilize the exoskeleton. The fall detection mechanism is implemented by placing an accelerometer on the back side of the lower limb to measure the tilt. If the measured sensor value crosses the threshold, a message will be given to the caregivers for emergency rescue. The exoskeleton is controlled through human intentions. Electroencephalograph (EEG) sensors use non-invasive methods to collect the brain signals from the scalp of the person. EEG sensor has 16 electrodes incorporated in structure, where two electrodes act as the reference for measurement. The conductivity of the electrodes is improved by using gold plating. The signals collected are amplified using a high gain amplifier and a band pass filter is used for filtering high-frequency noise. In the signal processing stage, the signal undergoes further pre-processing and filtering. The suitable pattern based on the mental command is selected by using windowing technique. The signal is converted into digital data which is given as input to the microcontroller. The microcontroller does the classification of each mental command based on the feature extraction. In the training phase, users will be trained for five basic commands (sitting, standing, forward movement, right turn, left turn). The recorded patterns during the training phase will be used by the microcontroller for decision making. The recognized thought patterns will be mapped to five different commands. During the testing phase, the controller makes use of machine learning to recognize and match patterns in the input data along with the training data that is already stored in the system to make the necessary decision regarding the action to be performed. The activation command to the exoskeleton is given by the controller through the Bluetooth module. At the receiver side the microcontroller converts this command into motor action which in turn moves the desired parts of the exoskeleton. Using a three-level sensing mechanism, feedback is given to the microcontroller regarding the status of the exoskeleton. Based on this feedback the microcontroller makes the desired corrections on the activation signals. The sensory feedback gives more stability to the system, and moreover rescue messaging systems are also implemented in case of emergencies.

The secured communication between the paralyzed person and caregiver is achieved using Novel-T symmetric algorithm (NTSA). This algorithm ensures that the data is securely transmitted to the intended caregiver. NTSA is a symmetric algorithm that uses a single 128-bit symmetric key that is agreed upon by sender and receiver for performing encryption and decryption. The 128-bit key is divided into four partial keys k0, k1, k2 and k3. There are 64 rounds with partial keys k0, k1 applied for odd rounds and k2, k3 applied for even rounds. Multiple XOR and shift operations are performed in each round of encryption. The message

from the paralyzed person is encrypted using NTSA encryption algorithm to produce ciphertext. The cipher text is transmitted to the caregiver either through the internet or wireless module. The NTSA decryption algorithm decrypts the cipher text using the key and the original message is retrieved at the receiver-end by the caregiver. The NTSA algorithm introduces key confusions in each round of encryption that makes the algorithm safe and secure from possible attacks. This algorithm uses minimum system memory and provides faster response.

3.1 system architecture of AMIDL

AMIDL EEG Acquisition Module

The system architecture is designed using a modular approach, it consists of three main modules. They are 1) EEG Acquisition Module, 2) Muscle Stimulation Module and 3) Gesture to Voice Conversion Module. Figure 1 indicates the two main modules of the system. The system captures brain signals using an EEG sensor module, which has 14 electrodes to make measurement and two acts as reference. The acquired signal undergoes pre-processing, feature extraction and classification. The low amplitude EEG signal is amplified using a high gain instrumentation amplifier with a gain of approximately 1000-2000 db. The signal is band limited by employing a band pass filter having a pass band frequency of 5-50Hz.Windowing and pattern selection is utilized for getting finite response. Feature coefficients of the signal are extracted using Walsh Hadamard Transform (WHT). These extracted features are used to classify the thoughts into six different movements. The actual brain pattern is reconstructed using the transmitter Hadamard coefficients. The decoded brain pattern is given to the TENS device, which transforms the thought into muscular actions. The muscle inspired algorithm stored in the controller facilitates the process of conversion. In the offline phase, muscle movements corresponding to the six different predefined hand postures are recorded to create the database. The hand postures are recorded using 7 Electromyography (EMG) sensors on the different hand muscles. Five EMG electrodes are placed on the finger muscles to record finger activity. Two electrodes are placed on either side of the elbow to identify roll movements. In the online phase, brain signals based on human thought are acquired and transformed into muscle movement. This transformed muscle movement is then correlated with the recorded muscle movements. The signal with superior characteristics is selected by the controller for producing movements on the affected body part. If the brain signal fails to provide sufficient activation, periodic movements in the upper limb will be triggered by artificial muscle.

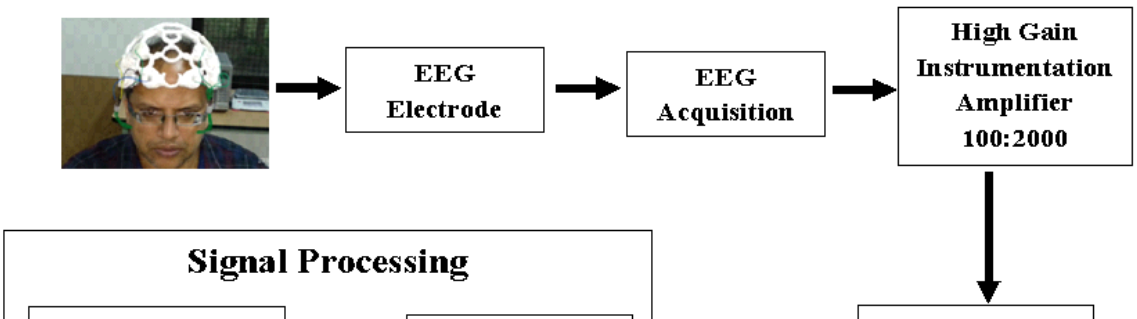


Figure 2. AMIDL EEG Acquisition and Muscle Stimulation Modules

AMIDL Gesture to Voice Conversion Module

If the brain signal with superior features activate the upper limb, the created gesture will be captured. Flex sensors placed on each finger is used for acquiring the gesture. The captured

gesture will be recognized by the algorithm and transforms it into voice commands for the care givers. Figure 3 depicts the AMIDL gesture to voice conversion module. This module is used to give emergency alert messages to the caregivers or relatives.

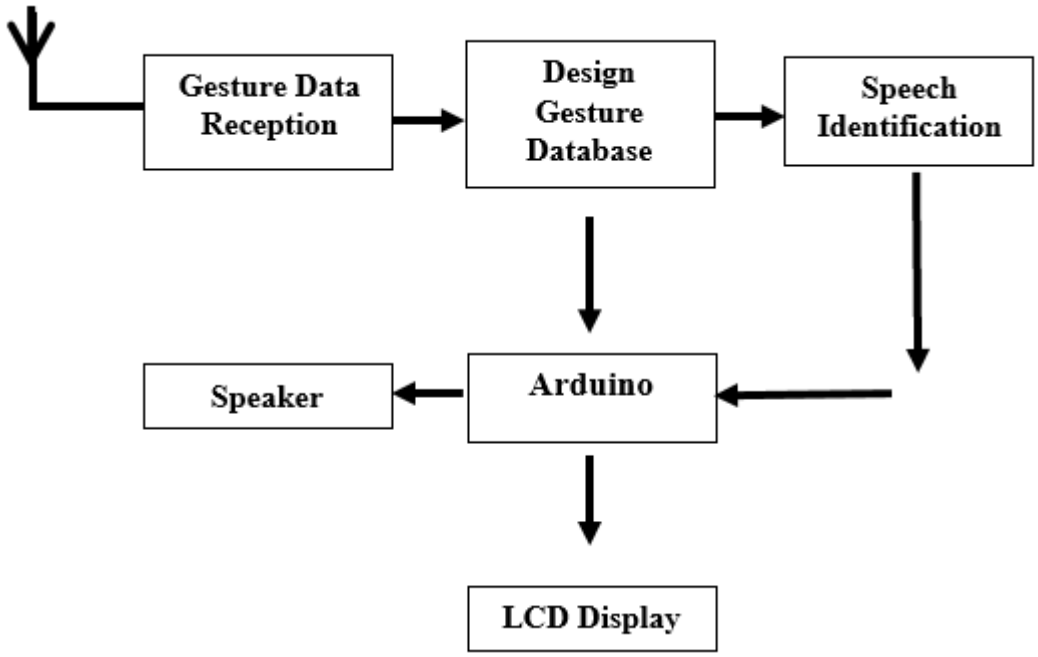


Figure 3. AMIDL Gesture to Voice Conversion

4. Results and Implementations

4.1 Sensor Design

In the initial stages, brain signals are monitored using Emotive EPOC mobile EEG headset. Emotive uses 14 channels to access the raw EEG data and the analysis of acquired data is carried out using integrated software tools. Figure 4 exhibits the Emotive EEG headset deployed in brain signal monitoring. In the latter stages of experimentation Emotive headset is replaced by the designed EEG Sensor. The EEG sensor is manufactured using 3D printer Technology. It has a total of 16 electrodes in which 14 are used for tapping the brain signals and two electrodes act as reference. Figure 5 shows the designed EEG sensor and its electrodes

Figure 4. Emotive EPOC mobile EEG headset

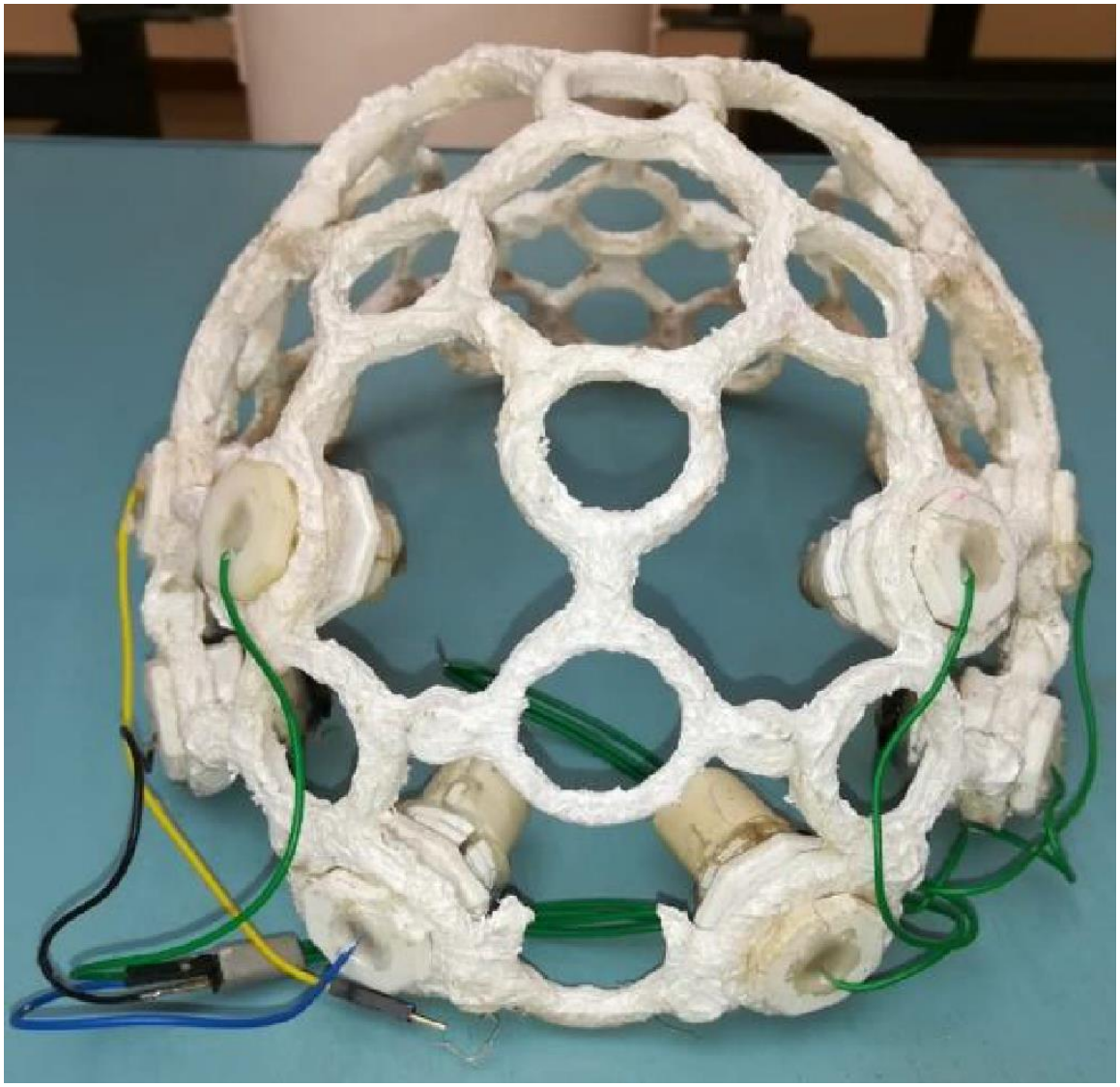


Figure 5. Designed EEG Sensor with electrodes

4.2 *Exoskeleton Design*

The Lower limb exoskeleton is designed matching the characteristics of the human anatomy. Figure 6 depicts the complete lower body exoskeleton designed using 3D software. The important parts of the exoskeleton are labelled as below

A Gluteal Region
B Hip joint
C Thigh Region
D Knee Joint
E Leg Region
H Ankle Joint
G Foot Region

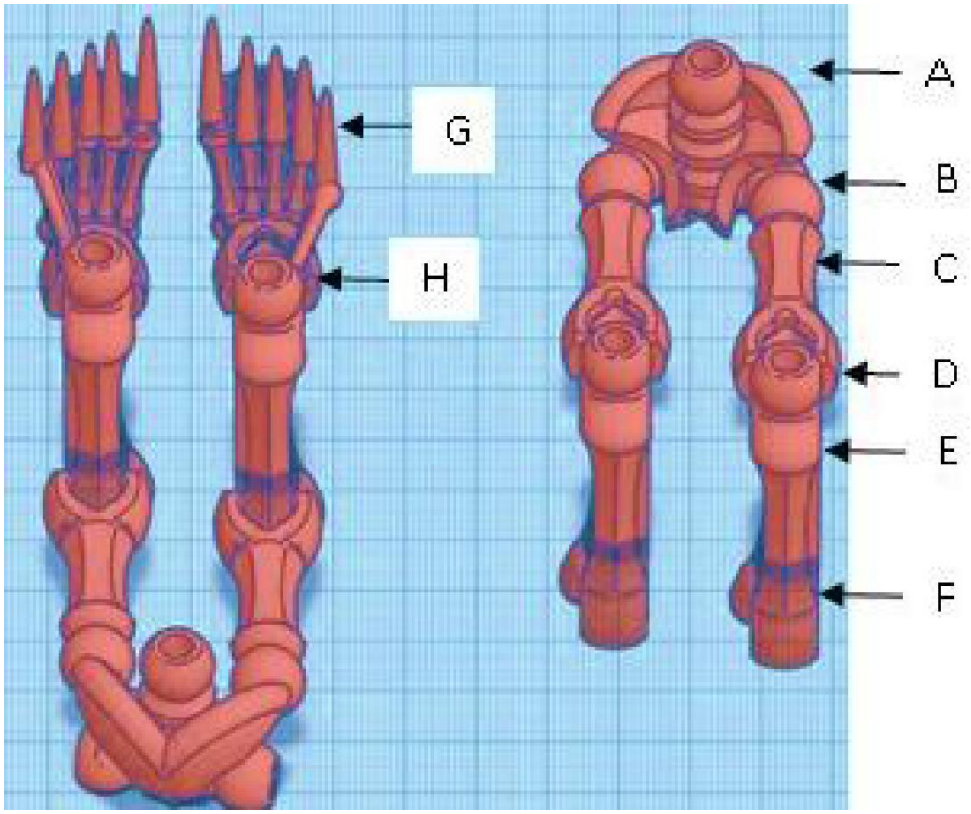


Figure 6: Complete Lower body part exoskeleton

These parts are flexible and allow easy attachment and detachment. For the fully paralyzed, the complete exoskeleton will be used. In case of partial paralysis, we can detach the complete assembly into separate parts. The carbon fiber material is used for the construction of exoskeleton. This provides the exoskeleton, easier mobility and light weight. To get better adhesion to the exoskeleton two supports are designed: one over the foot region and other on the back side of the ankle joint

4.3 Artificial Skin Preparation

The sensor circuit is incorporated in the artificial skin to get the sense of touch or feeling for the exoskeleton. The skin will be placed over the designed exoskeleton model with all the essential circuits. This gives the exoskeleton the functionality and aesthetics similar to the human body parts. Silicon rubber is the material used for constructing the artificial skin. The artificial skin acts as a protective coating and binds together the entire exoskeleton structure. Figure 7 illustrates the developed artificial skin along with its SMD components. ATtiny45 microcontroller is used for capturing vibrations and sense of touch using different sensors integrated into the circuit. The PCB design of the circuit is done using Fritzing software which

is an open source tool for PCB design. The design is optimized for compactness by appropriate placement of components and reducing the line width.

