

**Application form for Christ College Research Seed Fund Self - Financing Faculty  
(CCRSF-SF)**

1. Name of the Faculty: Dr. Ajeesh George
2. Qualification of Faculty: MA, MSW, MPhil, Ph.D
3. Name of Department of the Faculty: Social Work
4. Total number of research papers published by the faculty in peer reviewed Journals: 10
5. Details of research projects, if any, currently the faculty: Nil
6. Details of the equipment the faculty would like to buy using Research Seed Fund:  
Books
7. A brief description of the project that would be undertaken by the faculty based on the Seed Fund:

**Title of the Study:** A study on awareness level organ donation among students in higher education Institutions in Kerala

**Significance of the study**

Organ donation can be a life-saving opportunity for patients with severe organ failure. In India, the rate of organ donation of the deceased Indian population is exceptionally low. This necessitates enhancing awareness regarding organ donation among students from higher education Institutions in Kerala, which can motivate the general population.

**Aim:** To study and analyse the awareness among students on organ donation in order to suggest potential strategies regarding improvement of awareness and willingness towards organ donation.

**Materials and methods:** A cross-sectional study and data will collect through standardized tools. UG students of various Colleges will included. The Snowball sampling technique will use for data collection. Statistical analysis will undertake using the statistical package for the social sciences (SPSS) software.

**8. Proposed budget of the Project:**

SL.NO	ITEMS	AMOUNT
1	Books	8000
2	Print Out	2500
3	TA for data Collection	5000
4	Statistical analysis	3500
5	Publication	7000
	Total	26000

Dr.Ajeesh George

Assistant Professor

Mrs Rosemary T George

Head of the Department

**Application form for Christ College Research Seed Fund Self Financing Faculty  
(CCRSF-SF)Current Academic Year 2022-2023**

1. Name of the Faculty: Dr. Anso M A
2. Qualification of Faculty: Ph.D
3. Name of Department of the Faculty: Geology and Environmental Sciences
4. Total number of research papers published by the Faculty in peer reviewed Journals: 4
5. Details of research projects, if any, currently the Faculty: None
6. Details of the equipment(s) the Faculty would like to buy using 'Research Seed Fund'
  - a) Polyethylene Bottles
  - b) Groundwater Sample Collector
  - c) Water Sieve
  - d) Filtration Unit
7. A brief description of the Project that would be undertaken by the faculty based on the Seed

**Geochemical Assessment Of Groundwater Quality And Microplastic Contamination In And Around Of Bhramapuram Waste Processing Plant Ernakulam District, Kerala**

The increased production and consumption scale of plastic items has led to the generation of microplastics (MPs), an emerging class of contaminants, in our environment. The increasing concern of MP pollution in every compartment of our environment is being globally explored, with relatively fewer studies in India. The atmospheric pollution from solid landfills of Bhramapuram on 2<sup>nd</sup> March,2023 has made prodigious impact on regional scale. Since the landfill covers an area of 110 acre, the level of contamination to the nearby water sources are expected. Thus,the groundwater quality analysis and microplastic contamination in groundwater is inevitable to check the quality of the Bhramapuram area. The groundwater quality parameters involvepH, EC, Ca, Mg,Na, K, Cl, SO<sub>4</sub>, HCO<sub>3</sub>, CO<sub>3</sub>, NO<sub>3</sub> and F. The evaluated results may be helpful for the governments to take serious decisions and helps them to improve the quality of the groundwater.

8. Proposed Budget of the Project: 25000

Name & Signature

Dr. Anso M A

Head of the Department/Co-ordinator

## Application form for Christ College Research Seed Fund Self Financing Faculty

(CCRSF-SF)

Current Academic Year 2023-2024

1. Name of the Faculty : Dr. BHAGYESH VB
2. Qualification of Faculty : MSc, CSIR-JRF, NET& PhD
3. Name of Department of Faculty : CHEMISTRY SELF
4. Number of research papers published by the Faculty in peer reviewed journals : 2
5. Details of research project, if any, currently the: Nil  
Faculty has undertaken
6. Details of equipment (s) the faculty would like to buy using "Research Seed Fund" : (a) Magnetic Stirrer of 1L capacity  
(b) Condenser Apparatus  
(c) Heating Mantle  
(d) Required chemicals
7. Proposed Budget of the Project – Rs. 25,000/-
8. Total duration of the study – One Year
9. A brief description of the Project that would be undertaken by the Faculty based on the Seed Fund:

**Introduction:** Polyaniline (PANI) is a famous conductive polymer, and it has received tremendous consideration from researchers in the field of nanotechnology for the improvement of sensors, optoelectronic devices, and photonic devices. PANI is doped easily by different acids and dopants because of its easy synthesis and remarkable environmental stability. This project focuses on different preparation processes of PANI thin film by chemical and physical methods. The preparation of PANI-based compounds with organic and inorganic nanofillers is believed to be a potential route to improve the properties and performance of PANI. Such approaches result in materials with synergistic or complementary features between PANI and organic/inorganic nanoparticles. Organic polymers that possess the magnetic, optical, and electric features of metals are called intrinsically conducting polymers, and such polymers are the electroactive polymers that possess the behaviors mentioned above while retaining their structural features. These polymers have conjugated double bonds in their backbones and determine good electrical conductivity without the use of conductive additives. They convert

to high conductivity alone in a doped state. The conductivity of the polymers is improved to a metallic state from their insulating state through the doping process whereby both N-type (electron donors) and P-type (accepting electrons) dopants are used to induce an insulator-to-metal transition in electronic polymers. To study the various applications of these composites, such as electrochromic devices, LEDs, EMI shielding, electrostatic discharge systems, batteries, and chemical and biochemical sensors. Given its unique properties, easy synthesis, low cost, and high environmental stability in various applications such as electronics, drugs, and anti-corrosion materials, it has attracted extensive attention. This study principally focuses on advances in PANI chemical modification and advanced features over the past decades, which serve as a strategic guide to establish a nearby link between PANI chemical modifications and practical applications.

**Objectives:**

- a. Preparation of Nanofiller - Functionalised Clay nanotube (HNT)
- b. Preparation of PANI with various Doping agent using direct mixing process
- c. Characterization of the composites using Structural, Mechanical, Conductivity studies and to evaluate the Anti-corrosive coating applications.

Faculty

Head of the Department / Course Coordinator

Dr. BHAGYESH.VB

GREENI KI

**Application form for Christ College Research Seed Fund Self Financing Faculty  
(CCRSF-SF)Current Academic Year 2022-2023**

1. Name of the Faculty: Ivine Joseph
2. Qualification of Faculty: M.Sc
3. Name of Department of the Faculty: Geology and Environmental Sciences
4. Total number of research papers published by the Faculty in peer reviewed Journals: Nil
5. Details of research projects, if any, currently the Faculty: None
6. Details of the equipment(s) the Faculty would like to buy using 'Research Seed Fund'
  - a) Polyethylene bag
  - b) Scooper
  - c) Chemicals (HCl, oxalic acid, sodium hexametaphosphate, ortho phosphoric acid, silver sulphate solution, potassium di chromate, ferrous ammonium sulphate, diphenylamine indicator)
7. A brief description of the Project that would be undertaken by the faculty based on the Seed

**Distribution of Microplastics from surface sediments in Brahmapuram area,  
Ernakulam district, Kerala**

Microplastics are tiny plastic particles measuring less than 5mm in size. They come from various sources, including the breakdown of larger plastic debris, synthetic fibers from clothing, and industrial processes. Thus, the increased production of plastics in our daily routine leads to the generation of microplastics (MPs) which affects the environment adversely. The atmospheric pollution from solid landfills of Brahmapuram on 2<sup>nd</sup> March, 2023 has made tremendous impact on regional scale which causes contamination to the environment in nearby areas. Thus, the determination of distribution and analysis of microplastics in surface sediments of Brahmapuram area is inevitable to understand the level of contamination in that area. The distribution of microplastics and the presence of organic matter in surface sediments can be evaluated.