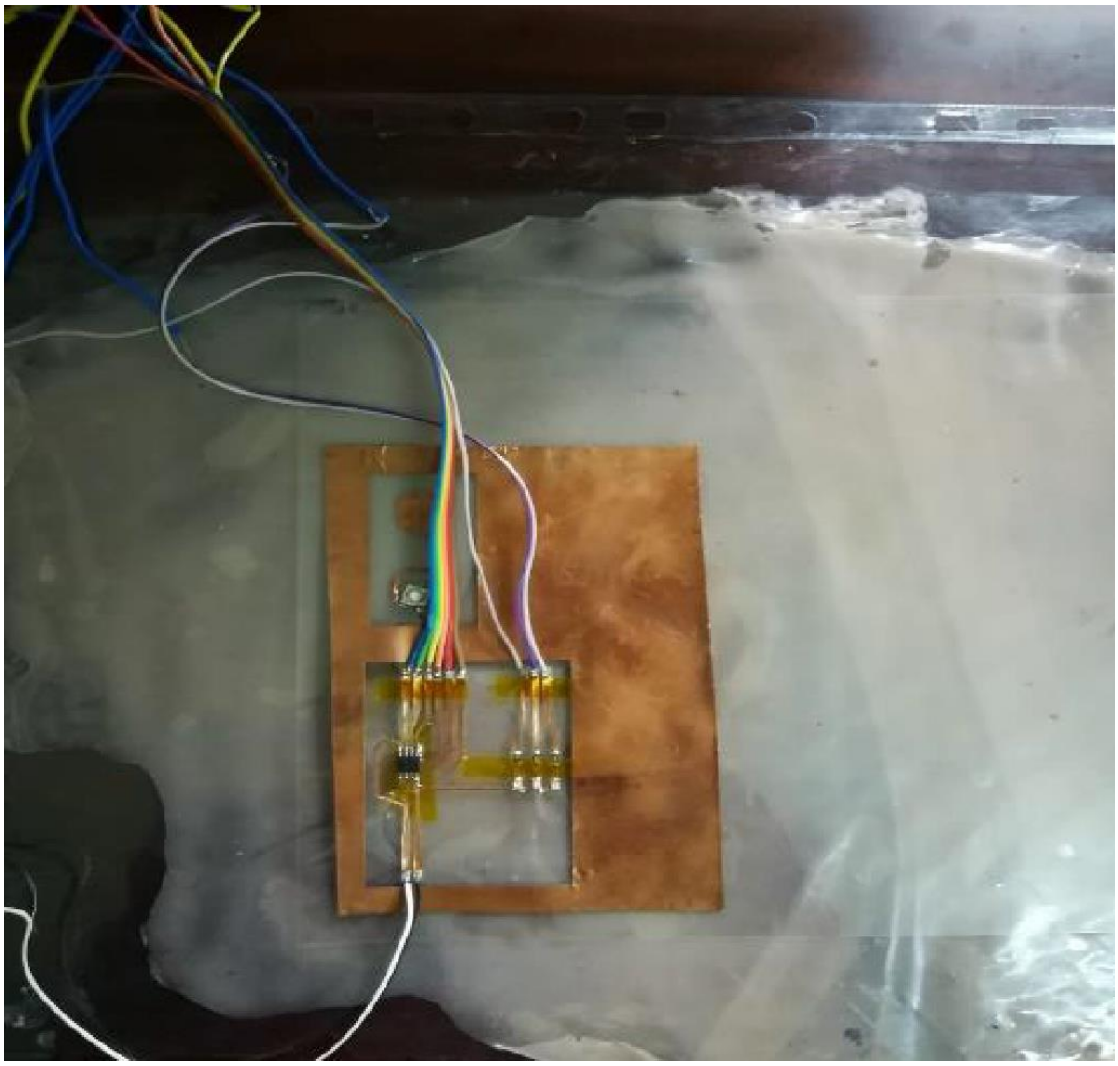


FIGURE 7. Artificial Skin along with processor and sensor circuit

4.4 Mechanical structure and hardware design of Exoskeleton

The mechanical structure of the exoskeleton is designed using high torque motors with geared mechanisms. Figure 8 shows the subject controlling the internal part of the exoskeleton using his thoughts. This part of the exoskeleton will be encapsulated inside the designed 3D model. The 3D model along with artificial skin gives the exoskeleton the aesthetics and functionality similar to the human body part. Figure 9 displays the PCB of the control unit and associated circuits which control all the movements of exoskeleton. Driver circuits are designed to provide enough current to activate the high torque motors and actuators. The output of the sensors integrated in the artificial skin is connected to the control unit. The PCB of the control unit,

driver circuits and sensor circuit will be embedded inside the exoskeleton module. After powering up, the microcontroller waits for human command, based on the detected posture, the microcontroller activates the corresponding motor rotations. Then the microcontroller scans the sensor value to validate if the applied activation signal is sufficient to make the exoskeleton stable. According to the sensor value, alterations will be made on the excitation signal. Thus using an adaptive mechanism, the system improves the stability and reduces the errors. The sensors are also utilized for providing a sense of touch. The pressure sensors accept the external force on the skin surface, converting it into vibrations with the aid of a control unit. The vibrations produced on the affected body part are proportional to the applied force. These vibrations or sense of touch also assist in the rehabilitation process. Testing and validation of the hardware design are done using different human controlled movements in the online and offline phase.

FIGURE 8.Controlling the outer structure of exoskeleton using EEG headset

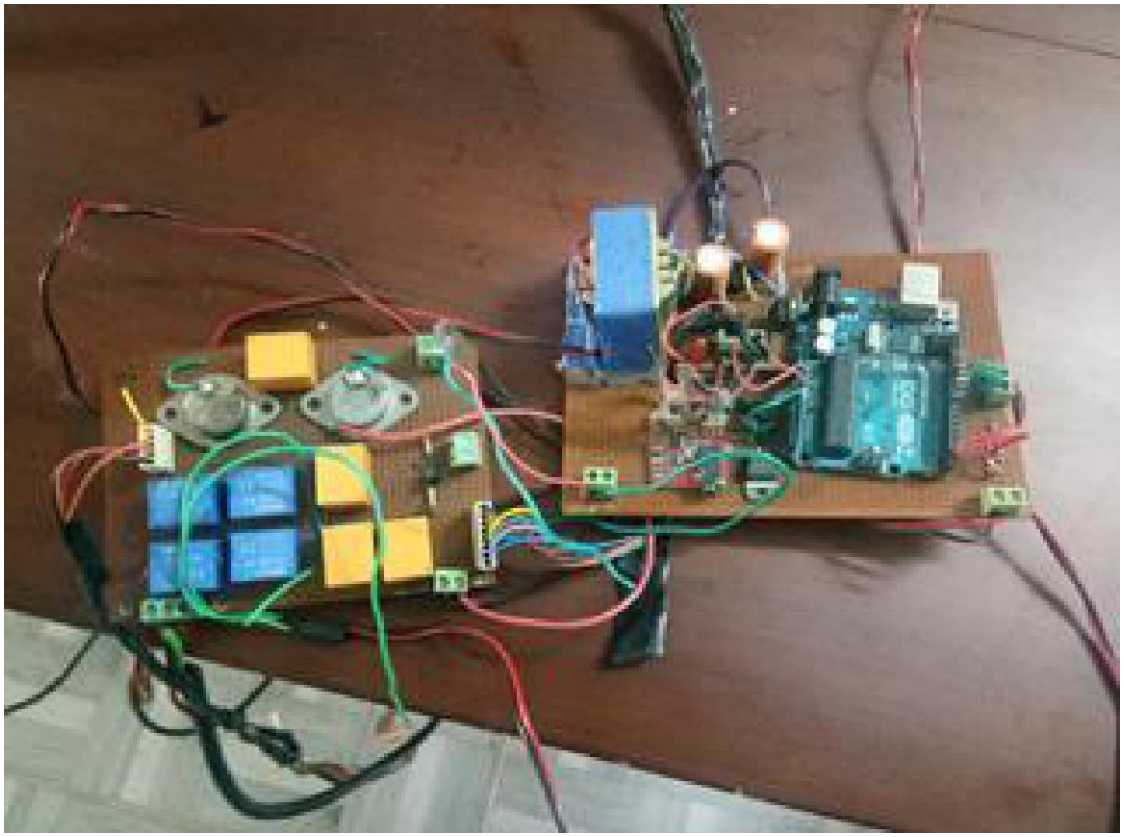


FIGURE 9.PCB of microcontroller and its associated driver

4.4 Results of EEG patterns using Realistic Head models

EEG analysis is carried out using realistic Head models to identify the unique EEG signal features and to validate the brain network connectivity. EEG signal is acquired by 16 electrodes placed in the frontal and parietal regions of the Brain. Figure 10 indicates the electrode placement scheme followed in the experimentation. The electrodes E12, E5, E13, E6, and E7 are placed in the parietal region and remaining in the frontal region, as shown in Figure 10. The power spectral analysis is carried out for each electrode used in the signal acquisition, Figure 11 indicates the brain patterns variations at different frequencies based on power spectral density. The brain signal analysis using realistic head models is carried out for different human intentions and on a variety of healthy and unhealthy subjects with repeated trials. Figure 12 depicts the realistic head models with active and non-active region variations

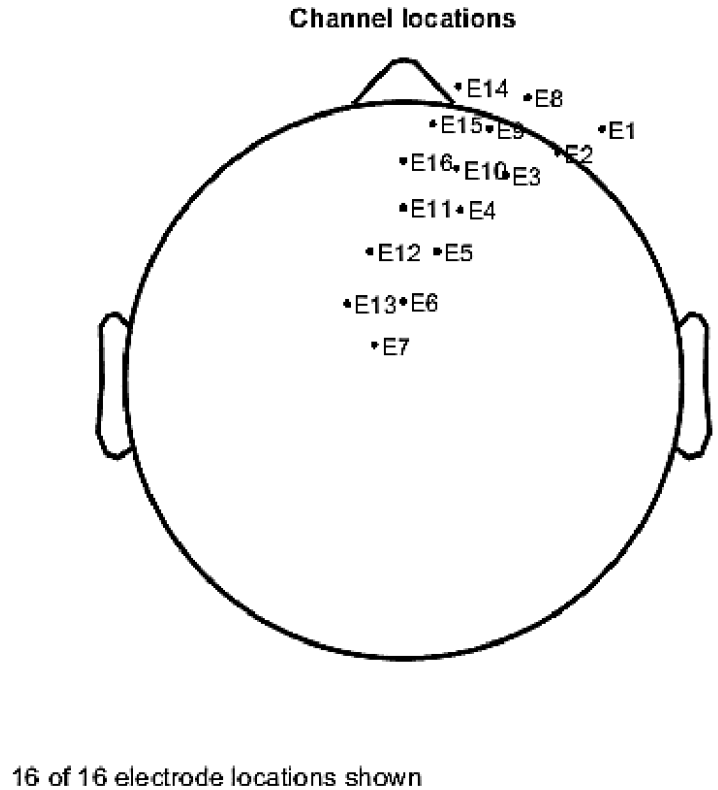


FIGURE 10. Location of 16 different electrodes

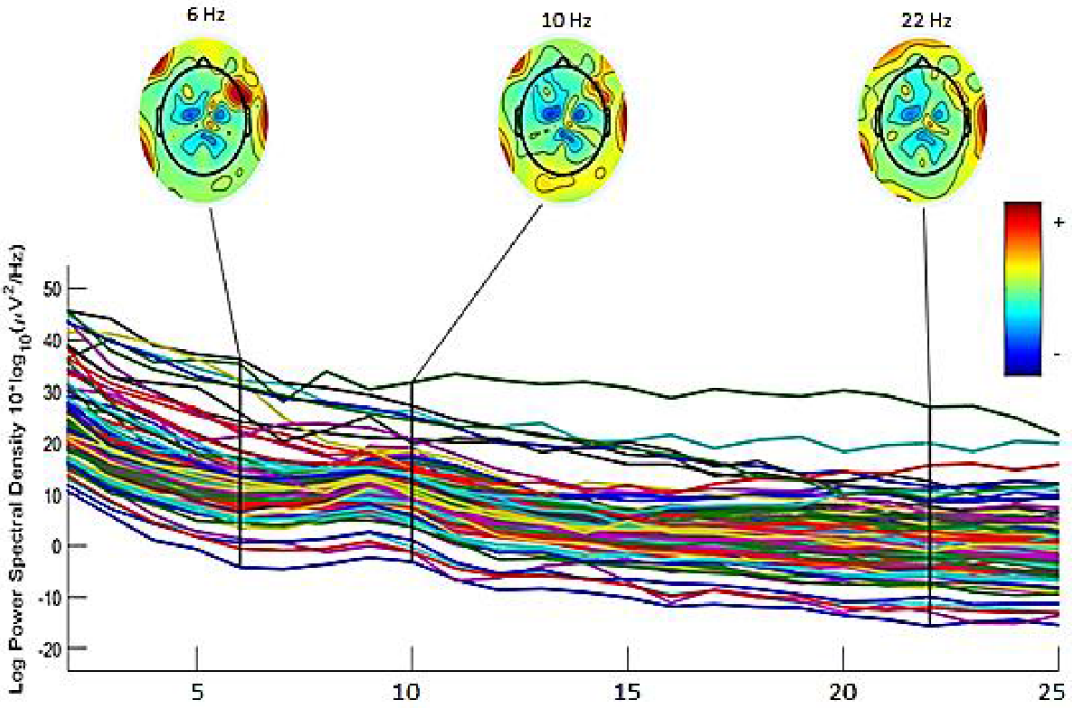


FIGURE 11. Brain pattern variations at different frequencies

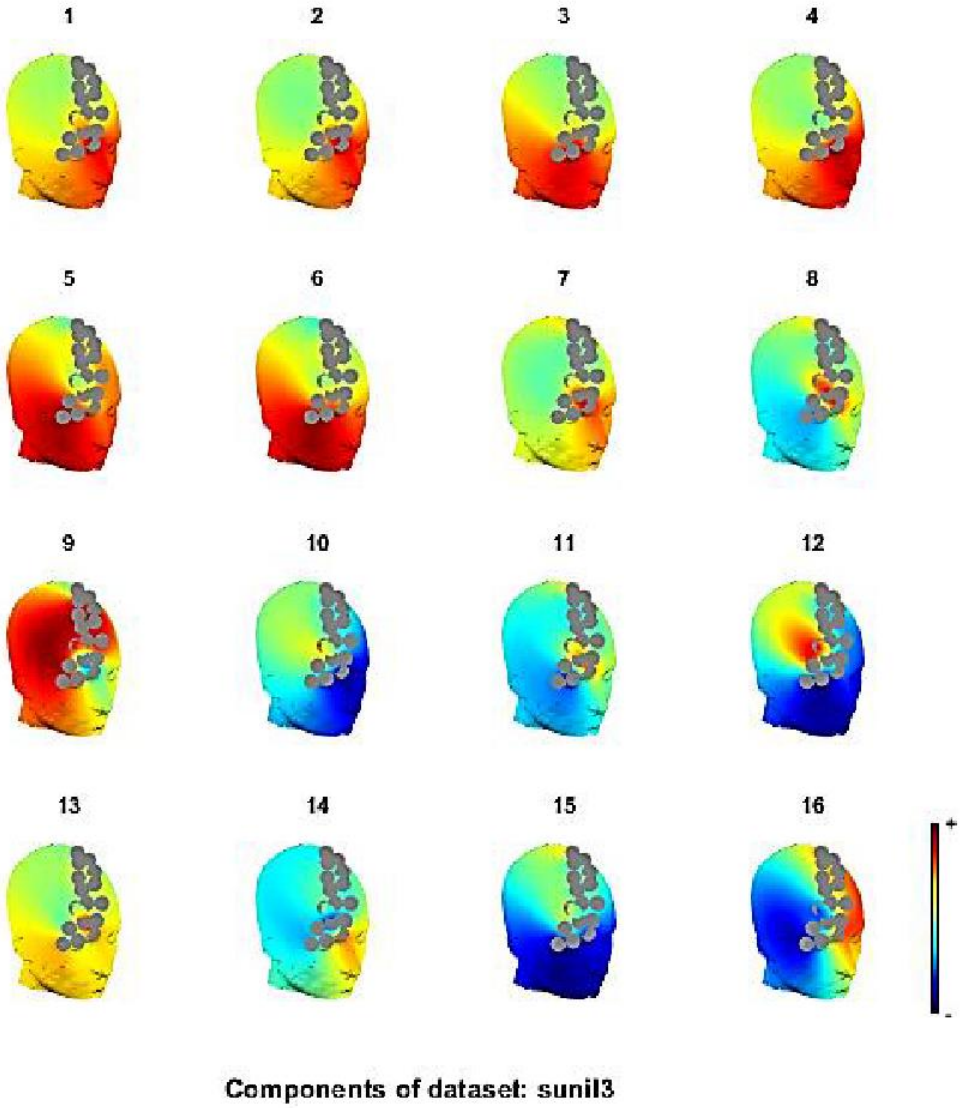


FIGURE 12. Realistic head model with active region

4.5 AMIDL Acquisition and stimulation process

The muscle stimulation module receives the data using a wireless module. The received data is converted into muscle movements or stimulation using muscle inspired algorithms stored in Arduino along with the TENS device interfaced to it. The output of the TENS is connected to the EMG electrode through EMG shield to activate the affected upper limb movements. The EMG shield helps to customize the stimuli produced by the TENS device. The entire assembly used for acquisition and stimulation is depicted in figure 13. Signal undergoes further pre-processing and filtering to reduce the high frequency noise. Frequency domain conversion of the signal is done by using WHT transform and a finite sample is selected using window technique. The design uses a microcontroller in the acquisition and muscle stimulation module. The microcontrollers communicate with each other using Bluetooth technology. Bluetooth is

selected because the short distance between modules and data rate required is less than 1mbps. EEG sensors and other electronic circuits are interfaced to the microcontroller to design the PCB. Figure 14 shows the electronic assembly used in our experimentation.

Figure 13. Acquisition and stimulation process

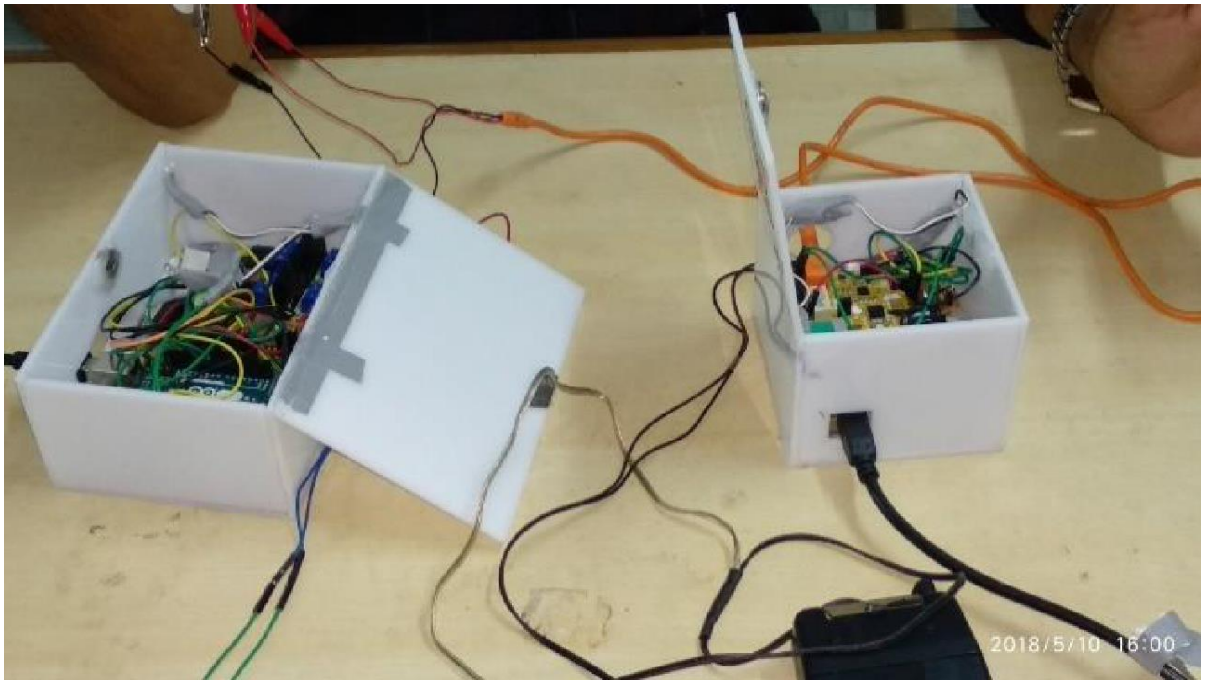


Figure 4. PCB designed for the experimentation

5. Publications

The publications in refereed journals are:

1) Artificial Muscle Intelligence System with Deep Learning for Post-Stroke Assistance and Rehabilitation, published in IEEE Access Journal, ISSN: 2169-3536, DOI: 10.1109/ACCESS.2019.2941491, Page(s): 133463 – 133473, https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8839118 - Impact Factor – 4.098 indexed with SCIE & Scopus Clarivate Analytics

2) Artificial Intelligence Powered EEG-EMG Electrodes for Assisting the Paralyzed, published in IEEE Future Directions, published on September 2019, https://cmte.ieee.org/futuredirections/tech-policy-ethics/september-2019/artificialintelligence-powered-eeg-emg-electrodes-for-assisting-paralyzed/

3) Brain-Controlled Adaptive Lower Limb Exoskeleton for Rehabilitation of Post-Stroke Paralyzed, published in IEEE Access Journal, ISSN: 2169-3536, DOI: 10.1109/ACCESS.2019.2921375 , Page(s): 132628 – 132648, https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8732331 - Impact Factor – 4.098 indexed with SCIE & Scopus Clarivate Analytics

4) Secure thought transfer and processing using Novel-T algorithm, Basic & Clinical Pharmacology & Toxicology (ISSN: 1742-7843),Volume 123, Issue S3, 2018, https://onlinelibrary.wiley.com/doi/full/10.1111/bcpt.13100 No.6

5) Hybrid brain actuated muscle interface for the physically disabled, Basic & Clinical Pharmacology & Toxicology (ISSN: 1742-7843),Volume 123, Issue S3, 2018, https://onlinelibrary.wiley.com/doi/full/10.1111/bcpt.13100 No.10

6) Secure Brain to Brain Communication with Edge Computing for Assisting Post-Stroke Paralyzed Patients, IEEE Internet of Things Journal (Early Access), DOI: 10.1109/JIOT.2019.2951405, 05 November 2019, https://ieeexplore.ieee.org/document/8891712

6. Patents

Patents published

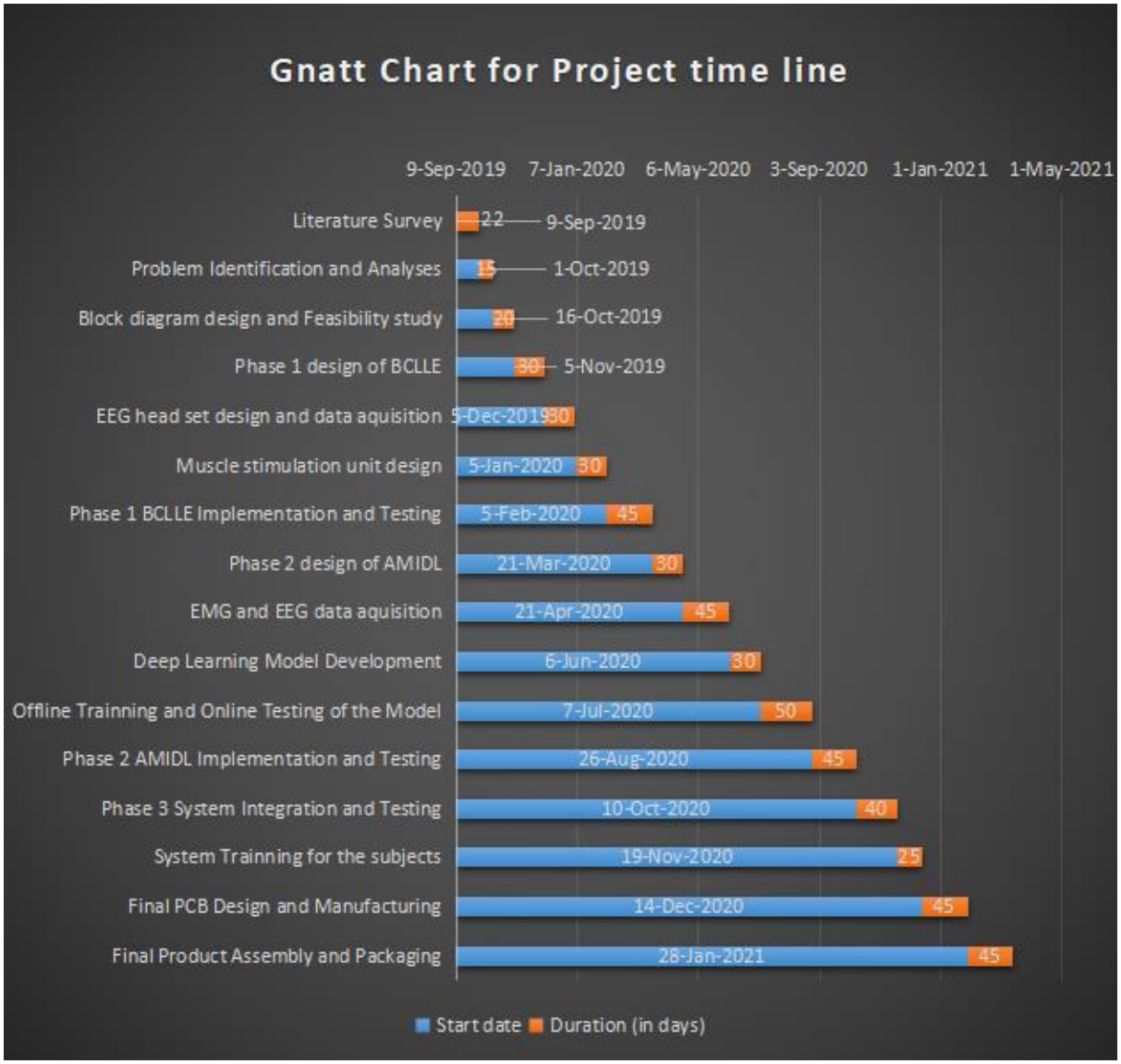
1) The patent published in the version and application of the concept I am attaching the link http://ipindiaservices.gov.in/PatentSearch/PatentSearch//ViewApplicationStatus Application No: 201841042113

2)http://ipindiaservices.gov.in/PatentSearch/PatentSearch//ViewApplicationStatus Application No: 201841042115

7. Conclusions/Project Status

As per the timeline of the project,we have completed the implementation of BCCLE.Online and offline testing of the BCLLE on six different subjects was carried out.WH Transform is utilized for feature extraction and reconstruction. The results obtained indicate that it produces good classification accuracy. The SSVEP method is incorporated using a visual interface,

which improves human concentration. The healthy and paralyzed subjects were able to control the exoskeleton for different movements such as backward movement, forward movement, Sitting, Standing, Turn Left and Turn Right. The sensory feedback was implemented using angle sensors and rescue assistance is provided using accelerometers. The adaptive mechanism used helped to reduce the false rate of the system. The secure message transmission is established using NTSA encryption, which helps the caregiver to know the status of the paralyzed. In phase 2 of the work we will be integrating artificial muscle intelligence to the system. The timeline of the project implementations are listed in the Gantt chart below



Payment Summary

[100750] The transaction with reference ID 511712516 is processed successfully.

Step 1: Payment Details | Step 2: Preview and Confirm | Step 3: Summary

Payment details

General Transaction Details:

Reference ID:	511712516	Transaction Type:	Funds Transfer Third Party Account
Transaction Reference Name:	SSET		
Pay From Account:	VINOJ P G	Beneficiary Type:	Personal Payees
Sender's Account:	588802010007430	Beneficiary's Account:	345801010030000
Beneficiary Nickname:	SSET KARUKUTTY	Amount:	INR 200,000.00
Payment Date (dd/MM/yyyy):	16/03/2021		
Remarks:	Gyti fund for purchase	Transaction Status:	Success

Amount & Frequency Details:

Total Payable Amount:	INR 200,000.00		
Transaction Currency:	INR	Frequency Type:	One Time

Download Details As PDF →

Make Another Payment

Favorites

Select your favorite activity

Select

Add to Favorites

Navigate to...

- Approve/Modify/Delet...
- Account Summary

Payment Summary

[100750] The transaction with reference ID 512203542 is processed successfully.