8. Proposed Budget of the Project: 25000

Name & Signature: Ivine Joseph

Head of the Department/Co-ordinator

**Application form for Christ College Research Seed Fund Self Financing Faculty  
(CCRSF – SF)**

**Current Academic Year 2022-2023**

- |   |   |
|---|---|
| 1. Name of the Faculty -  | Dr. Meril Shelly  |
| 2. Qualification of Faculty -   | M.Sc. , Ph.D  |
| 3. Name of Department of the Faculty -  | Chemistry   |
| 4. Total number of research papers published by the faculty in peer reviewed journals -               | 3   |
| 5. Details of research projects, if any, currently the Faculty has undertaken -                       | NIL   |
| 6. Details of the equipment (s) the Faculty would like to purchase                                    | a. Magnetic stirrer with hot plate and rotor<br>b. Vacuum Desiccator<br>c. Casting Plates |
| 7. A brief description of the Project that would be undertaken by the Faculty based on the Seed Fund: |   |

**Preparation and Characterization of High Density Polyethylene (HDPE) –  
Derivatives of Chitosan based Bio-composites as Potential Bone- implant materials**

**Introduction:** Engineered bio-materials are gaining widespread applications in medical field, automobile industry, food packaging industry etc. Apart from the synthetic materials used as bone replacement materials in medical field, the emergence of hybrid systems especially, thermoplastic / bio-based composites are under research. The modification of such hybrid systems can bring out efficient materials with improved mechanical and bio-compatible properties. Porous High Density Polyethylene (HDPE) has been currently used as bone replacement materials in the bone-replacement field. Chitosan (CS), is a cationic biopolymer, obtained by the alkaline N-deacetylation of chitin, which is the main component found in the exoskeleton of crustaceans. Reports shows that functionalised chitosan, especially phosphorylated chitosan show good cell adhesion, effective mineralisation and non-toxic nature in *in-vitro* analysis. Composite materials derived from hybrid systems have received significant appreciation in recent

years, because of the increased awareness and drive towards more environmentally sustainable applications. Incorporation of chitosan and its derivatives into polymer matrices offers the possibility to design new composite materials with reduced environmental impact, better biodegradability, renewability and of course with low cost.

**Objectives:**

- a. Preparation of filler - functionalised Chitosan (f-CS)
- b. Preparation of HDPE/f-CS using melt mixing process
- c. Characterization of the composites using structural, mechanical and bio-compatibility analysis to study its potential as bone-replacement material.

The binary system consisting of High Density Polyethylene / Functionalised Chitosan has not been studied in detail. Hence, this system can be developed and studied for better mechanical properties and cell adhesive studies and can be evaluated for its potential as a good bone replacement material.

8. Proposed Budget of the Project – Rs. 25,000/-

Sl.No	Model	Description	Cost
1.	RQG-126/D	REMI Medium Duty Geared stirrer with PMDC Motor suitable for viscous material, with hollow shaft and propeller in SS 316, Chunk, Digital speed indicator and speed regulator.	Rs. 15,000 /-
2.	HI991300P	3 in 1 amplified probe with pH, EC/TDS and temperature sensors, Quick Cal Mode to calibrate pH and EC/TDS with one solution, EC to TDS Conversion factor selectable between 0.45 and 1.0	Rs. 10,000/-



9. Total duration of the study – One Year

<b>Activities</b>	<b>1-3 months</b>	<b>4-6 months</b>	<b>7-9 months</b>	<b>10-12 months</b>
Collection of literature; procuring of chemicals and equipments				
Preparation of the filler – Functionalised chitosan followed by preparation of High Density Polyethylene composites using melt mixing technique				
Characterization of composites				
Consolidation of the results and final report, publication of results in journal papers				

Faculty

Head of the Department / Course Coordinator

Dr. Meril Shelly

Ms. Greeni K I

**Application form for Christ College Research Seed Fund Self Financing Faculty  
(CCRSF-SF)**

**Current Academic Year 2022-2023**

1. Name of the Faculty -PRIYANGA K.K
2. Qualification of Faculty-MCA
3. Name of Department of the Faculty-COMPUTER SCIENCE
4. Total number of research papers published by the Faculty in peer reviewed Journals-3
5. Details of research projects, if any, currently the Faculty-  
AN EFFECTIVE IMAGE COMPRESSION AND DENOISING OF IMAGE USING  
DEEP LEARNING TECHNIQUE
6. Details of the equipment(s) the Faculty would like to buy using 'Research Seed Fund'-  
MEDICAL IMAGE DATA SET  
PRUNING SIMULATOR
7. A brief description of the Project that would be undertaken by the Faculty based on the  
Seed Fund.

**Network Pruning and Optimization**

The pruning scheme is accomplished using magnitude and penalty based pruning strategy. It is a hybridized approach where weights are trained and error functions are minimized. Quantization is known as the process of approximating a continuous signal by a set of discrete symbols or integer values. Initially, only weights were quantized. By quantizing, clustering, and sharing, weight storage requirements can be reduced by nearly four times

8. Proposed Budget of the Project -45000



Signature:

Name of the Faculty: Priyanga k.k



Signature:

Head of the Department: Viji Viswanathan

# **Christ College (Autonomous) Irinjalakuda Research Project Proposal – Self-Financing**

Submitted by: Ms. Anjali Jobi, Assistant Professor (ADHOC)  
Department of Physics (SF)

## **Title of the project:**

**Analysis of radiation characteristics of horn antennas using high accuracy non-standard finite difference time domain algorithm.**

## **Introduction:**

Computational electrodynamics deals with various programming methods and algorithms for simulating different types of electromagnetic problems. Finite Difference Time Domain (FDTD) method is one among them and is widely used these days for solving various problems. Since from its invention, this method is popular because of its simplicity and easiness in programming. One disadvantage of this method is its moderate accuracy and computational cost. Another variant of FDTD is formulated recently known as non-standard FDTD (NSFDTD) is found to be highly accurate and it is observed to be less time consuming for completing simulations related to various complicated problems. One astonishing fact is that the NSFDTD proposed with lot of advantages was suitable for homogeneous dielectric media only. A recent study carried out by the electromagnetic group of Christ College Irinjalakuda developed an excellent method using it for problems having metallic medium. The study depicts the details of how the traditional FDTD method used for solving the problem of propagation of electromagnetic waves through a media can be modified to suit a hybrid medium with metal inclusions also. This more accurate, efficient and faster NS-FDTD method, was found to be unfit for dealing with highly conducting media due to the computational hurdle of non-convergence. This aspect has been rectified using an innovative method which proposes the idea of identifying and using discrete and specific conductivity values for which the oscillating velocity dependent stability function of the algorithm called  $u^2$  passes through zero, for successfully driving the equations to solutions, is effectively demonstrated in the case of metallic structures. This novel method of effective solutions has brought about a wonderful change in dealing with the propagation of electromagnetic waves in a heterogenous media with metal inclusions. This method has put forth a brilliant and beneficial solution strategy for these type of media with an added advantage of savings in the

form of computational time and space. Or in other words, it reduces the computational cost to a greater extent.

As it is mentioned one of the promising possibilities of this new simulation method is in the field of media having metallic inclusions. This becomes an efficient method for the analysis of radiation characteristics of different types of radiating systems. The common strategy followed in the study of antennas is that, before engineering any structure for a radiator, simulation studies are carried out first using suitable solvers or packages. After getting expected results, the structure is engineered, and radiation performances are analysed. If conventional FDTD is used for simulations accuracy obtained is found to be less when a comparative study is performed with experimental data. Also, it takes lot of time for completing the simulation. So, if NS-FDTD method is chosen for antenna simulation studies, it may give accurate results in less time in a more efficient manner.