Step 1: Payment Details | Step 2: Preview and Confirm | Step 3: Summary

Payment details

General Transaction Details:

Reference ID:	512203542	Transaction Type:	Funds Transfer Third Party Account
Transaction Reference Name:	GyTI Fund for purchase		
Pay From Account:	VINOJ P G	Beneficiary Type:	Personal Payees
Sender's Account:	588802010007430	Beneficiary's Account:	345801010030000
Beneficiary Nickname:	SSET KARUKUTTY	Amount:	INR 295,000.00
Payment Date (dd/MM/yyyy):	20/03/2021		
Remarks:	Gyti project fund	Transaction Status:	Success

Amount & Frequency Details:

Total Payable Amount:	INR 295,000.00		
Transaction Currency:	INR	Frequency Type:	One Time

Favorites

Select your favorite activity

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Add to Favorites

Navigate to...

- Approve/Modify/Delete ...
- Account Summary

SULTANATE OF OMAN
MINISTRY OF MANPOWER
Directorate General for Technological Education

سلطنة عمان
وزارة القوى العاملة
المديرية العامة للتعليم التقني

الكلية التقنية العليا
Higher College of Technology

No. الرقم :
DATE: التاريخ :
DATE: الموافق :

To

Dr. Sunil Jacob,

Director, SCMS Centre for Robotics

SCMS School of Engineering and Technology

Ernakulum, Kerala, India

Sub: Research collaboration on the funded project from The Research Council, Oman

Date: 07th July 2020

Dear Dr.Sunil Jacob,

Greetings!

The Higher College of Technology (HCT) is founded in 1984, with an objective to enrich the Omani youth with the knowledge and skills to encounter daily challenges at the work place. It is considered to be the second largest higher education institution in Oman, catering for almost 12,200 students studying in various programs.

As part of the Covid-19 Research Program initiated by the Research Council Oman, our department received a funded project titled "Prediction, Analysis and Smart Mask based on Social distancing system"(TRC/CRP/HCT/COVID-19/20/06). Dr. Abraham Varghese is the Principal Investigator of the project.

In this regard, we would like to have collaboration with your institution for making the Smart Mask with the attached specifications in your lab. The work needs to be completed on or before October 15, 2020. The cost incurred for purchasing the components for the device will be met from the project fund.

Expecting your reply at the earliest,

Dr.Huda Salim Al Shuaily,

HoD, Department of IT,

Higher College of Technology,

Muscat, Sultanate of Oman

ص.ب : ٧٤ ، الرمز البريدي: ١٣٣ الخوير ، سلطنة عمان ، هاتف : ٢٤٤٧٣٦٠٠ ، فاكس : ٢٤٤٧٣٦١١ ، الموقع على الإنترنت: www.hct.edu.om
P.O. Box : 74 Al-Khuwair , Postal Code : 133 , Sultanate of Oman, Tel. : 24473600, Fax: 24473611, Website : www.hct.edu.om

The specification of the model is as follows:-

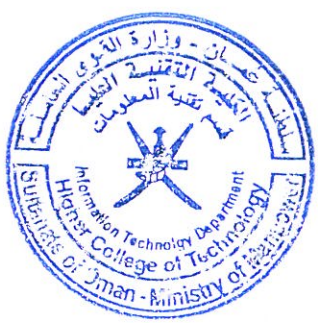
Low Spec Model/ Base Model: A wearable/handheld model, which helps the user to analyze the temperature of the other person, with whom the user is interacting.

- Uses 1D thermal sensor to capture thermal signature.
- It acquires spectral signature from a single point of target.
- Portable and cost-effective.
- Can operate on microcontroller unit.

An additional simple proximity-sensing feature is made as an add-on for the users; wearing it helps to alert the user to maintain a safe distance.

High Spec Model/ Advanced Model: It is designed for using in airports, hospitals/healthcare teams or by police officers helping them to screen the crowd or people, looking for individuals with chances for COVID-19 infection, based on their body temperature. Alert the officials when it detects an individual having abnormal temperature.

- Uses 2D MEMS thermal array sensor to capture thermal signature data like a camera.
- It acquires cluster of spectral data not a single point.
- Can be used during both day & night.
- Exclusively functioning based on thermal spectrum and not on ambient light.
- Portable and cost-effective.



1) **Were all the features mentioned in the objectives eventually implemented?**
Ans—Yes, all the features mentioned in the phase 1 objective was implemented successfully
2) **what features make it smart?**
Ans—The Smart mask is due to its non-invasive temperature detecting and distance calculation capability. The Audio and Visual indicator for the detection of temperature and social distancing range. The replacing and reusing capability of the mask make it smart
3) **What is the materials used to make the mask, why they were chosen?**
Ans—The mask is made up of Acrylic sheet of 6 mm thickness. It will provide good strength and durability to the design. The strap used to hold the map is made up of rexine material which can be washed and sanitised. The materials used were FDA approved
4) **Which sensors were used and what they measure, accuracy level, collected data,**
Ans—The controller we have used is Arduino Nano.
Usage--This is a controller board to which all the sensors were connected and controlled
Specifications and accuracy level
ATmega168 Microcontroller ATmega168 is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. And its features as follow: • High Performance, Low Power Atmel®AVR® 8-Bit Microcontroller Family • Advanced RISC Architecture o 131 Powerful Instructions o Most Single Clock Cycle Execution o 32 x 8 General Purpose Working Registers o Fully Static Operation o Up to 20 MIPS Throughput at 20MHz o On-chip 2-cycle Multiplier • High Endurance Non-volatile Memory Segments o 4K/8K/16KBytes of In-System Self-Programmable Flash Program Memory o 256/512/512Bytes EEPROM o 512/1K/1KBytes Internal SRAM o Write/Erase Cycles: 10,000 Flash/100,000 EEPROM o Data Retention: 20 years at 85°C/100 years at 25°C o Optional Boot Code Section with Independent Lock Bits • In-System Programming by On-chip Boot Program • True Read-While-Write Operation o Programming Lock for Software Security • Atmel® QTouch® Library Support o Capacitive Touch Buttons, Sliders and Wheels o QTouch and QMatrix® Acquisition o Up to 64 sense channels • Peripheral Features o Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode o One 16-bit Timer/Counter

with Separate Prescaler, Compare Mode, and Capture Mode o Real Time Counter with Separate Oscillator o Six PWM Channels o 8-channel 10-bit ADC in TQFP and QFN/MLF package • Temperature Measurement o 6-channel 10-bit ADC in PDIP Package

The Long-Distance Infrared Temperature Sensor GYMLX-90614-DCI

Usage— It is used to measure the temperature of the person from the distance of 1meter.

Specifications and accuracy level

Long distance infrared temperature sensor module small angle high precision GY-906-DCI

Chip:MLX90614-DC

Power supply:3-5V(internal low pressure differential)

Communication mode: standard IIC communication protocol

High quality heavy gold PCB

Size: 11.5 * 16.5 mm

The Distance Sensor Ultrasonic Sensor Module HCSR04

Usage—This is used to measure the distance of the person communicating with the master

Specifications and accuracy level

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules include ultrasonic transmitters, receiver and control circuit. The basic principle of work: (1) Using IO trigger for at least 10us high level signal, (2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. (3) IF the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time×velocity of sound (340M/S) / 2.

5) **How heavy it is**

Ans—The total weight of the mask including\g the chargeable battery will comes to around 250 to 300 Grams. The tolerance of 50 Grams depend on the weight of the battery used. It may vary within 50Gram

6) **The, how practical and convenient it is to wear it**

Ans—The mask is light weight and compact which can be suitable to any head size. The adjustable head strap will enable us to do the same.

7) **Any practical demonstrations of using it by healthcare staff,**

Ans—The video of its usage by health care staff of sunrise hospital is attached and they find it very comfortable and satisfactory

8) **Have you contacted any companies and tried to commercialize it?**

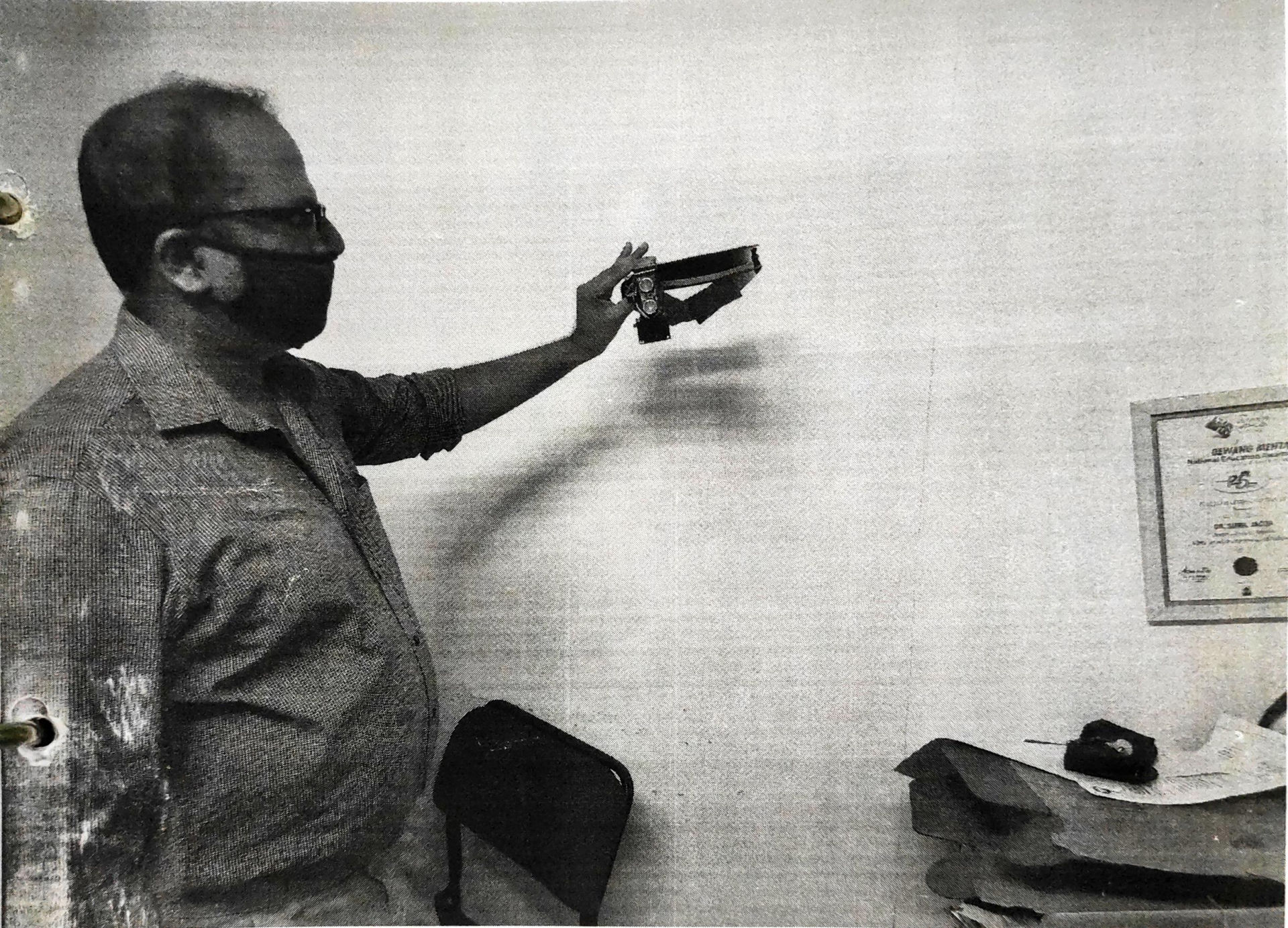
Ans—We are in the process of applying patent for it we will contact the mask manufacturing companies like 3M soon.

9) **Its limitations**

Ans—It is battery operated we must supply power supply of 5V. Though we are using a rechargeable battery to overcome it still we must charge it occasionally.

Though it is completely concealed, when we have to sanitise the mask it will be safe to dismantled concealed electronics part.

Thank you TRC for your comment and review. Your review has helped us to present the proposal more in deep.



SCMS SCHOOL OF ENGINEERING & TECHNOLOGY

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An ISO 9001:2015 Certified Institution

CAMPUS: VIDYA NAGAR, KARUKUTTY, ERNAKULAM-683576 PHONE: 0484- 2882900, 2450330
E-mail: sset@scmsgroup.org • Website: www.scmsgroup.org/sset

Invoice:SSET/20/394	Date:5.11.2020		Cashier: SUBHA K
Customer: University of Technology & Applied Sciences (Higher College of Technology)			
Item	Quantity	Unit price	Amount (INR with GST)
932-MIKROE-2026	1	4935.25	4935.25
Arduino Mkr1000 Wifi with Headers Mounted	1	3894	3894
726-EVALSHNBV01TOBO1	1	6438.43	6438.43
Pressure Sensor Development tools	1	3209.1	3209.1
MIKROE Development Board Kits-AR	1	2147.34	2147.34
BIC SMD SOLDER 500 GM	1	1100	1676
IR proximity sensor	5	32	
BO2 MOTOR 100 RPM	8	80.5	
FLAT CABLE L-200MM M/M	20	2.5	
FLAT CABLE L-200MM M/F	20	2.5	
FLAT CABLE L-200MM F/F	20	2.5	
SMD IC NE 555	10	5	1185
CON 1PIN RMC MALE TO FEMALE B	20	**70**	
BOD ENCODER/DECODER	6	**1350**	
XTL 433MHZ RF MODULE RED	6	**1200**	
WHL SMALL CASTER WHEEL	3	**90**	
BOD BREAD BOARD MINI	8	**360**	
TAP INSULATION TAPE	6	**60**	
MOT BO MOTOR L TYPE T/W B	10	**750**	
TYR BO OT TYRE YELLOW	10	**400**	5050
Cloth printing	1	**360**	360

.....2

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E-mail: sset@scmsgroup.org • Website: www.scmsgroup.org/sset

OLED DISPLAY	1	950	1300
ARDUINO NANO	1	350	
NANO	1	350	380
B2	1	20	
SNUP	1	10	
LONG DISTANCE IR TEMPERATURE SENSOR GY-MLX90614-DCI	2	7200	17153
ARDUINO NANO	2	350	700
BELT	2	400	400
Acrylic Sheet			1000
Machine Running Cost			3000
Prototyping and Coding			19172
Design			40000
Transportation			2031
Total			114031 INR (600 OMR)

Amount chargeable (in words)
Rial Omani Six hundred only

Total: 600
Cash: 600
Balance 0

Dr. PRAVEENSAL C.J
PRINCIPAL

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E-mail: sset@scmsgroup.org • Website: www.scmsgroup.org/sset

SSET/20

5th November, 2020

The Head of the Department
(Information Technology)
Higher College of Technology
Muscat, Oman

Madam,

We have successfully developed Smart Mask based social distancing system funded by your esteemed institution. The details of the expenses towards the completion of the project is attached.