### **Objectives of the proposed study:**

The objective of the study is to analyse of radiation characteristics of different types of horn antennas using NSFDTD. E-Plane & H-Plane sectoral horns and Pyramidal horn structures can be chosen for the study. To compare the accuracy of the results obtained, simulations are to be carried out using conventional FDTD also. The time required for simulations are also need to be compared. The accuracy claimed for NS-FDTD is more than ten thousand times than that obtained using conventional one. Various steps involved in the study may be listed as follows.

- Selection of suitable domain space and time step for the simulation using both FDTD and NSFDTD.
- Simulation studies of the following horn antennas both algorithms
  - H-Plane horn antenna
  - E-Plane horn antenna
  - Pyramidal horn antenna
- Analysis of results obtained in terms of computational cost.
- Comparison of the obtained results using experimental studies.

### **Methodology:**

For the analysis of the propagation of electromagnetic waves through a medium containing the antenna under consideration, computational domain with suitable space is to

be identified in the programme space. Software selected for the simulation is MATLAB. The possibility of using Python may also be checked. Since these are user-friendly programming languages, the algorithms can be written with less complexity. The following steps are involved for the simulation procedure.

- Setting-up of the required computational domain
- Identification of various antenna structures in the domain.
- Simulation using FDTD and NS-FDTD
- Analysis of the accuracy of the results by plotting the radiation pattern
- Analysis of time requirements

Experimental studies are also needed to perform for verifying the accuracy of the obtained results. Experimental setup involving a microwave Vector Network Analyser(VNA) system may be used for this purpose. After arranging the antenna under study inside an an-echoic chamber, the radiation performance can be analysed. A detailed analysis of the results can be done by comparing the experimental results with the simulated results.

#### **Expected outlay:**

1. MATLAB software single end used	- ₹ 20000.00
2. Printed circuit boards for antenna	- ₹ 4000.00
3. Fabrication charges	- ₹ 4000.00
4. Connectors	- ₹ 2000.00
<b>Total</b>	<b>- ₹ 30000.00</b>

#### **References:**

1. “Frequency Dependent Radiation Properties of Negative Permittivity Metamaterial Horn antenna”, International Symposium on Optics (OSI-ISO 2018), 19 - 22 September 2018 at INDIAN INSTITUTE OF TECHNOLOGY (IIT), KANPUR.
2. “Nonstandard FDTD Realization of Radiation Behaviour of Epsilon Negative Metamaterial Corner Horn antenna.”; Metamaterials 2019, Rome, 13th International Congress on Artificial Materials for Novel Wave Phenomena, 16- 19 Sept. 2019.
3. “Scattering from artificial plasma cylinder using nonstandard FDTD”; International Conference on Advanced Materials, 12 – 14 June 2019 at Nirmalagiri College, Kannur, Kerala, India.
4. FDTD analysis of the interaction of a Gaussian pulse with negative permittivity metamaterial slab”, National seminar on Electroceramics, International Congress on Numerical Electromagnetic and Multiphysics Modeling and Optimization (NEMO), 2016 at Beijing, China.

5. Peter W Milonni. *Fast light, slow light and left-handed light*. CRC Press, 2004
6. Allen Taflove and Susan C Hagness. *Computational electrodynamics: the finitedifference time-domain method*. Artech house, 2005.
7. Dennis M Sullivan. *Electromagnetic simulation using the FDTD method*. John Wiley & Sons, 2013.
8. David R Smith et al. "Composite medium with simultaneously negative permeability and permittivity". In: *Physical review letters* 84.18 (2000), p. 4184.
9. John B Pendry et al. "Extremely low frequency plasmons in metallic mesostructures". In: *Physical review letters* 76.25 (1996), p. 4773.
10. DF Sievenpiper, ME Sickmiller, and E Yablonovitch. "3D wire mesh photonic crystals". In: *Physical Review Letters* 76.14 (1996), p. 2480.
11. DR Smith et al. "Experimental and theoretical results for a two-dimensional metal photonic band-gap cavity". In: *Applied Physics Letters* 65.5 (1994), pp. 645– 647.
12. Allen Taflove and Morris E Brodwin. "Numerical solution of steady-state electromagnetic scattering problems using the time-dependent Maxwell's equations". In: *IEEE transactions on microwave theory and techniques* 23.8 (1975), pp. 623–630.
13. John B Pendry et al. "Low frequency plasmons in thin-wire structures". In: *Journal of Physics: Condensed Matter* 10.22 (1998), p. 4785
14. James B Cole. "High accuracy nonstandard finite-difference time-domain algorithms for computational electromagnetics: Applications to optics and photonics". In: *Advances in the applications of nonstandard finite difference schemes*. World Scientific, 2005, pp. 89–189.
15. Ronald E Mickens. "Nonstandard finite difference schemes for differential equations". In: *Journal of Difference Equations and Applications* 8.9 (2002), pp. 823– 847.
16. James B Cole. "High accuracy solution of Maxwell's equations using nonstandard finite differences". In: *Computers in Physics* 11.3 (1997), pp. 287–292.
17. James B Cole. "High-accuracy Yee algorithm based on nonstandard finite differences: new developments and verifications". In: *IEEE Transactions on Antennas and Propagation* 50.9 (2002), pp. 1185–1191.
18. James B Cole. "High-accuracy FDTD solution of the absorbing wave equation, and conducting Maxwell's equations based on a nonstandard finitedifference model". In: *IEEE Transactions on Antennas and Propagation* 52.3 (2004), pp. 725–729.
19. James B Cole and Saswatee Banerjee. "Applications of nonstandard finite difference models to computational electromagnetics". In: *Journal of difference equations and applications* 9.12 (2003), pp. 1099–1112.

# **Christ College (Autonomous) Irinjalakuda Research Project Proposal – Self-Financing**

Submitted by: **Simmy Jose Assistant Professor (ADHOC)**  
**Department of Physics (SF)**

## **Title of the project:**

**Designing and developing of reconfigurable/smart plasma medium for plasma switching application**

## **Introduction:**

The metamaterial structures are those which has properties that are not exhibited by naturally occurring materials. The term meta indicates beyond, it depicts metamaterial systems are beyond the conventional system.

There are some specific properties for metamaterials. The cellular size should be smaller than the wavelength of the interacting electromagnetic wave. The cellular units have the same role as atoms in the macroscopic scale. The structural unit of metamaterial is called the meta-atoms or meta molecules. Electrical permittivity and magnetic permeability are the factors affecting the properties of metamaterials. According this they are divided into four different types.

1. Naturally occurring materials with positive permittivity and permeability.
2. With negative permittivity and positive permeability called epsilon negative metamaterials region. The ionised gas, the plasma medium etc. include in this region.
3. With positive permittivity and negative permeability region. Some variants of ferro and anti-ferro magnetic materials are included in this region.
4. With negative permittivity and permeability.

In the case of plasma medium, we are considering the negative permittivity and positive permeability. These materials can be found in the nature. Natural Plasma is one examples. Metals show negative permittivity up to their plasma frequency. It is due to the finite conductivity of the medium. The plasma frequency range is in uv spectrum for metals.

The present study attempts to design a smart configurable plasma medium having plasma frequency around microwave regions.