Thanking you,

Yours faithfully

Dr. PRAVEENSAL C.J
PRINCIPAL

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY * ERNAKULAM 683 582 *

यूनियन बैंक Union Bank

आन्ध्रा Andhra

Statement of Account

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY EDUCATIONAL INSTIT

C/O. SCMS SCHOOL OF ENGINEERING & T

SCMS CAMPUS, PRATHAP

NAGAR, MUTTOM, ALUVG

City	
State	KERALA
Country	INDIA
Zip	683106
Mobile No	918589054713
E-mail	SUBHA@SCMSGROUP.ORG

Union Bank of India

Branch	PALISSERY
Customer Id	137305091
Account No	345801010030000
Account Currency	INR
Account Type	Current Account

Statement Date : 11/09/2020 10:15

Records from 1 to 112. No more records available.

Statement Period From -10/09/2020 To 11/09/2020

10/09/2020	MOBFT from GOKUL SURESH/025416286601	S95183379	-		60,000.00	1,46,54,147.51
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10/09/2020	UPIAB/025416837940/CR/SHINY VA/UBIN/engineeringstu	S95360330	-		200.00	1,46,54,547.51
10/09/2020	NEFT ATOM TECHNOLOGIES NODAL ACCOUNT N25420124133	S95431139	Sender No:N2542012413 38130		2,26,920.00	1,48,81,467.51
10/09/2020	NEFT M O MANPOWER N254201241198867	S95459738	Sender No:N2542012411 98867		1,14,031.13	1,49,95,498.64
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10/09/2020	UPIAB/025417140211/CR/Ms. SALINI DIB/salini0025@oks	S95519350	-		200.00	1,49,95,898.64
10/09/2020	MOBFT from JITHIN THOMAS/025417360067	S95598748	-		1,000.00	1,49,96,898.64
10/09/2020	UPIAB/025417752779/CR/BINDU C/FDRL/ghs16manjapra@	S95653619	-		1,200.00	1,49,98,098.64
10/09/2020	UPIAB/025468806033/CR/MINAYA C/UBIN/9605404386@ybl	S95787992	-		200.00	1,49,98,298.64
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10/09/2020	NEFT Mr ABHILASH SATHIAN C SBIN220254235360	S96450929	Sender No:SBIN2202542 35360		200.00	1,50,01,498.64
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10/09/2020	UPIAB/025420136051/CR/MR JOSHUA/DIB/joshuajoll112	S96739712	-		400.00	1,50,04,898.64
10/09/2020	UPIAB/025420690335/CR/SOHAN J/SBIN/sohanjames33@	S96747515	-		400.00	1,50,05,298.64

Annex 2

Contract for Acquisition of Research Services (CARS)

By signature of authority identified at (11) below, DRDO hereby contracts on the Research Service Provider identified at (3), the provision of the Research Services described at (6), within the time stated at (8), for payments at (9.2), and subject to other conditions overleaf, as follows :

1	Short title of Research Service to be provided: **Design and Analysis of Hydrodynamic Depressor** in response to :					Contract Number: NPOL/21CR 0007/OE/GN/LP Date: 12/02/2021
2.	RSQR Document Ref. No. NPOL/E/GH/7100	Date of Issue YY: 20 MM: 08 DD: 12			Issuing DRDO Lab/Estt/Project NPOL,KOCHI	Dates of CARS Amendments
3.	Name & address of Research Service Provider (RSP) : Ajithkumar R Department of Mechanical Engineering, SCMS School of Engineering and Technology, Vidyanagar, Karukutty, Ernakulam- 683576, Kerala				4. RSP's Offer Ref. letter Date	
5.	(a) This contract will require a formal amendment if the following key professionals are not available to RSP : (b) RSP is authorized to engage these professionals as research consultants (names, institutes/companies):					
6.	Principal technical features of Research Service to be provided (Detailed in Attachment A) The project will lead to design of three variants of hydrodynamic depressors based on hydrodynamic and structural analyses. Based on the design, realization of depressors can be achieved through industry.					
7.	DRDO will make available the following DRDO-owned equipment to RSP (Detailed in Attachment B) NIL					
8.	The tech performance of this contract shall be complete when RSP submits the Final Report before (date):					
9.	1. Expenditure on items below shall not exceed sums shown against each					Rs.
	a) Personnel					7,14,000
	b) Equipment					-
	c) Others					2,14,200
					Total ➢	9,28,200
9.	2. Schedule of payments (Rs. in lakhs)				Date	Payment *
	(a) Initial advance					2,784,60
	(b) at Performance Milestone I					2,78,460
	(c) at performance Milestone II					2,78,460
	(d) at performance Milestone III and submission of Final Report (Refer also entry 8 above)					92,820
	* Payments will be made within 45 days of receipt by L/E/P of Contingent Bill				Total ➢	9,28,200

10.	DRDO will deem this contract, including amendments thereto, to have been consummated when signed below by the authority of the academic institution (e.g. Registrar) competent to enter into this contract [Sign overseal] Name Designation	11.	Signature of L/E/P contract administrator: Name Designation Address Telephone: Email:

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY KARUKUTTY ERNAKULAM 683 582

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

Dr. REJI JOHN
Scientist
Government of India, Ministry of Defence
Defence Research & Development Organisation
Naval Physical & Oceanographic Laboratory
Thrikkakara, Kochi-682 021

Conditions of this contract appear on reverse. Please read them.

2018-19

MERIN MATHEW <merinmathew@scmsgroup.org>

NEFT Details from Rotary Club of Cochin.

1 message

rotarycochin2013 cochin <rotarycochin2013@gmail.com> Sat, Jun 30, 2018 at 1:39 PM
To: merinmathew@scmsgroup.org
Cc: Susheel Aswani <aswani.susheel@gmail.com>, Raveendra Krishnan <rkrishnan0123@gmail.com>, Shweta V <shweta.rotary@gmail.com>

Dear Ms. Merin Mathew,

Ref: Your e-mail dt. 29-6-2018.

This is to bring to your notice that today we have transferred an amount of Rs. 20,000/-. The NEFT details are attached.

Please confirm.

Thanks

Rotary Club of cochin
Rotary Balbhavan
Panampilly Nagasr
Cochin - 682036.

NEFT details to SCMS.jpg
422K

Counter foil

State Bank of India

Branch .... Purgar

Date 30/6/18

Received ₹ 20000/-

From .. RCC

For remittance of NEFT/RTGS by way of (i) Transfer (only NEFT), (ii) Cash (only NEFT), (iii) Cheque (NEFT/RTGS) using

cheque No. 403109

favouring .. SCMS School of Engineering and Technology

A/c No. .. 345801010030000

IFSC Code .. UBIN 0558885

Beneficiary Bank & Branch .. Union Bank of India Passis pallissery Br

Amount ₹ 20000

Bank's Charges ₹ 5.90

Total ₹ 2000 5.90

(Rupees ....

.... Only)

For office Use

UTR No. .... Branch Manager

SBIN 818181719581

Envelope ID: 50CAA36A-D9CC-4687-5F7B-136346001F88

IEEE SIGHT

Special Interest Group on
Humanitarian Technology

Date: 30-Jul-2019

To: Dr. Sunil Jacob <suniljacob@scmsgroup.org>
IEEE Kerala Section SIGHT Group

On behalf of the IEEE SIGHT Steering Committee: ***Congratulations!*** The IEEE SIGHT Steering Committee, a committee of the IEEE Humanitarian Activities Committee, has approved a grant of **US $2,953.00** for the project named **"Smart Switching Toilet with urine diversion system for Flood Region" (19-SPC2-01)**. Our offer of this grant is subject to your agreement to:

1. Use the grant funds only as specified in the approved grant proposal.
2. Maintain your records to show and account for the uses of grant funds and retain all original receipts.
3. Allow the IEEE SIGHT Steering Committee access to records to verify grant expenditures and activities.
4. Provide written acknowledgement of receipt of grant funds.
5. Repay any portion of the funds not used for the specified purposes.
6. Refrain from use of the funds for any purpose prohibited by law.
7. Cooperate with any efforts of the IEEE SIGHT Steering Committee to publicize the grant award.
8. Comply with reasonable requests for information about program activities.
9. Meet terms and conditions specified in the addendum to this letter.

All grants are made in accordance with current and applicable laws and pursuant to the Internal Revenue Service Code and the regulations issued thereunder.

If you agree to these terms, please sign and return one copy of this letter to sight-projects@ieee.org. We appreciate being able to assist in the success of your project.

Sincerely,
Sampathkumar Veeraraghavan
Chair, IEEE SIGHT Steering Committee
A Committee of the IEEE Humanitarian Activities Committee

I certify that I accept the terms outlined in this letter:

Signature: DocuSigned by: Sunil Jacob 770164E271EE42F...

Printed Name: Sunil Jacob

Title: Director SCMS Centre for Robotics and Prof ECE Dept

Date: 2019-07-31

Project name:

Smart Switching Toilet with urine diversion system for Flood Region

Recently Kerala experienced a devastating flood that affected more than half the population of Kerala. Hence our project focuses on eliminating the problems of latrine facility during these times. We intend on creating a sustainable sanitation facility in which a four layered filter system along with separate tanks to collect faeces and urine.
The project can be introduced in the flood prone areas as well as congested areas like cities where providing individual septic tanks is not feasible.

The idea is to create sanitation facility that can be used continuously during and after flood. It can provide increased pit life using filtration system.

Phase-1

The idea is to create sanitation facility that can be used continuously during and after flood. It can provide increase pit life. It is assisted by desludging pump for automated cleaning of the composite faeces pit.

Working and Implementation

The design is basically a raised pit latrine. The cement and sand is used to coat the raised plinth.

The latrine is having two chambers with one roof and two pits. Each chamber is having three partitions. The first partition is to collect the urine the centre partition is to collect the faeces and the third partition is for washing. The washing partition and the urine partition are connected. The centre partition is connected to the urine partition while flushing. Again, as the flush tank is filling the water slowly the sliding system will open. It is ready to use.

The excreta are decomposed by adding clay or lime.

The separation of urine from excreta will increase the life of the pit. It will allow the excreta to decompose fast.

The valve is connected to the basin. If the water level is more the valve will get open to the tank created for the flood.

If the water level decreases the valve will get open in the normal septic tank.

Plan to Implementation

It occupies less space and can be shared with different houses. The heighted area can be the appropriate site for the implementation of it. The project can be pushed through the Flood control NGO and Sanitary society.

Scope for the improvement

The pit can be improved by connecting parallel connection and collection pit. The septic tank covering can be made of transparent glass to penetrate the sunlight for the fast decomposition of the excreta.

Phase-2

Phase-2 is friendlier to the women than phase-1. Phase 2 is an add on feature of phase-1.

Working and implementation

Design of smart toilet is same as that of the ordinary toilet except for the waste disposal mechanism. There are two partitions at the base. One for faeces and other for urine and flush water collection. Separation of waste is done by filtering mechanism. The separation of urine from excreta will increase the life of the pit. It will allow the excreta to decompose fast.

There are four layers of filtration. Here instead of flush handle we are using a flush puller. When we pull the flush puller, the beam connecting the filter will move to the first partition and turns 90 degree. Thus the faeces that collected in the filters will be collect at the base part of the first partition. When the flush puller goes to the resting position flush water will come and clean the filters. This will prevent the clogging. Thus there will be no overflow during the flood.

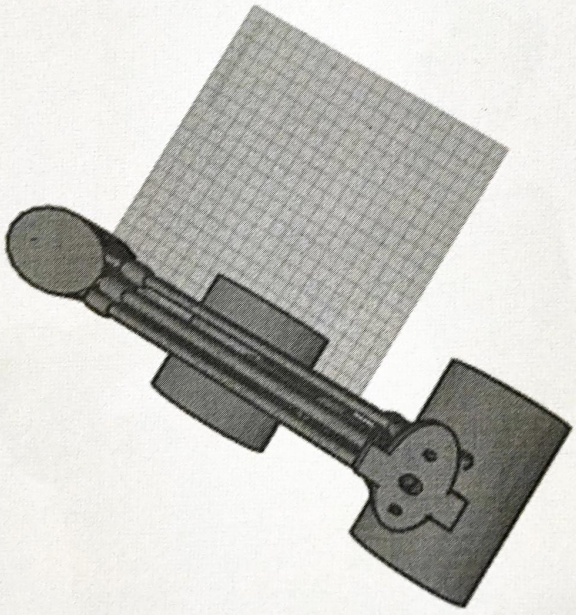
Scope for improvement

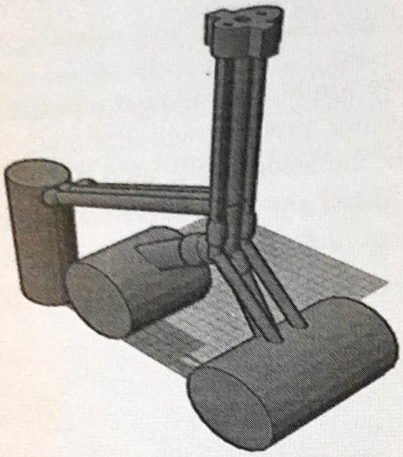
We wish to extend our design so as to make it more handicap friendly. We wish to incorporate a self-raising toilet seats to make it easier for age old people. The waste material so obtained is sent to a biogas plant as a means of sustainable power generation and the water collected from it will recycle and use for other purposes like irrigation of gardens.

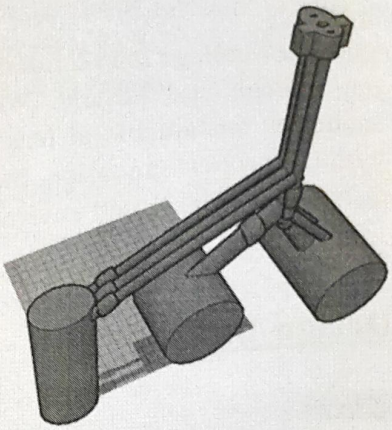
Goals

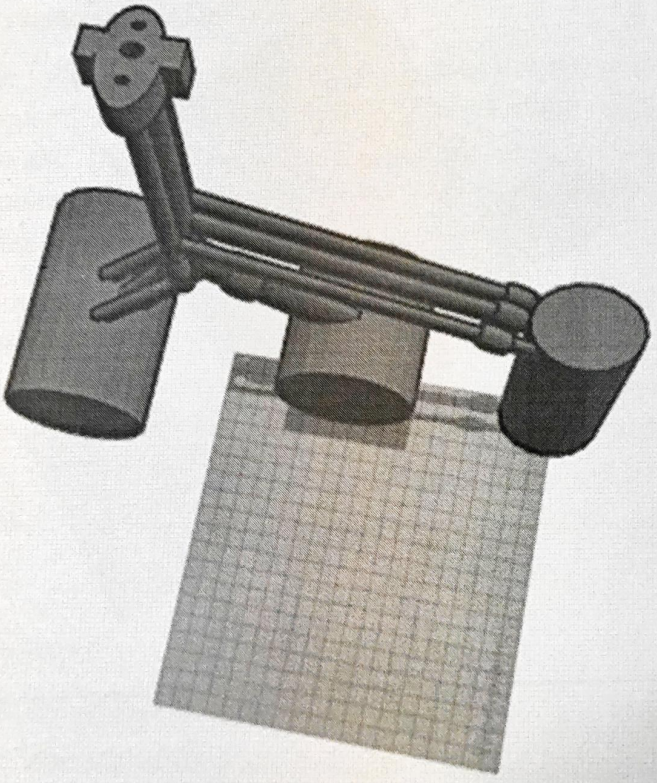
Since our college is in a flood prone area, we would like to initiate the design in our college and hostels. We expect that our product will definitely make sanitation sustainable at least for people in the flood prone area. Even homes without proper sanitation facilities may install our product as we intend to provide affordable and environment friendly toilets.