### Theoretical considerations:

In the case of an electrically neutral plasma, we all know that the mass of negative ions is smaller than that of the positive ions so they will contribute to the polarization. It is an apt condition for good conductivity. Plasma has negative value for  $\epsilon$  and positive value for  $\mu$  when the frequencies are smaller than the plasma frequency. The equation which represents the electron in a harmonic field is given by,

$$m \frac{d^2}{dr^2} + m\gamma \frac{d}{dr} = -eE \exp(-i\omega t)$$

Here, the magnetic contribution is neglected.  $m\gamma$  is the phenomenological damping force constant. In our point of view the wavelength of radiation is large compared to the distance travelled by electrons. From this we can attain a polarization.

$$P = (\epsilon - 1)\epsilon_0 E = -Ner = -\left(\frac{Ne^2}{mE}\right)/\omega(\omega + i\gamma)$$

N is the number density of conduction electrons, and we assume that each electron individually contributes to the polarization. The relative dielectric permittivity is given by,

$$\epsilon(\omega) = 1 - \frac{\frac{Ne^2}{\epsilon_0 m}}{\omega(\omega + i\gamma)} = 1 - \left(\frac{\omega_p^2}{\omega(\omega + i\gamma)}\right)$$

From this we can see that for frequencies less than the plasma frequency, charges move quickly and shield the interior medium from electromagnetic radiation. At larger frequencies it behaves as ordinary dielectric medium.

For some dielectric materials there occur some spectral bands for epsilon less than zero. For large oscillator strength and small damping, the dielectric constant is negative over the frequency band  $\omega_0 < \omega < \omega_p$ . Where  $\omega_p = \sqrt{(\omega_j^2 + \omega_0^2)}$  which is equivalent to the plasma frequency. In fact, there are optical phonon resonance in many dielectric and ionic materials. The optical phonon resonance is important when it comes to the designing of metamaterials.



## **Aim and Objective of the study:**

Our aim is to design and develop smart plasma medium for plasma switching application using discharge tubes (Ne, Ar tubes etc.). We are checking whether the switching takes place in the presence of EMF for such discharge environment. As the first step of the study design and development of artificial wire structure is need. The plasma properties of such structures usually show a high pass behaviour. Next step of the study is the development of plasma medium discharge tubes. The potential given across the discharge terminals need to change gradually for getting rarefied plasma medium. The expected performance of the set-up is a tenable and switchable type plasma medium. This may find good number of applications in various electromagnetic applications especially in defence and communication fields.

Various steps involved in the study may be listed as follows.

- Constructing and characterisation of plasma medium using thin wires
- Analysis of plasma behaviour of discharge tubes
- Study of switching action of the plasma by controlling the potential across the cathod and anode of the tube.

## **Methodology:**

In order to perform the study, an experimental setup with the plasma medium placed between a transmitting and receiving antenna system is used

The study involves the following steps:

- Transmission and reflection studies of the artificial plasma structures with different plasma frequencies
- Analysis of the plasma behaviour of discharge tube with various pressure differences i.e., If we change pressure, it will change the electron density in the tube.
- Analyse plasma frequency or pass band frequency for different pressure.
- Check the possibility of the design to use it for specific applications

**Expected outlay:**

1. Discharge tube	- ₹ 10,000.00
2. Antenna (small aperture) and connectors	-₹ 7000.00
3. Metallic fabrication (thin film and associated components)	-₹3000.00
4. Travel	-₹3000.00
5. Miscellaneous	-₹2000.00

Total -₹25,000

**References:**

1. John B Pendry et al. “Extremely low frequency plasmons in metallic mesostructures”. In: Physical review letters 76.25 (1996), p. 4773.
2. David R Smith et al. “Composite medium with simultaneously negative permeability and permittivity”. In: Physical review letters 84.18 (2000), p. 4184.
3. DR Smith et al. “Experimental and theoretical results for a two-dimensional metal photonic band-gap cavity”. In: Applied Physics Letters 65.5 (1994), pp. 645– 647.

# Application form for Christ College Research Seed Fund Self Financing Faculty (CCRSF-SF)

## Current Academic Year 2022-2023

1. Name of the Faculty : Reeja Eugene
2. Qualification of Faculty : MSc CS
3. Name of Department of the Faculty : Department of Vocational Studies
4. Total number of research papers published by the Faculty in peer reviewed Journals : 4
5. Details of research projects, if any, currently the Faculty : NA
6. Details of the equipment(s) the Faculty would like to buy using 'Research Seed Fund-'  
A laptop with basic features and a scanner
7. A brief description of the Project that would be undertaken by the Faculty based on the Seed Fund. (250 words) :

Optical Character Recognition (OCR) technology has been a popular research topic in recent years due to its ability to digitize and extract text from scanned documents. OCR is a process of transforming images of printed or handwritten text into machine-readable text, which can be searched and analyzed electronically. This technology has numerous applications such as digitization of historical documents, automatic license plate recognition, and automated data entry. OCR technology is based on pattern recognition algorithms that use machine learning techniques to recognize characters and convert them into text. Many researchers have focused on improving OCR accuracy, especially for degraded or noisy documents. This has led to the development of various pre-processing techniques and algorithms, such as image enhancement, noise removal, and character segmentation. Moreover, advances in deep learning and neural networks have significantly improved OCR performance, enabling the recognition of complex and cursive handwriting. However, there are still many challenges to overcome, such as developing a robust system that can handle multiple languages, fonts, and writing styles, and dealing with text that is skewed or torn. Despite these challenges, OCR technology has become an essential tool for document management and information retrieval, revolutionizing the way we interact with printed material.

8. Proposed Budget of the Project : 25000/-

Signature  
Faculty

Name & Signature  
Head of the Department/Coordinator

A basic framework for developing an OCR system for document digitization:

1. Acquire and prepare the dataset: Collect a large dataset of printed documents and prepare them for use in training the OCR system. This may involve cleaning up the data, removing noise, and organizing it in a format that can be easily processed by the OCR system.
2. Train the OCR system: Use machine learning techniques such as convolutional neural networks (CNNs) to train the OCR system on the dataset. This will involve feeding the system a set of input images and their corresponding text labels, allowing it to learn how to accurately recognize text in new images.
3. Implement image processing algorithms: To enhance the quality of scanned documents and improve OCR accuracy, implement image processing algorithms such as thresholding, deskewing, and noise removal.
4. Evaluate OCR system performance: Test the OCR system on a separate set of data to evaluate its accuracy and identify areas for improvement. Refine the system based on the evaluation results.
5. Integrate with document management system: Once the OCR system has been developed and tested, integrate it with a document management system to allow for efficient document digitization and storage.

The above steps provide a general framework for developing an OCR system for document digitization. The actual implementation will depend on the specific requirements and tools chosen for the project.

**Application form for Christ College Research Seed Fund Self Financing Faculty  
(CCRSF-SF) Current Academic Year 2022-2023**

1. Name of the Faculty: Roshini P.P.
2. Qualification of Faculty: M.Sc. B.Ed.
3. Name of Department of the Faculty: Geology and Environmental Sciences
4. Total number of research papers published by the Faculty in peer reviewed Journals: Nil
5. Details of research projects, if any, currently the Faculty: None
6. Details of the equipment(s) the Faculty would like to buy using 'Research Seed Fund'
  - a) Vacuum Pump
  - b) Groundwater Sample Collector
  - c) Filter Paper
7. A brief description of the Project that would be undertaken by the faculty based on the Seed

**Regional study of microplastics in surface water of Brahmapuram area, Ernakulam District**

Microplastic (MP) is a prevalent pollutant seen in biota, sediment and water all over the world. Though, the research regarding the extent to which mankind are exposed to this pollutant is very feeble. Recently researches have suggested the fact MP are found in surface water, ground water, bottled water, tap water etc. Microplastics are described as tiny plastic fragments of size less than 5 millimeters long which is harmful to our entire mankind. There are 2 kinds of microplastics; primary and secondary. Microplastics being hazardous pollutant are a serious threat to both aquatic ecosystem and human health. So, regarding these issue appropriate measures has to take for proper waste management and its disposal. Brahmapuram is one of the prominent industrial areas in Ernakulam district, so assessment of surface water quality and microplastic contamination is of high demand. The physico-chemical characteristics and spatial variation of surface water and the distribution of microplastics in surface water can be analysed.

Proposed Budget of the Project: 25000

Name & Signature

Roshini P.P.

Head of the Department/Co-ordinator

# Application form for Christ College Research Seed Fund Self - Financing Faculty

## (CCRSF-SF)

1. Name of the Faculty: Mr. Saijith N S
2. Qualification of Faculty: MSW
3. Name of Department of the Faculty: Social Work
4. Total number of research papers published by the faculty in peer reviewed Journals: Nil
5. Details of research projects, if any, currently the faculty: Nil
6. Details of the equipment the faculty would like to buy using Research Seed Fund: Books
7. A brief description of the project that would be undertaken by the faculty based on the Seed Fund:

**Title of the study: A STUDY ON INTERPERSONAL MINDFULNESS AMONG TEACHERS IN HIGHER SECONDARY SCHOOLS IN KERALA**

### Significance of the study

Mindfulness helps develop awareness by supporting emotion management, reducing stress and disciplining the mind. Teachers interpersonal mindfulness may help them to be emotionally supportive, teachers social and emotional wellbeing is an important contributor to students social and emotional development and academic outcome. This study focuses that importance of interpersonal mindfulness among teachers

Objective: To study and analyse the interpersonal mindfulness and performance of teachers in higher secondary schools and suggest and intervene (training) various strategies to sustain and improve the level of mindfulness among them.

**Methodology:** This study is mixed with descriptive and application level and data will be collected through standardized tool. Teachers of Higher secondary schools include. Stratified sampling technique will be used for data collection. SPSS will use for analysis and interpretation of data

### 8. Proposed budget of the Project:

Sl. No	ITEMS	AMOUNT
1	Travelling allowance	5000
2	Books for review	8000
3.	Pilot study & Pretest	2000
4.	Print out	3000
5.	Publication	10000
6.	ToT	20000
7.	Total	48000
	Sanctioned Amount from College	20000

Signature of Faculty

Signature of HOD

**Signature of Faculty**

**Signature of HOD**

## Christ College (Autonomous) Irinjalakuda Research Project Proposal – Self-Financing

Submitted by: Mr. Jose Sunny and Ms. Aswathi K Sivarajan, Assistant Professors (ADHOC)  
Department of Physics (SF)

Title of the project:

**Design and characterization of Light weight plasma horn radio telescope for Galaxy mapping applications using  $H_{21}$  line.**

Introduction:

In recent years researchers have attempted to design and build up different types of antennas by making use of metamaterial inspired structures and artificial plasma. Metamaterials are new class of artificial materials having properties not possessed by natural materials. These exotic properties of these artificially engineered materials are due to their negative values of permittivity, permeability and index of refraction. The physics of these materials are entirely different from that of ordinary materials and hence these materials can be used for enormous applications in the state-of-the-art technological developments. Negative permittivity plasma medium is naturally occurring in different forms such as ionosphere, metals etc. The resonance frequency is the crucial parameter that decides its negative properties and hence tuning of this frequency is very essential for suggesting it for various applications. In order to overcome this hurdle, artificial structures are proposed by various researchers by making use of different technologies. One such structure is materialized with the help of thin wires of micro or nano dimensions. This method makes use of the principle based on reduction of effective electron density of the medium for tuning the plasma frequency.

In this project we suggest the design and development of new type of horn antenna constructed using artificial plasma sheets (light weight) fabricated with the concept of negative permittivity metamaterial structure for astronomical data collection, with special intention for mapping of our galaxy using the emission line of  $H_{21}$ . Thin conducting wires of few microns radius may be used for this purpose.

$H_{21}$  line is the electromagnetic spectrum line that is created by the change in the energy state of neutral hydrogen atom. Hydrogen is the most abundant element in the universe, this makes hydrogen line very important in radio astronomy. When a Hydrogen atom is transferred from a parallel spin to an anti parallel spin configuration, it emits electromagnetic radiation



corresponding to a frequency of 1420.4MHz or a wavelength of 21cm. The 21cm line was first detected in 1951 at Harvard university.

### **Aim and Objective of the study:**

The objective of the study is the design and construction of light weight horn antenna using artificial plasma medium and detection of  $H_{21}$  lines coming from the milky way. The study of radio emission can help us to evaluate presence of Hydrogen in interstellar clouds and to understand the structure of Milkyway. Various steps involved in the study may be listed as follows.

- Design and characterization of Horn antenna using artificial plasma using thin conducting wires.
- Study of the radiation characteristics of the new radio telescope
- Detection of  $H_{21}$  line using the constructed antenna.
- Analysis of obtained spectrum.
- Mapping of Milky way galaxy using obtained data.
- Comparison of the obtained results using experimental studies.

### **Methodology:**

In order to analyse  $H_{21}$  lines present in our atmosphere we would like to construct a horn antenna with plasma sheets for detecting the  $H_{21}$  lines. The observed spectrum is analysed using a high accuracy spectrum analyser. Mapping of Milky way galaxy is supposed to be done using obtained data. The experimental setup consisting of a wide band horn as the transmitter for studying the characteristics of the new antenna. The plasma antenna is used as the receiver and the radiation pattern, gain and VSWR of the design is to be analysed. The radio telescope is then set for receiving signals from different arms of our galaxy with the help of suitable transducer devices such as LNA and bandpass filters.

### **Expected outlay:**

- |                           |             |
|---------------------------|-------------|
| 1. Satellite radio module | - ₹ 6000.00 |
| 2. LNA                    | - ₹ 6000.00 |

- |  |             |
|--|-------------|
| 3. Bandpass filter                       | - ₹ 4000.00 |
| 4. Materials for fabricating the antenna | - ₹ 4000.00 |
| 5. Fabrication charges                   | - ₹ 4000.00 |
| 6. Connectors and cables                 | - ₹ 1000.00 |

**Total**            - ₹ 25000.00

### References:

1. "Metamaterial inspired featherlight artificial plasma horn antenna for astronomical and communication applications." *Microwave and Optical Technology Letters* 61.3 (2019): 777-780.
2. Mhaske, Ashish A., et al. "A Bose horn antenna radio telescope (BHARAT) design for 21 cm hydrogen line experiments for radio astronomy teaching." *American Journal of Physics* 90.12 (2022): 948-960.
3. "Scattering from artificial plasma cylinder using nonstandard FDTD"; International Conference on Advanced Materials, 12 – 14 June 2019 at Nirmalagiri College, Kannur, Kerala, India.
4. "Frequency Dependent Radiation Properties of Negative Permittivity Metamaterial Reflector Antenna", International Symposium on Optics (OSI-ISO 2018), 19 - 22 September 2018 at INDIAN INSTITUTE OF TECHNOLOGY (IIT), KANPUR.
5. John B Pendry et al. "Extremely low frequency plasmons in metallic mesostructures". In: *Physical review letters* 76.25 (1996), p. 4773.
6. DF Sievenpiper, ME Sickmiller, and E Yablonovitch. "3D wire mesh photonic crystals". In: *Physical Review Letters* 76.14 (1996), p. 2480.
7. John B Pendry et al. "Low frequency plasmons in thin-wire structures". In: *Journal of Physics: Condensed Matter* 10.22 (1998), p. 4785
8. Peter W Milonni. *Fast light, slow light and left-handed light*. CRC Press, 2004

## **Application form for Christ College Research Seed Fund Self - Financing Faculty**

**(CCRSF-SF)**

**Current Academic Year 2022-2023**

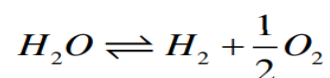
1. Name of the Faculty: **GREENI K I**
2. Qualification of Faculty: **M.Sc. Chemistry, B.Ed., NET**
3. Name of Department of the Faculty: **Chemistry Self**
4. Total number of research papers published by the faculty in peer reviewed Journals:  
NA
5. Details of research projects, if any, currently the faculty: NA
6. Details of the equipment the faculty would like to buy using Research Seed Fund:
  - a. Sonicator
  - b. Magnetic stirrer
  - c. Chemicals for analysis
7. A brief description of the project that would be undertaken by the faculty based on the Seed Fund:

### **SYNTHESIS, CHARACTERIZATION AND CATALYTIC PERFORMANCE OF ELECTROCATALYSTS FOR HYDROGEN EVOLUTION REACTION**

Today, energy is the primary input for almost all economic activities and has become vital for improvement in the quality of life. There is a wide disparity in energy consumption and energy production. The worldwide energy demand is continuously growing and according to the forecasts of the International Energy Agency, it is expected to rise by approx. 50% by 2040. Currently over 80% of the primary energy demand is covered by fossil fuels. The increased use of fossil fuel combustion to produce energy increases carbon dioxide gas levels in the atmosphere. This causes greenhouse effect, which is a major cause of global warming. To cope with this increasing demand of energy and the reduction of greenhouse effect, efforts are being made to develop new approaches in conventional and non-conventional energy sources and new measures of energy conservation. To avoid the worst impacts of climate change, emissions need to be reduced by almost half by 2030 and reach net-zero by 2050. To achieve this, we need to end our reliance on fossil fuels and invest in alternative sources of energy that are clean, accessible, affordable, sustainable, and reliable.

Hydrogen is the fuel of the future that can transform our fossil-fuel dependent economy into a hydrogen economy, which can provide an emissions-free transportation fuel. Electrolysis is an electrochemical process performed by passing current among the electrodes

through an aqueous electrolyte solution. During reaction, dissociation of stable water molecule takes place forming hydrogen (H<sub>2</sub>) and oxygen (O<sub>2</sub>) gasses on the electrode surfaces. The overall reaction of water electrolysis is presented as follows,



As a promising substitute for fossil fuels, hydrogen has emerged as a clean and renewable energy. A key challenge is the efficient production of hydrogen to meet the commercial-scale demand of hydrogen. Water splitting electrolysis is a promising pathway to achieve the efficient hydrogen production in terms of energy conversion and storage in which catalysis or electrocatalysis plays a critical role. The development of active, stable, and low-cost catalysts or electrocatalysts is an essential prerequisite for achieving the desired electrocatalytic hydrogen production from water splitting for practical use, which constitutes the central focus in the coming years.

8. Proposed budget of the Project:

- a. Sonicator: 15000/-
- b. Magnetic stirrer: 10000/-
- c. Chemicals for analysis: 5000/-
- d. Fee for characterization of catalyst developed: 10000

Signature

Signature

Name of the Faculty

Head of the Department

**Application form for Christ College Research Seed Fund Self Financing Faculty  
(CCRSF-SF)**

**Current Academic Year 2022-2023**

1. Name of the Faculty -Jomesh Jose
2. Qualification of Faculty-MSc, B.Ed
3. Name of Department of the Faculty-Mathematics (Unaided)
4. Total number of research papers published by the Faculty in peer reviewed Journals-0
5. Details of research projects, if any, currently the Faculty-Null
6. Details of the equipment(s) the Faculty would like to buy using 'Research Seed Fund-'  
Text Books
7. A brief description of the Project that would be undertaken by the Faculty based on the  
Seed Fund.

**Algebraic Graph Theory**

This work is concerned with the use of algebraic techniques in the study of graphs. It aims to translate properties of graphs into algebraic properties and then, using the results and methods of algebra, to deduce theorems about graphs. The work deals with the applications of linear algebra and matrix theory to the study of graphs. We begin by introducing the adjacency matrix of a graph; this matrix completely determines the graph, and its spectral properties are shown to be related to properties of the graph. For example, if a graph is regular, then the eigenvalues of its adjacency matrix are bounded in absolute value by the valency of the graph. In the case of a line graph, there is a strong lower bound for the eigenvalues. Another matrix which completely describes a graph is the incidence matrix of the graph. This matrix represents a linear mapping which, in modern language, determines the homology of the graph; however, the sophistication of this language obscures the underlying simplicity of the situation. The problem of choosing a basis for the homology of a graph is just that of finding a fundamental

system of circuits, and we solve this problem by using a spanning tree in the graph. At the same time we study the cutsets of the graph. These ideas are then applied to the systematic solution of network equations, a topic which supplied the stimulus for the original theoretical development.

8. Proposed Budget of the Project -10000

DR. JOJU K T

Signature

Faculty

Head of the  
Department/Coordinator

**Application form for Christ College Research Seed Fund Self Financing Faculty  
(CCRSF-SF)**

**Current Academic Year 2022-2023**

1. Name of the Faculty -Mary Pauly K
2. Qualification of Faculty-MSc
3. Name of Department of the Faculty-Mathematics (Unaided)
4. Total number of research papers published by the Faculty in peer reviewed Journals-0
5. Details of research projects, if any, currently the Faculty-Null
6. Details of the equipment(s) the Faculty would like to buy using 'Research Seed Fund-'  
Text Books
7. A brief description of the Project that would be undertaken by the Faculty based on the  
Seed Fund.

## Graph Colouring

This work deals with the problem of colouring the vertices of a graph in such a way that adjacent vertices have different colours. The least number of colours for which such a colouring is possible is called the chromatic number of the graph, and we begin by investigating some connections between this number and the eigenvalues of the adjacency matrix of the graph. The algebraic technique for counting the colourings of a graph is founded on a polynomial known as the chromatic polynomial. We first discuss some simple ways of calculating this polynomial, and show how these can be applied in several important cases. Many important properties of the chromatic polynomial of a graph stem from its connection with the family of subgraphs of the graph, and we show how the chromatic polynomial can be expanded in terms of subgraphs. From our first (additive) expansion another (multiplicative) expansion can be derived, and the latter depends upon a very restricted class of subgraphs. This leads to efficient methods for approximating the chromatic polynomials of large graphs.

8. Proposed Budget of the Project -10000

DR. JOJU K T

Signature

Name & Signature

Faculty

Head of the

Department/Coordinator





# **Application form for Christ College Research Seed Fund Self - Financing Faculty**

## **(CCRSF-SF)**

1. Name of the Faculty: **KRISHNAPRIYA.K.M**
2. Qualification of Faculty: **M.Sc. Chemistry, B.Ed., NET**
3. Name of Department of the Faculty: **Chemistry**
4. Total number of research papers published by the faculty in peer reviewed Journals: NA
5. Details of research projects, if any, currently the faculty: NA
6. Details of the equipment the faculty would like to buy using Research Seed Fund:
  - a. Micro pipette (20-200 micro L)
  - b. Carbon coated Aluminium foil
7. A brief description of the project that would be undertaken by the faculty based on the Seed Fund:

### **Organic Functionalized Graphene oxide electrode for energy storage**

The world's ever growing and increasing demand for energy is one of the major challenges of the 21<sup>st</sup> century. With regard to growing environmental issues, the requirements for efficient and clean power sources such as solar, wind power and especially the need for sustainable energy storage system led to ongoing research to improve the existing battery techniques.

Usually, a battery consisting of two electrodes with different electrochemical potentials connected by an ionically conductive electrolyte, providing a certain cell potential depending on the chemistry of the electrodes.

At present, the electrode materials of rechargeable batteries are mainly inorganic materials such as layered metal oxides, spinel oxides, polyphosphates etc, but inorganic electrode material has drawbacks such as limited capacity, high energy consumption, safety hazards, and high-cost raw materials. For overcome these limitations, it is necessary to develop more green and efficient electrode material. Organic electrode materials have the advantages of high capacity, environmental friendliness, High safety and natural abundance. Organic materials are flexible,

and their redox mechanism during charge-discharge process is based on conversion reaction. But electrode dissolution is the main drawback of organic electrodes. When a voltage is applied, the electrode dissolves and form metal organic frameworks. It will reduce the efficiency of the electrode. To reduce electrode dissolution the Organic compound require large amounts of conductive additives. For high-rate performance carbon additives with a high surface area such as graphene oxide can use. Due to its favourable electron mobility and unique surface properties, such as one- atom thickness and high specific surface area, GO can accommodate the active species and facilitate their electron transfer at electrode surfaces. So, the development of different organic functionalized graphene oxide electrode materials can improve the working of many energy storage devices.