Design-phase1

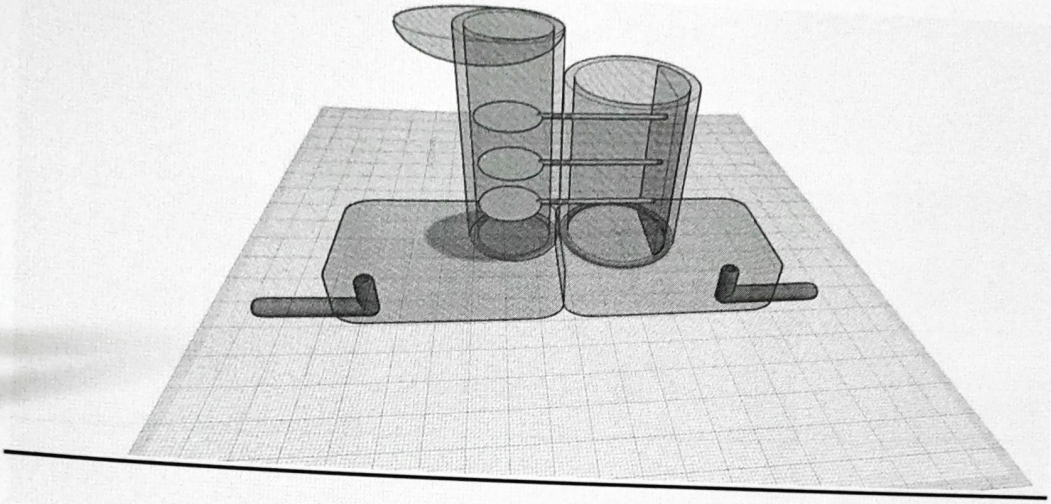


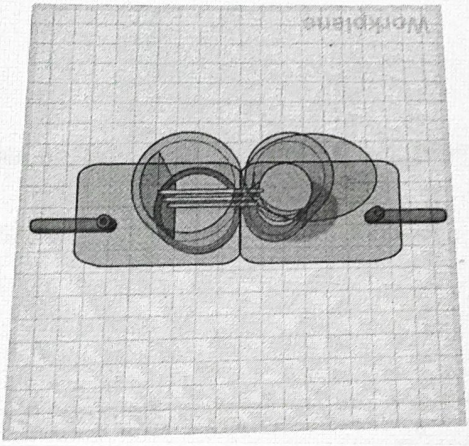


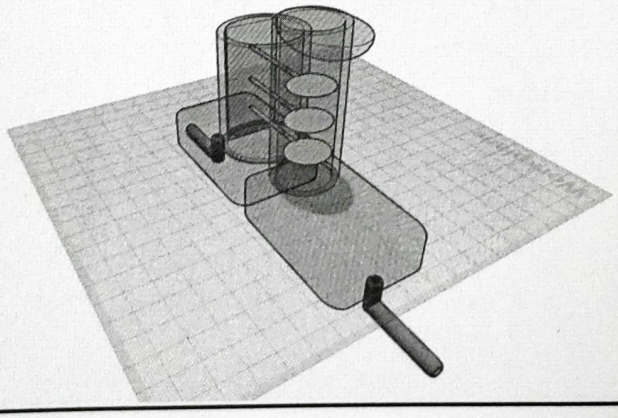


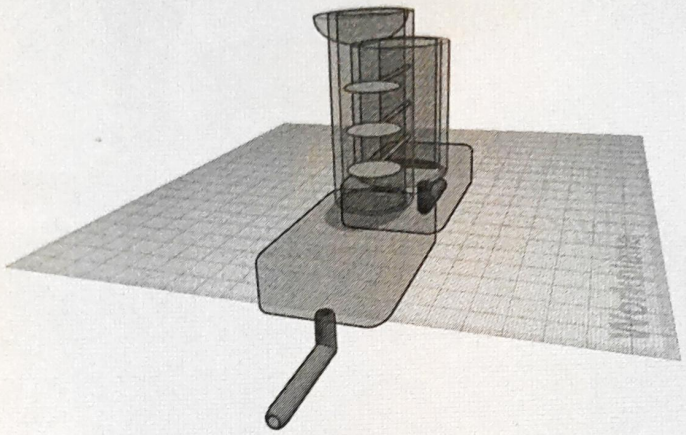


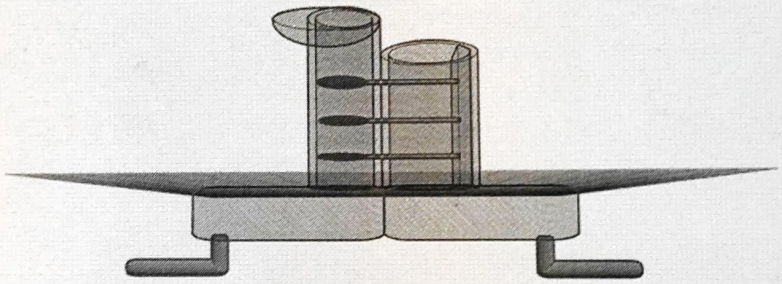
Design-phase2











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IEEE SIGHT

Special Interest Group on Humanitarian Technology

Intellectual Property Policy

Prepared for: **"Smart Switching Toilet with urine diversion system for Flood Region"** (the "Project")

Reference number: **19-SPC2-01**

Grants provided by IEEE SIGHT Steering Committee ("SSC"), a committee of the IEEE Humanitarian Activities Committee ("HAC") may result in the creation of intellectual property ("Grant IP") by the grant funds recipient (the "Grantee"). Grantee and IEEE SIGHT Steering Committee agree to work together to protect and distribute the Grant IP in order to achieve the goals of the Project and for the benefit of humanity.

A. The Grantee shall own all rights in any Grant IP created during the Project. All costs involved in obtaining and maintaining legal protection of Grant IP shall be borne by the Grantee.

B. Grantee will take all reasonable steps to protect the Grant IP and will coordinate with the SSC to ensure the Grant IP is not abused or infringed upon by any third parties.

C. Grantee will take all reasonable steps to make the Grant IP available under license to interested parties in a manner that is consistent with each of IEEE's mission, not-for-profit status and intellectual property policies.

D. The Grantee agrees to grant a worldwide, perpetual, irrevocable and royalty-free license to SSC and HAC to continue to use, reproduce and distribute the Grant IP.

E. The Grantee shall disclose to SSC any Grant IP that is developed during the Project and provide any additional reports or information that may be requested by IEEE SIGHT Steering Committee in IEEE.

F. IEEE is committed to advancing technology for the benefit of humanity and the Grantee understands and agrees that the Grant IP should be used to advance IEEE's mission. Where possible, the Grant IP will be distributed in an open and expedited manner at a rate comparable to the means of production.

G. If immediate release of the Grant IP is impracticable or imprudent given the subject matter of the Project, Grantee will work with SSC to create reasonable restriction periods or limit the distribution channels. Grantee agrees to widely distribute the Grant IP as soon as it becomes practicable to do so. Grantees will take all reasonable steps to determine the best way to distribute the Grant IP in order to allow for maximum impact and dissemination.

H. Grantee shall use its best efforts to ensure that the Grant IP is not used to inhibit the development of additional projects by others organizations or individuals.

By signing below, the Grantee certifies that he/she is a representative of the Project and accepts the terms outlined in this Intellectual Property Policy.

I certify that I accept the terms outlined in this letter:

Signature: DocuSigned by: Sunil Jacob 770164E271EE42F...

Printed Name: Sunil Jacob

Title: Director SCMS Centre for Robotics and Prof ECE Dept

Date: 2019-07-31

ign Envelope ID: 50[illegible]9CC-4B87-9F7B-13634[illegible]F88

5. Equipment

Title to equipment purchased shall be vested in the grantee with the understanding that the equipment will be used for the Project, or similar activities, for which it was obtained.

6. Reversion of Grant Funds

The grantee will return to the IEEE SIGHT Steering Committee any portion of the funds not used for the specified purposes at the close of the grant period. Funds also will be promptly returned if the IEEE SIGHT Steering Committee determines that the grantee has not performed in accordance with the Award Letter or has not met the specific grant conditions of the Project and its supporting budget.

7. Special Conditions

Project lead will ensure that every participant in the Project signs (i) the **Waiver and Release of Liability Form** and (ii) the **Publicity Release Form** prior to participating in the Project. The grantee will sign the **Intellectual Property Policy** prior to receiving the grant funds and undertaking any work on the Project. The Project lead will keep a copy of all signed documents and submit them to the IEEE SIGHT Steering Committee together with the first and final reports.

8. Grant Renewal

Unless otherwise stipulated in writing, this grant is made with the understanding that the IEEE SIGHT Steering Committee has no obligation to provide other or additional support to the grantee.

9. Legal Compliance

The grantee currently complies and will comply with all state and federal laws and regulations, including laws concerning civil and human rights, and will ensure that the Project will be free of any discrimination based on race, color, national origin, physical disability, religion, gender, or age.

Initials: DS Sunil Jacob

Envelope ID: 50CA

Addendum to Award Letter for
"Smart Switching Toilet with urine diversion system for Flood Region"
(the "Project")

Grant Reference number: #19-SPC2-01
Please refer to this number in all communications regarding this grant.

1. Publicity
The grantee shall mention that the Project is sponsored by IEEE SIGHT (the "Sponsorship") in all press releases, news conferences and other media contacts concerning the Project. All materials developed or published by the Project, including brochures, announcements, flyers, manuals and reports, shall mention the Sponsorship. The grantee shall send to the IEEE SIGHT Steering Committee copies of all publicity regarding the grant, including print media and information materials that are related to the Project. Copies of the IEEE SIGHT logo suitable for reproduction are included for your convenience.

2. Accounting
The grantee is responsible for the expenditure of the grant funds and for maintaining adequate supporting records consistent with generally accepted accounting procedures.

3. Reports
A complete project and financial report for the Project must be provided within sixty (60) days after the completion of the grant period based on the below schedule. Biannual reports are to be provided every 6 months for any Project lasting longer than 6 months.

Beginning Date	Ending Date	Interim Report Due Date	Final Report Due Date
01-Sep-2019	*31-Aug-2020*	*01-Mar-2020*	*31-Oct-2020* *or 60 days after Actual Completion Date.*

SIGHT may occasionally reach out to you for updates throughout the term of the project; likewise, SIGHT welcomes periodic updates, including pictures and/or videos, as you have available.

4. Payment Schedule
Unless otherwise agreed in writing by IEEE SIGHT Steering Committee, the grant award shall be paid as indicated below:

- **US $2,953.00 will be transferred to IEEE Kerala Section account for disbursement to this project.**

The grant award shall be paid to the grantee after the IEEE SIGHT Steering Committee receives an executed copy of the Grant Award Letter.

Initials DS Sunil Jacob

IEEE SIGHT

Special Interest Group on Humanitarian Technology

IEEE SIGHT 2019 Funded Project Assessment Report

Instructions: SIGHT has provided you with a copy of your original project application. Please refer to this as you fill out the assessment report below.

- If nothing has changed from the original application, you may leave the response field blank.
- All questions in **red* require a response.
- Please provide photos and links to videos, when available, to supplement your answers.
- You may also answer a question in the form of a video. If you choose to do so, please provide a link to the file.

I. Project Information

Name of Project:	Smart Switching Toilet with urine diversion system for Flood Region
Which SIGHT group are you affiliated with?	IEEE Kerala Section SIGHT
Current Status of Project	**Complete** **Completion month and year: November 2020**

Executive Summary of Project	*Please summarize what, if anything, changed from your proposal in 2019.* Design of smart toilet is same as that of the ordinary toilet except for the waste disposal mechanism. There are two partitions at the base. One for urine and flush water collection and other for faeces collection. Separation of waste is done by filtering mechanism. In conventional sanitation system a huge amount of fresh water is used as a transport medium and a sink for dispose of both liquid and solid waste all together. Here a small amount of human faeces is diluted with a huge amount of water. Therefore, a large portion

of fresh water is contaminated and deemed unfit for other purposes. In the case of heavy rains and flood the sceptic tank may fill with water through the lid or by rising ground water around the inlet or outlet or the drain field may become saturated and unable to drain. Water entering the tank, or the saturated drain field may cause sewage to backup into home depending on the elevation of the sceptic system relative to the lowest drain or toilets and the sceptic tank waste may get mixed with the pure ground water. Safe disposal of human waste is essential to protect health of the mankind. This calls for a proper sanitation system which is put forth by the proposed model. Nothing changed from our proposal in 2019

II. Proposal Focus

1. **Need Addressed.** *Please summarize what, if anything, changed from your proposal in 2019. Did your assessment of the problem change over the course of the project?*

. Nothing changed from our proposal in 2019

2. **Overall project objectives.** *Please provide a list of clear, measurable objectives and how their relevance to the beneficiary community was validated. What, if anything, changed from your proposal?*

The proposed model considers an Indian toilet system. It has three holes within it. First one is for passing the urine, second one is for human faeces and third one is for the wastewater to flow. Apart from the septic tank which is present in the existing system this system uses two more additional tanks, which are placed at a level above the level of septic tank. One of the tanks is connected to the faeces hole. It is meant to collect the solid wastes. The other tank is connected to the two remaining holes from which it stores the liquid waste. Each tank is connected to the toilet with separate tubes and each tube is having internal valve within it to control the unidirectional flow. The separation between solid and liquid waste ensures faster decomposition. Separation of waste is done by filtering mechanism. The separation of urine from excreta will increase the life of the pit. It will allow the excreta to decompose fast. The valve is connected to the basin. If the water level is more the valve will get open to the tank meant for the flood time. When the water level decreases the valve will get opened to the normal septic tank.

During the floods and the heavy rains ground water rises at a rate higher than normal. When the water rises above the septic tank, it may leak into it filling the septic tank. This is blocked by a unidirectional valve fitted in the tube connecting the septic tank. At the same time the valves in the tubes of other tanks is opened. This facilitates the flow of human waste into these two tanks. The liquid waste flows into the liquid tank via pipes and faeces moves to the solid waste tank. In order to separate between solid and liquid when the flush is used. An internal flap system closes the pipe

connecting to the faeces tank and is redirected to the liquid tank via pipe. Nothing changed from our proposal in 2019

3. *Did you achieve your expected objectives? Did everything go as planned? What happened differently than you expected? Please elaborate.*

A major portion of electricity in Kerala is from hydroelectric power from the dams. Kerala climate, being monsoon, the dams are mostly at full capacity. As a caution sometimes the dam shutters are opened based on estimated rainfall. Adding this to the monsoon climate, chances of flood are more. Recently Kerala experienced a devastating flood that affected more than half the population of Kerala. Hence the proposal focuses on eliminating the problems of latrine facility during these times. We intend on creating a sustainable sanitation facility. The project can be introduced in the flood prone areas as well as congested areas like cities where providing individual septic tanks is not feasible.