Proposed budget of the Project:

- a. Micro pipette(20-200 micro L): 14750/-
- b. Carbon coated aluminium foil: 12500/-

Total duration of the project : one year

Signature

Name of the Faculty

Signature

Head of the Department

**Application form for Christ College Research Seed Fund Self Financing  
Faculty (CCRSF-SF)**

Current Academic Year: 2022-2023

- 1. Name of the Faculty:** FAMY FRANCIS
- 2. Qualification of Faculty:** M.Sc. CHEMISTRY
- 3. Name of Department of the Faculty:** CHEMISTRY
- 4. Total number of research papers published by the Faculty in peer reviewed Journals:** 1
- 5. Details of research projects, if any, currently the Faculty :** NA
- 6. Details of the equipment(s) the Faculty would like to buy using ‘Research Seed Fund-’**
  - a) Magnetic stirrer    b) Glass wares    c) Chemicals    d) Mini microscope
- 7. A brief description of the Project that would be undertaken by the Faculty based on the Seed Fund.**

**DEVELOPMENT OF ION-EXCHANGE MEMBRANE MATERIALS FOR  
ENERGY STORAGE AND PRODUCTION**

Energy is a fundamental component of almost all economic activity; therefore it is crucial for enhancing the quality of life. Without energy, neither current manufacturing methods nor daily existence for humans would be conceivable. Thus, for the good of our civilization, we must switch from fossil fuel based economy to a clean energy economy. New approaches to conventional and non-conventional energy sources as well as new energy-saving techniques are being developed in order to meet the rising demand for energy and the decrease of the greenhouse effect.

The recent emphasis on sustainability and alternative energy sources has increased the trend in research and development of new energy gadgets. One of the

most promising clean and effective energy production technologies is the use of fuel cells, which convert chemical energy into electric and thermal energy. An electrochemical energy storage system is the redox flow battery (RFB). Redox reactions are chemical reduction and oxidation processes that are used in the RFB to store energy in liquid electrolyte solutions that pass through a battery of electrochemical cells during charge and discharge. Redox flow batteries exhibit considerable benefits in terms of cost, system flexibility, quick reaction, and safety concerns for large-scale applications.

Chemical power sources like fuel cells, redox batteries, and reverse electrodialysis equipment, all frequently employ ion exchange membranes. Ion exchange membranes (IEMs) are typically made up of moveable counter-ions, immobilised ion-functionalized groups, and hydrophobic substrates. IEMs are widely divided into cation exchange membranes (CEMs) and anion exchange membranes (AEMs) based on the sort of ionic groups they contain.

The use of anion exchange membranes in electrochemical energy conversion and storage systems is becoming more and more popular on a global scale. As promising electrochemical devices for energy production, anion exchange membranes (AEM) are gaining more and more attention. As a result, significant progress has been achieved in the design and development of artificial or naturally occurring anion exchange membrane (AEMs). AEM have garnered a lot of interest among the numerous fuel cell varieties since they are efficient and clean conversion technologies. In electrolytic cells and fuel cells, ion exchange membranes are utilized to transfer the anions necessary for cell function while separating the reactants that are present between the two electrodes. AEMs must have strong conductivity and excellent alkaline stability in alkaline settings in order to be used practically and for commercialization. The properties of AEMs are

significantly influenced by the micromorphology and chemical makeup of the backbone and cations. AEMs with outstanding performance are highly desired, even though numerous AEMs with varied chemical structures and micromorphologies have been created to improve their conductivity and alkaline stability. High ion exchange capacity (IEC), high permselectivity, excellent dimensional stability/low membrane swelling and water uptake, as well as high chemical, mechanical, and thermal properties, are all expected to be present in a desired AEM. The preparation of AEMs that have all the aforementioned advantages is, however, quite difficult. Various synthesis methods are developed aiming to meet some or all the above requirements. On the other hand, the variety of IEM applications calls for the creation of various IEMs with desirable characteristics.

#### **8. Proposed Budget of the Project**

- a) Magnetic stirrer – 15000/-
- b) Glass wares - 5000/-
- c) Chemicals- 10000/-
- d) Mini microscope- 5000/-

#### **9. Duration of project work- One year**

Signature

Faculty

Name & Signature

Head of the Department/Coordinator

# Application form for Christ College Research Seed Fund SelfFinancing Faculty (CCRSF-SF)

## Current Academic Year 2022-2023

1. Name of the Faculty: SWATHY V CHANDRAN
2. Qualification of Faculty: M.COM
3. Name of Department of the Faculty: COMMERCE(UNAIDED)
4. Total number of research papers published by the faculty in peer reviewed Journals: 4
5. Details of the equipment(s) the faculty would like to buy using 'Research Seed Fund-'  
Statistical software for doing analysis
6. A brief description of the Project that would be undertaken by the **faculty** based on the Seed Fund.

## FINANCIAL INCLUSION AMONG TRIBAL HOUSEHOLDS OF SOUTH KERALA

Swathy V Chandran  
Assistant Professor  
Department of Commerce (Unaided)  
Christ College (Autonomous), Irinjalakuda

### INTRODUCTION

Financial inclusion implies delivery of formal financial products and services at an affordable cost to disadvantaged, low-income and unbanked sections of people of the society. Financial inclusion will enable the poor and the rustics of our country to open a bank account to save and invest, to borrow and to repay, to insure and to take part in the credit. Tribals are the most vulnerable section and live apart of the mainstream of the society as well. In this regard, the present paper intent to assess the status of financial inclusion and financial literacy among tribal households of Kerala.

## **STATEMENT OF THE PROBLEM**

Despite making significant improvements in the areas relating to financial viability, profitability and competitiveness, there are concerns that the financial institutions have not been able to include vast segment of the population, especially the underprivileged sections of the society, into the fold of basic financial services. Despite many studies in the area of financial inclusion have taken place over years, and the tremendous growth in the Indian as well as Kerala economy, there exists a huge disparity of rich remaining as rich and poor being poorer. so this study aims to analyse the extent of financial products and services among tribal households of Kerala.

## **OBJECTIVES OF THE STUDY**

- 1.** To find out the extent of financial inclusion among the tribal households of Kerala
- 2.** To assess savings, investment and borrowing pattern of tribal households of Kerala
- 3.** To analyse the level of awareness among the tribal households of Kerala

## **HYPOTHESIS OF THE STUDY**

Hypothesis 1

**H<sub>0</sub>:** There is no significant difference in the extent of financial inclusion among tribal households of Kerala

**H<sub>1</sub>:** There is significant difference in the extent of financial inclusion among tribal households of Kerala

Hypothesis 2

**H<sub>0</sub>:** There is no significant difference in the level of awareness of financial inclusion among tribal households of Kerala

**H<sub>1</sub>:** There is significant difference in the level of awareness of financial inclusion among tribal households of Kerala

## **METHODOLOGY OF THE STUDY**

The proposed methodology study is basically based on primary field level data which have been collected by administering a structured questionnaire. Purposive sampling method will be used for selection of tribal groups and household level respondents will be selecting randomly. ANOVA and Chi-square are the tools planning for the study and further tools will be added if the study requires the same.

## **LIMITATIONS OF THE STUDY**

The most predicable limitation will be the non-cooperation and reluctance of respondents to disclose their affairs to people who seems strange to them.



**7. PROPOSED BUDGET OF THE PROJECT:**

Cost of purchase statistical software (SPSS): Rs. 9,000 (AnnualSubscription)

Cost of travel to collect primary data: Rs. 15,000

Total cost: Rs. 24,000

Name of faculty: Swathy V Chandran

Prof. K.J Joseph  
Head of the Department

**Christ College Research Seed Fund (CCRSF) -Award Letter**  
**CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA**

30.

To

,

THE PRINCIPAL  
CHRIST COLLEGE  
(AUTONOMOUS),  
IRINJALAKUDA

This is to inform you that the research proposal submitted by you has been reviewed by the CCRSF panel. Your proposal on the topic – “FINANCIAL INCLUSION AMONG TRIBAL HOUSEHOLDS OF KERALA” is approved and you are eligible for the Christ College Research Seed Fund of Rs. 15,000/-. You should return the acceptance letter (after going through the CCRSF guidelines) within seven days from the date of this letter.

**PRINCIPAL**

**Christ College Research Seed Fund (CCRSF) -Acceptance Letter**  
**CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA**

TO  
THE PRINCIPAL  
CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA

Received a sum of Rs. 15,000/- as Christ College Research Seed Fund  
for purchasing instruments for the research topic - FINANCIAL

INCLUSION AMONG TRIBAL HOUSEHOLDS OF KERALA.

I have gone through the CCRSF guidelines and I do here by declare that the fund will be utilized as per the guidelines and also will be submitting the detailed report on the project within a year from the date of this acceptance letter.

Yours sincerely,

Swathy V Chandran  
Dept. of Commerce (Unaided)

Reapplication form for Christ College Research Seed Fund  
Self Financing  
Faculty(CCRSF-SF)

Current Academic Year 2022-2023

Topic Change

1. Name of the Faculty: Krishna A.S
2. Qualification of Faculty: MBA, M Phil
3. Name of Department of the Faculty: Management Studies
4. Total number of research papers published by the Faculty in peer reviewed Journals: 4
5. Details of research projects, if any, currently the Faculty: "Women Workers in seafood processing sector in Kerala: Working conditions, Opportunities and Challenges" Currently doing the research work under the guidance of Dr. Nikita Gopal, Principal Scientist, Central Institute of Fisheries and Technology.
6. Details of the equipment(s) the Faculty would like to buy using 'Research Seed Fund-' Statistical software for doing analysis
7. A brief description of the Project that would be undertaken by the Faculty based on the Seed Fund. (250 words)

Plan to do a research project on the topic "The working conditions of women workers in Kerala with special reference to export units". Export units of Kerala provide huge foreign earning to the state. They are providing vast employment opportunities to the women workers. Improving quality of work life is the important factor to retain the women workers. The study will help to examine the working conditions of workers.

8. Proposed Budget of the Project:

Cost of purchase statistical software (SPSS): Rs. 9,000 (Annual Subscription)

Cost of travel to collect primary data: Rs. 10,000

Total cost : Rs. 19000

Name: Krishna A.S

Prof. C.L Babyjohn

Faculty

Head of the Department/Coordinator

**Christ College (Autonomous) Irinjalakuda**  
**Research Project Proposal – Self-Financing**

Submitted by: Ms. Anju Sebastian, Assistant Professor (ADHOC)

Department of Physics (SF)

**Title of the project: Temperature dependent water quality analysis of various water resources in and around Irinjalakuda using metamaterial Split Ring Resonator based sensor.**

**Introduction:**

Metamaterial based Split Ring Resonator (SRR) structures have gained great significance as near field sensors in various industrial, scientific and medical applications due to its unique electromagnetic properties. Different variants of SRRs have gained extra attention in recent decades and a plethora of attempts have been made to utilize them as sensing probes for concentration measurements. Accurate liquid concentration measurements have become much important in research in recent years due to its practical applications in biomedical, chemical industry, food-quality testing and agriculture.

In this modern era of industrialization, urbanization, population increase, and concentrated agricultural actions, there is a huge decline in freshwater sources. The insufficient surface water availability makes people dependent on ground water resources like concealed boreholes. It is important to assess the quality of water frequently to ensure health and hygiene as it is used for domestic, industrial and agricultural purposes. The water quality evaluation is for huge samples containing concentrations for many parameters. The Conventional methods of water quality analysis include chemical and biological analysis which is time consuming and costly based on various water quality indices. Here we are trying to put forward a method to categorize the available water samples, both surface and ground water sources, based on the level of the presence of various contaminants and toxins. The proposed method can also be utilised for the detection of adulterants in edible oils, dairy products, liquid bio-fuels etc .

Hard water contains high concentration of calcium ions, magnesium ions etc. Hardness can also be caused by several other dissolved metals like Aluminium, Barium, strontium, iron, zinc, and manganese. Along with the major contaminants like Ca and Fe that are usually considered for the testing of the quality of potable water, salinity of water is also an inevitable parameter.

**Aim and Objective of the study:**

The objective of the study is to utilise Broadside Coupled Split Ring Resonator metamaterial structure based sensor to analyse the water from various water resources in and around Irinjalakuda and develop a calibration technique to carry out the quality checking of water resources with special emphasis on the presence of Calcium, Iron and Sodium Chloride. Another objective is to study the temperature dependence on the sedimentation process of the pollutants under consideration. Analysis can be done to study about the degree of hardness of given water samples with the help of calibration charts prepared with standard samples.

Perturbations in the near field distribution region of the SRR/ BCSRR test probes can be effectively utilised for achieving this objective with suitable experimental arrangements. Calibration curves are obtained by allowing the liquid sample to flow through a microfluidic channel set between the rings of the BCSRR, excited with microwaves of selected frequency, which results in changes in resonant frequency and from which sensitive measurement of concentrations can be achieved.

Various steps involved in the study may be listed as follows.

- Identification of various elements like Calcium, Iron and salt content which may be present in water samples collected from well and borewells, lake and ponds in and around Irinjalakuda, using chemical analysis
- By preparing solutions of different concentrations based on these identified constituent elements and by allowing the liquid sample to flow through a microfluidic channel set between the rings of the BCSRR, calibration curves are drawn using the changes obtained in resonant frequency.
- Temperature dependent variation of the frequency shifts may also be analysed.
- Then choosing different samples of water from various sources and analyse the frequency shifts using BCSRR concentration sensor to identify if the given sample can be used as potable water by using the calibration curves obtained with potable water samples.

**Methodology:**

An experimental setup with a BCSRR as the test probe is used to study the effect of concentration variation on the resonant frequency at microwave frequencies. The shift in resonant frequency of BCSRR due to the influence of near field perturbations caused by the variation in molar concentration changes of various salt solutions and iron and calcium mixtures in water, is measured. A capillary tube of bore dimension around 1 mm can be used

to place the sample between the BCSRR rings. Two electrical probes connected to Vector Network Analyzer (VNA), one acting as transmitter and other as receiver are arranged parallel to the plane of BCSRR, which is placed symmetrically on the capillary tube arrangement. Temperature variation can be studied heating the samples to different temperatures and repeat the experiments with the above-mentioned experimental setup.

The dependence of dielectric properties on the resonant frequency enables the possibility of utilizing the BCSRR structure as a probe to precisely determine the concentration of the various solutions and using that identify the water quality as well. One distinct advantage of this BCSRR based method is that it can be used for the accurate determination of the concentration of liquids even if it is of very low value. Once the calibration graph is made ready, it takes very little time for the measurement of concentration of the liquid samples.

**Expected outlay:**

1. Chemical Analysis and verification	- ₹ 10000.00
2. Chemicals and Glassware	- ₹ 5000.00
3. Fabrication charges & transmission cables	- ₹ 4000.00
4. Travel	- ₹ 3000.00
5. Miscellaneous	- ₹ 2000.00
<b>Total</b>	<b>- ₹ 25000.00</b>

**References:**

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