One of the main problems faced during flood was the overflow of the septic wastes into the surface. Water supply and sanitation condition become severely disrupted during the flood and it embraces various water borne to several bacterial and viral diseases. During every flood about two thirds of wells and other water resources and all toilets become unstable. Our project idea aims towards a solution for the above stated problem. Nothing changed from our proposal in 2019

4. **Alignment with Objectives of IEEE SIGHT & Sustainable Development Goals (SDGs).** *Please summarize what, if anything, changed from your proposal.*

Our Project is well in accordance with the Objectives of IEEE SIGHT and Sustainable Goal 6 clean water and sanitation.
The concept will help the sanitation to be waterproof.
The waste can be eventually collected and sent to a bio-gas plant for production of energy.
This satisfies the goal of Affordable and Clean Energy. Using a 4 layered filter to filter out the waste, we ensure a clean water and sanitation. In conclusion, we assure a sustainable and leveraged sanitation facility. . Nothing changed from our proposal in 2019

III. End-user Engagement

1. **Beneficiary community**. *Please summarize what, if anything, changed from your proposal.*

Kerala recently experienced an outrageous flood which affected more than half the people. Contaminated wells, drainage system failures, epidemic outbreaks, deterioration of water quality, made the situation worse. So, we aim to put forward a

smart switching toilet that would benefit all those people affected. Nothing changed from our proposal in 2019

2. **Community engagement during proposal concept development.** *Please summarize what, if anything, changed from your proposal.*

The project be pushed through the Karukutty Gram Panchayat and National Service Scheme unit SCMS School of Engineering and technology NSS Flood control NGO and Sanitary society. The concern letter from both the society is attached in the supplementary file. The prototype on completion will be implemented through the Karukutty Grama Panchayat, Angamaly, Kerala, India and NSS unit. It will be implemented with the involvement and support of Karukutty community affected with flood. The community will provide us with concrete carpenter expert. The identification of the location and areas where the smart toilet has to be installed and the existing toilet which has to be converted into smart toilet will be done with the help of community. The community civil and Environment Engineer will help us in testing and validating the structure, The NSS will support us to implement in all over kerala and the same technology can be transferred to the different flood effected countries around the world.
This project for sure, will be a great invention in the field of rural development. We understand it is our duty to ensure that the impact of our project has a very wide outreach. As an initial step, we intend to distribute our design to every family in the flood prone area through the panchayat and National Service Scheme (NSS) cell. Nothing changed from our proposal in 2019

3. **Role of stakeholders in implementation.** *How did stakeholders contribute to the implementation of this project? Now that the SIGHT team has finished project execution, how will local community members and stakeholders sustain project impacts? Please summarize how sustainable the project has proven to be or not. Include information on any challenges faced in this regard.*

We would ensure that our stake holders are socially responsible, and we will try our best to avail our design to the deserved ones at the most reasonable price. The NSS will lead the project implementation throughout the state. The concern letter is attached for your reference. Nothing changed from our proposal in 2019

IV. Expected Impact & Sustainability of Project Outcomes

1. **Impact on target communities.** *List the metrics you used to measure the impact of your project. Did these metrics best capture the impact of your project? If not, what information would you have collected instead? What, if anything, changed from your proposal?*

We expect that our product will make sanitation sustainable at least for people in the flood prone area. Even homes without proper sanitation facilities may install our product as we intend to provide an affordable and environment friendly toilets. Nothing changed from our proposal in 2019

2. **Sustainability of project components.** *Is this project financially sustainable past the SIGHT grant period? If so, did you receive funding from other sources to continue the project? Or does the project generate revenue to cover operational costs?*

Yes the project was financially sustainable

3. **Project outputs and contribution to long-term outcomes**. *Please summarize what, if anything, changed from your proposal, dividing outcomes into short, mid, and long-term. NOTE: Outputs = quantitative summary of an activity, deliverables such as technology/prototype(s) developed or installed, trainings imparted, partnerships created, etc. Outcomes = consequences and conditions that occur as a result of the change that outputs measure.*

	Project Outputs	*Short-term outcomes*	*Mid-term outcomes*	*Long-term outcomes*
Example	*Two toilet system for flood prone region*	*Parallelly both can be used*	*More Such toilet can be replicated in high range region to help the low range people effected with flood*	*Since Kerala has large number of water reservoirs, there are high chances of recurring floods. The prototype can be used in the condition of flooding and non-flooding. Once it is installed there is no maintenance, as it is an automated system. project is designed additionally for the flood prone areas. The community will have*

				perfect sanitation system a the time of flood. The community labor will be more employable. The system will help to improve the environment condition better sanitation facility. We can minimize the spreading of disease. Our aim i s the healthy and best sanitation for flood prone areas.

4. **Plan for measuring project outcomes.** *Please summarize how you measured short and/or mid-term project outcomes, and how you plan to evaluate long-term outcomes.*

We plan to constantly obtain feedback and make the relevant updates making the product more user friendly. We would suggest the partner panchayats in our project to take the relevant promotional steps to increase the reach of the product and make it easily available. The student volunteer will be taking the feedback of the people using the facility both at the time of flooding and non-flooding. The report will be formed based on the feedback and survey, which in the future will be used as a measuring bench mark.

5. **Potential for replicating or scaling project outcomes**. *What potential (if any) is there to replicate or scale project outcomes, now that some of them can be observed?*

The suggested improvement is to incorporate a mechanism in this system such that the waste is chemically treated and can be used as manure.
The pit can be improved by connecting parallel connection and collection pit. The septic tank covering can be made of transparent glass to penetrate the sunlight for the fast decomposition of the excreta.
We wish to make it more handicap friendly. We wish to incorporate a self-raising toilet seats to make it easier for age old people. The waste material so obtained is sent to a bio-gas plant as a means of sustainable power generation and the water collected from

it will recycle and use for other purposes like irrigation or gardening.

6. **Proposed technology and relevance to local environment.** *Please summarize what, if anything, changed from your proposal.*

The sanitation system which we propose works on two phases.
Phase 1-
The design is basically a raised pit latrine. The cement and sand is used to coat the raised plinth. The latrine is having two chambers with one roof and two pits. Each chamber is having three partitions. The first partition is to collect the urine the center partition is to collect the faeces and the third partition is for washing. The washing partition and the urine partition are connected. The center partition is connected to the urine partition while flushing. Again, as the flush tank is filling the water slowly the sliding system will open. It is ready to use. The excreta are decomposed by adding clay or lime. The separation of urine from excreta will increase the life of the pit. It will allow the excreta to decompose fast. The valve is connected to the basin. If the water level is more the valve will get open to the tank created for the flood. If the water level decreases the valve will get open in the normal septic tank.
Phase 2-
Phase-2 is friendlier to the women than phase-1. Phase 2 is an add on feature of phase-1.
Design of smart toilet is same as that of the ordinary toilet except for the waste disposal mechanism. There are two partitions at the base. One for fāeces and other for urine and flush water collection. Separation of waste is done by filtering mechanism. The separation of urine from excreta will increase the life of the pit. It will allow the excreta to decompose fast. There are four layers of filtration. Here instead of flush handle we are using a flush puller. When we pull the flush puller, the beam connecting the filter will move to the first partition and turns 90 degree. Thus the faeces that collected in
the filters will be collected at the base part of the first partition. When the flush puller goes to the resting position flush water will come and clean the filters. This will prevent the clogging. Thus there will be no overflow during the flood. Nothing changed from our proposal in 2019

7. **Dissemination of achievements and lessons learnt.** *Please summarize how you disseminated or are disseminating achievements and lessons learned. Include links to articles, papers, videos, etc.*

Since our college is in a flood prone area, we would like to initiate the design in our college and hostels. Once proved successful, we would extend the idea to nearby localities and institutions through the panchayat. The project can be pushed through

the Flood control NGO and Sanitary society.

8. **Implementing team.** *Please list the implementing team members, if different from the team listed in the proposal.*

	# involved in implementing the project	Names, if known	IEEE Member Numbers, if applicable
IEEE Members	A team of five headed by Mehaja P Ibrahim undergraduate students of SCMS School of Engineering and Technology are the implementing team. We are guided by Dr Sunil Jacob, professor and Director of SCMS Engineering college. The team comprises of Dr Sunny George Director of SCMS water institute and Dr. Ratish Menon. Associate Professor. Specialization: Environmental Engineering. We are the group of Civil and design engineer. Nothing changed from our proposal in 2019		
Representatives of the local community			
Other volunteers outside the local community			
Any who are not otherwise counted above			

V. Project Implementation Plan

1. **Timeline and milestones of project.** *Please describe your actual timeline and milestones achieved for the project.*

The project implementation was divided into six phases.
The Gantt chart is attached as a supplementary file
The number of days to complete the project is 365 days
Phase I
The phase I was completed by 45 days.
In Phase I the survey of the flood prone were taken. IN the recent flood an approximate level of water surge is marked.
The toilet water collector should be above that level.
The site selection for the installation of the toilet is done on the basis of the landscape of that area. The high lying area is selected
Phase II
The phase II was completed by 50 days
In phase II the dimension and design of the toilet was done. The community civil Engineer has given the dimension
and design. The stability of the design was checked and the approval for the same was taken from Karukutty Gram Panchayat. The foundation for the toilet was done depending on the design.
Phase III
The phase III took 60 days
In phase III The structure of the toilet was build. The concrete carpentry work was completed include laying of the brick and plastering it. The windows and the door was installed. The flooring of the toilet room was done.
Phase IV
The phase IV took 65 days
In phase IV the pipeline and fitting of the toilet was done. The pipeline and electrical connection was carried out.
The pipeline from the main pipeline connection was taken
The electrical wiring from the mains was taken the power plug was installed. The power supply is 230 V with 50 Hz. The light and exhaust fan was fitted.
Phase V
The phase V took 70 days
In phase V the fabrication and installation of the toilet was done.
The toilet seat, Flush tank and the flipping mechanism was implemented. It was connected to pipeline and septic tank.
Phase VI
The phase VI took 70 days
In phase VI the inspection and validation with the help of community environmental and civil Engineer was done. To get the sanction of the approval from the
expert committee for using the toilet. The testing is done in two phases In phase 1 the ground water level surrounding the toilet is less compared to the septic-tank.
It will work as normal toilet. In phase 2 the ground water level is increased above the

Septic-tank. The flap should close the normal tank and the waterproof tank mechanism should be activated. If in both the phases the toilet work fine, the testing and validation process is successful.
Nothing changed from our proposal in 2019

2. **Risk analysis and contingency planning.** *Did you encounter these risks? If yes, how did you respond? What other risks, if any, did you encounter?*

The risk involved is minimal in our project. We are committed to getting it on the market. Our team consisting SCMS graduate's students dedicated solely on the success of this design. As an initial step we intend to implement the design in the flood prone area of the college.
Considering the current scenario (i.e. flood) we are sure that no person affected by the disaster will reject it. We are well motivated in completing this project, Once the prototype is ready a third-party involvement panchayat would be of great help and we appreciate the contribution.

VI. Budget

1. **Budget.** *Please summarize what, if anything, changed from the budget submitted with your proposal. Upload the actual project budget using the template included as an email attachment.*

Nothing changed from our proposal in 2019. Attached the bill of the implementation

VII. Additional Information

1. *Please provide any details on partnerships associated with the work of the project.*

The SCMS NSS unit and Karukutty Gram Panchayat were associated with our work. Already provided in the proposal. Nothing changed from our proposal in 2019

2. *What IEEE organizational units (OUs) are or were involved in the project and what are or were their roles?*

SCMS IEEE SB were involved in the completion of the project. The students have done a commendable work in the development of the structure. I would like to mention at the time of COVID-19 there were the shortage of workers. The IEEE student have

helped us to fill the gap and get it done

3. *What IEEE Societies are most aligned with the technologies deployed in this project?*

SCMS IEEE SB

4. *What unforeseen challenges did you face during project implementation and what are/were your biggest lessons learned in implementing the project?*

The condition of COVID-19 was the unforeseen challenge. We overcome it by taking proper precaution. The delivering of goods was delayed but were able to manage everything on time.

5. *What aspect(s) of the project do you feel was/were the biggest success(es) and why?*

The construction of the toilet was done asper the plan. A full fledge working system we were able to implement.

6. *If the activity is still ongoing, can IEEE members get involved? In what ways and whom should they contact?*

The activity is still ongoing, and they can contact the student branch coordinator at SCMS school of Engineering and Technology

7. *Please provide any other comments you would like to share with the SIGHT Committee.*

Thank you, IEEE SIGHT member, for the wonderful opportunity you have provided to achieve such a noble cause.

VIII. Agreement

Yes, I agree that the information submitted on this final report is accurate and complete.

Yes, I agree that IEEE has permission to use photos, videos, and other materials submitted with this report.

SIGHT Project Budget

Applicant Name: Dr Sunil Jacob
Project Name: Smart Switching Toilet v

Affordability-The local people can easily afford as the cost of building is only required or it can be an exte
The whole karukkuty community is involoved which make the whole process as affordable.

Expenses	Project Expenses:	Total Amount:
Pipes and fittings	4" Diameter PVC Pipes 24m	86$
	6" Diameter PVC Pipes 18 m	80$
	Pipe Fittings	40$
Concrete including cement, aggregtes	Cement bags, aggregtes both fine and coarse for main tank	336$
	Cement bags, aggregtes both fine and coarse for Solid waste only tank	202$
	Cement bags, aggregtes both fine and coarse for liquids only tank	202$
Labour charges	Excavation	60$
	Pipe Fitting	67$
	Concreting	80$
Mechanical Closing of pipes	Includes valves and levers	150$
Windows and Door	Doors Height 80'' and width 28''. Window Height 36'' and width 36''	450$
Electrical Wiring and switches	wire 20 m and two switch board	140$
Tools	Cutting, shovels, trowel, Formwork	60$
Overhead and Transportation	include transportation of furniture pipes and warehouse charges	1000$
		$2,953

Total Expenditure:
Total Sanction Amount
Balance

with urine diversion system for Flood Region

nsion to the existing toilet.

Amount Funded by Outside Sources	Amount funded by SIGHT:	Name of the Company
0$	86$	Prince PVC Pipe
0$	80$	Prince PVC Pipe
0$	40$	Prince PVC Pipe
0$	336$	Jindal Construction
0$	202$	Jindal Construction
0$	202$	Jindal Construction
0$	60$	Jindal Construction
0$	67$	prince PVC pipe
0$	80$	Jindal Construction
0$	150$	Prince PVC pipe
0$	450$	Lowes
0$	140$	Amazone
0$	60$	Jindal Construction
0$	1000$	

$0	**$2,953**
	$2,953
	$0

2017-18

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY

Affiliated to Mahatma Gandhi University, Kottayam and Approved by AICTE, Govt. of India
An ISO 9001:2008 Certified Institution

CORPORATE OFFICE: SCMS CAMPUS, PRATHAP NAGAR, MUTTOM, ALUVA, COCHIN-683 106
Phone: 91-484-2623803 (30 Lines) Fax: 91-484-2623855 E-mail: scms@scmsgroup.org
Website: www.scmsgroup.org

SSET/17/378

17th November ,2017

To,

The Principal,
Union Christian College, Aluva

Dear Sir,

Subject : Invoice for Green Audit conducted at UCC campus.

Please find the enclosed invoice for Green Audit conducted at Union Christian College, Aluva by SCMS Water Institute, SCMS School of Engineering and Technology (SSET), Vidya Nagar, Karukutty, Ernakulam, Kerala.

Yours faithfully,

Prof. M. Madhavan
Principal, SSET

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY KARUKUTTY ERNAKULAM 683 582

CAMPUS: VIDYA NAGAR, KARUKUTTY, ERNAKULAM-683582 PHONE: 0484-2450330, 2451907 FAX: 91-484-2450508
E-mail: sset@scmsgroup.org • Website: www.scmsgroup.org/sset

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Phone: 91-484-2623803 (30 Lines) Fax: 91-484-2623855 E-mail: scms@scmsgroup.org
Website: www.scmsgroup.org

INVOICE

The Principal	Inv. No.	02/2017-18
Union Christian College	Inv.Date	08.11.2017
Aluva - 683102, Kerala, India.		
Description		Amount
Fee for Green Audit conducted for Union Christian College, Aluva		20,000.00
	Total	**20,000.00**
		(Rupees Twenty Thousand Only)
Pan No.AADCP1668B		

Bank Details :

Account Name : SCMS School of Engineering and Technology
Account No : 345801010030000
Bank Name : Union Bank of India
Address : Pallissery Branch, Vidya Nagar, Karukutty , Ernakulam - 683 582
IFS Code : UBIN0558885

For
SCMS Water Institute - SCMS Group of Educational Institutions

Authorised Signatory

Reference number for amount credited:
IR 12204/15.12.2017

MELOOR GRAMAPANCHAYAT

MELOOR P.O, PIN – 680 311
(VIA) CHALAKUDY, THRISSUR DIST
Tel. 0480 – 2739236, 2737599 E-mail: meloorgp@gmail.com

No. A2-1839/15 *Date:* 01-09-2016

To

Dr. Sunny George
Director, SCMS Water Institute
SCMS School of Engineering
Karukutty, Ernakulam Dist

Sir.

Please recall your discussions with the President and other Officials of the Panchayat. As part of the budget 2016-2017, this Panchayat have a project on **"DEVELOPMENT OF A WATER MANAGEMENT PLAN".** We solicit the help of SCMS Water Institute, SCMS School of Engineering for providing Technical Assistance for the same. The amount allocated for this study in Rs. 2 lakhs. You are requested to provide your consent for the same, take up the study and complete the work within this financial year itself.

Thanking you,

SECRETARY
MELOOR GRAMA PANCHAYAT

MELOOR GRAMA PANCHAYATH OFFICE

[redacted]

SBI

Account Name	: PRATHAP FOUNDATION FOR EDUCATION AND TRAININ
Address	: SCMS CAMPUS PRATHAP NAGAR MUTTOM ALUVA COCHIN-683106 Ernakulam
Date	: 18 Feb 2019
Account Number	: 00000030087958094
Account Description	: CA-GEN-PUB-IND-NONRURAL-INR
Branch	: SSI ERNAKULAM
Drawing Power	: 0.00
Interest Rate(% p.a.)	: 12.1
MOD Balance	: 0.00
CIF No.	: 80191162353
IFS Code	: SBIN0005387
MICR Code	: 682002007
Nomination Registered	: No
Balance as on 1 Apr 2018	: [redacted]

Account Statement from 1 Apr 2018 to 30 Sep 2018

Txn Date	Value Date	Description	Ref No./Cheque No.	Debit	Credit
1 Apr 2018	1 Apr 2018	WITHDRAWAL TRANSFER-INT TRF FRM 30087958094 TO 35169867518-	TRANSFER TO 35169867518	6,20,231.00	
4 Apr 2018	4 Apr 2018	CHEQUE DEPOSIT--661096	TRANSFER TO 30553830085 / 661096		1,00,000.00
4 Apr 2018	4 Apr 2018	CHEQUE WDL-WITHDRAWAL TRANSFER BY CHEQUE-326377	TRANSFER FROM 30233979188 / 326377	58,924.00	
5 Apr 2018	5 Apr 2018	CHEQUE WDL-WITHDRAWAL TRANSFER BY CHEQUE-326378	TRANSFER FROM 20011052844 / 326378	9,000.00	
18 Apr 2018	18 Apr 2018	TO TRANSFER-TL- charges recovered-	TRANSFER TO 33658075677	590.00	
30 Apr 2018	30 Apr 2018	BY TRANSFER-NEFT*RBIS0THPA01*U000000405273462*Director of Trea-	TRANSFER FROM 3199676044305		81,664.00
2 May 2018	2 May 2018	CHEQUE WDL-WITHDRAWAL TRANSFER BY CHEQUE-326379	TRANSFER FROM 30233979188 / 326379	58,609.00	
2 May 2018	2 May 2018	CHEQUE DEPOSIT--159892	TRANSFER TO 30087934152 / 159892		10,00,000.00
4 May 2018	4 May 2018	TO TRANSFER-TFR TO INTEREST-	TRANSFER TO 33658075677	4,40,731.00	
4 May 2018	4 May 2018	TO TRANSFER-TFR TO INTEREST-	TRANSFER TO 35169867518	5,96,166.00	
9 May 2018	9 May 2018	BY TRANSFER-INB Notice Period Aswathy EV-	ITR2408595 TRANSFER FROM 32183774794		48,387.00

E4-6667/17

നഗരസഭാ കാര്യാലയം

ഗുരുവായൂർ, 14/06/2017

സെലക്ഷൻ മെമ്മൊ

വിഷയം - ഗുരുവായൂർ നഗരസഭ - എഞ്ചിനീയറിംഗ് വിഭാഗം 2017-18 വർഷത്തെ ബഡ്ജറ്റിൽ ഉൾപ്പെട്ടിട്ടുള്ള ജല ഓഡിറ്റ് നടത്തുന്നത് സംബന്ധിച്ച്

സൂചന - 1. താങ്കളുടെ 18/05/17 ലെ ക്വട്ടേഷൻ

2. 31/5/17 ലെ 15-ാം നമ്പർ കൗൺസിൽ തീരുമാനം

ഗുരുവായൂർ നഗരസഭയിലെ പ്രാദേശിക ജലനയരൂപീകരണത്തിന് ഉതകുന്ന വിധത്തിലുള്ള നഗരസഭ തലത്തിലുള്ള ജല ഓഡിറ്റിന് സൂചന(1) പ്രകാരമുള്ള താങ്കളുടെ 285000/- രൂപയുടെ ക്വട്ടേഷന് സൂചന(2) പ്രകാരം ഭരണാനുമതി ലഭിച്ചിട്ടുള്ളതിനാൽ നഗരസഭയുമായി 200/- രൂപ മുദ്രപത്രത്തിൽ കരാറിൽ ഏർപ്പെടുകയും സെക്രട്ടറിയുടെ പേരിൽ 285000/- രൂപയുടെ 5% തുകയായ 14250/- രൂപയുടെ ഡിഡി ഇ.എം.ഡി ആയി ഉള്ളടക്കം ചെയ്യേണ്ടതുമാണ്.

സെക്രട്ടറി

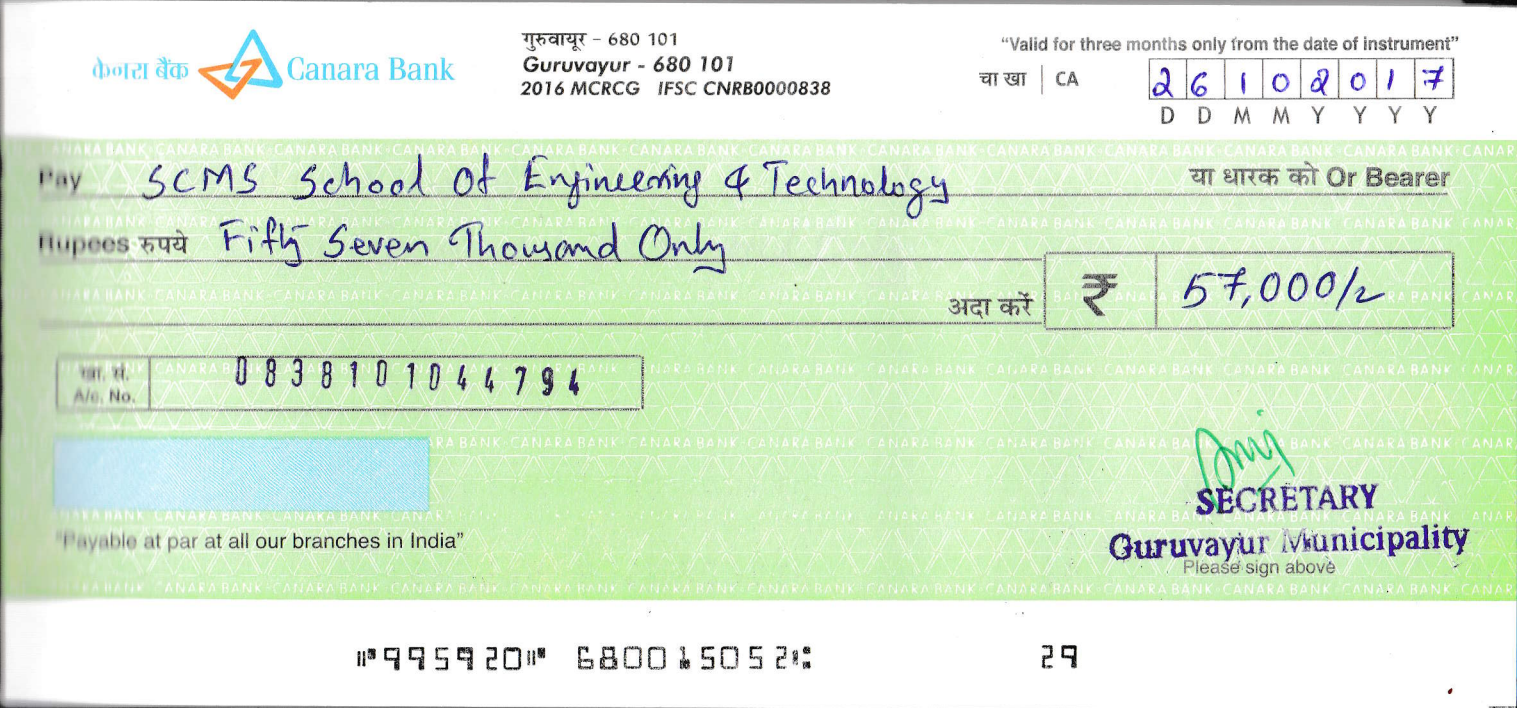
ഗുരുവായൂർ നഗരസഭ

GURUVAYUR MUNICIPAL OFFICE GURUVAYUR

സ്വീകർത്താവ്

M/s.SCMS School of Engineering & Technology

VidyaNagar, Karukutty, Eranakulam – 683 582


केनरा बैंक Canara Bank
गुरुवायूर - 680 101
Guruvayur - 680 101
2016 MCRCG IFSC CNRB0000838
"Valid for three months only from the date of instrument"
चा खा | CA
26102017
D D M M Y Y Y Y
Pay SCMS School Of Engineering & Technology
या धारक को Or Bearer
Rupees रुपये Fifty Seven Thousand Only
अदा करें
₹ 57,000/-
खा. सं. A/c. No.
083810104479 4
"Payable at par at all our branches in India"
SECRETARY
Guruvayur Municipality
Please sign above
"995920" 680016052": 29

गुरुवायूर - 680 101
Guruvayur - 680 101
2018 MCRCR IFSC CNRB0000838

"Valid for three months only from the date of instrument"

चा खा | CA

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Pay M/s SCMS School of Engineering & Technology या धारक को Or Bearer

Rupees रुपये Two lakhs Sixty Seven Thousand and nine hundred only.

अदा करें ₹ 2,67,900/-

खा. सं. A/c. No. 0838 10 10 44794

"Payable at par at all our branches in India"

Please sign above

SECRETARY
Guruvayur Municipality

⑈612927⑈ 680015052⑆ 29

IR. No- 3995
1/7/19.

given on 20/6/19

DD No. 612927/06/06/2019-

2016-17

MERIN MATHEW <merinmathew@scmsgroup.org>

Fwd: Request For STP Design and Plan

1 message

Dr.SUNNY GEORGE <sunnygeorge@scmsgroup.org> Fri, Mar 17, 2017 at 12:32 PM
To: teamsset@scmsgroup.org

Dear Prof Madhavan Sir,

Happy to note that SWI, SSET is getting consultancies for preparing Design, Plan and Estimate for Water Treatment Plants for various prestigious institutions in Kerala. Now we are providing consultancies for:

1. Thiruvalla Medical Mission Nursing College at Thiruvalla- pls see letter attached (which is an 84 year old School of Nursing with its own hospital and has produced the best nursing teachers and professionals around the world and which was elevated to College of Nursing with PG & Research courses in last decade) and another treatment plant for :

2. LEAD Management MBA College in Palakkad.(pls see the next mail).

Just For your kind information...pls

Regards,

Sunny

---------- Forwarded message ----------
From: **Administrator TMM College of Nursing** <administrator@tmmnursingcollege.in>
Date: Fri, Mar 10, 2017 at 4:12 PM
Subject: Request For STP Design and Plan
To: sunnygeorge@scmsgroup.org
Cc: reji sam cherian <rejiparayil@hotmail.com>, Sabu Abraham <sabuabrahamc@gmail.com>

Kindly see the attachment.
Thanks

Abin Abraham

--

Sunny George PhD

Director
SCMS Water Institute
SCMS School of Engineering and Technology
Karukutty, Ernakulam District
Kerala-683582, India
Telephone: +91 484 2439 033
Mobile: 7034780012 (O), 9847362520 (P)
email:sunnygeorge@scmsgroup.org
Website: www.scmsgroup.org/swi

scan (2).jpeg
894K

T.M.M. COLLEGE OF NURSING

(Dewan Bahadur Dr. V.Verghese Hospital Trust Association)
Anjilitanam P.O., Kaviyoor, Tiruvalla, Kerala, India- 689582
Phone: 0469-2618653, 2619041, 2626453/464, Fax: 0469-2618288
E-mail: info@tmmnursingcollege.in , tmmcollege@gmail.com
Website: www.tmmnursingcollege.in (EST. 2004)

To ,
Dr. Sunny George,
Director
SCMS WATER INSTITUTE
SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY

Date:9-03-2017

Sir,

We , the Management,Staff and the students of TMM College of Nursing College express our sincere gratitude to the Management of SCMS WATER INSTITUTE (SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY). And especially we are thankful to you and your colleague Dr, Ratheesh Menon for the visit to our college on 8/03/2017

In the light of the above mentioned visit , we request you to create a design, plan and estimate to set up a Sewage Treatment Plant ,conforming to the standards set by the Govt. authorities, at our campus. And we also seek your consultation and assistance in connection with the project implementation. Considering the gravity of the existing situation we request you to expedite the process of preparing the proposal.

Thanking you and expecting a long term association

Your's Faithfully
For T M M College Board

ABIN ABRAHAM
ADMINISTRATOR
T.M.M. COLLEGE OF NURSING
ANJILITHANAM, KAVIYOOR
THIRUVALLA - 82

T. M. M. COLLEGE OF NURSING * KAVIYOOR * THIRUVALLA 689 582