



THE COCHIN COLLEGE

Koovapadam, Kochi-2

Affiliated To Mahatma Gandhi University

Re-accredited by NAAC With B+ Grade



Fourth Cycle
NAAC Accreditation 2024

Criterion 1 Curricular Aspects

1.3 - Academic Flexibility

Metric No. 1.3.2

Percentage of students undertaking project work/field work/ internships

Projects - Physics

Submitted to



National Assessment and Accreditation Council



THE COCHIN COLLEGE

KOCHI - 682 002

(Affiliated to Mahatma Gandhi University and Accredited by NAAC)

Website: www.thecochincollege.edu.inemail: email@thecochincollege.edu.in

Declaration of Principal

This is to certify that following 39 students from The Department of Physics have completed Project work during the academic year 2023-2024

Sl. No.	Title of the Program	Number of Students
1	BSc Physics	28
2	MSc Physics	11





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List of students who undertook project works from Department of Physics during the year 2023-24

SL NO	PROGRAMME NAME	NAME OF STUDENT	PROJECT WORK/ FIELD/INTERNSHIP
1	BSc Physics	Adhil M P	PROJECT WORK
2	BSc Physics	Janet Aleena VA	PROJECT WORK
3	BSc Physics	MUNEER SAHUMAN V. N	PROJECT WORK
4	BSc Physics	Vyshnav P V	PROJECT WORK
5	BSc Physics	Sourav K Dimithrove	PROJECT WORK
6	BSc Physics	Shuhaib ansal	PROJECT WORK
7	BSc Physics	M.A Reji Shilsha	PROJECT WORK
8	BSc Physics	KrishnaPriya.P	PROJECT WORK
9	BSc Physics	GANGA SUDHEER V	PROJECT WORK
10	BSc Physics	VANDANA KU	PROJECT WORK
11	BSc Physics	Amal Ajith	PROJECT WORK
12	BSc Physics	Neenu P R	PROJECT WORK
13	BSc Physics	ABHIRAMI V R	PROJECT WORK
14	BSc Physics	Kavya.s	PROJECT WORK
15	BSc Physics	Avaniprabha N J	PROJECT WORK
16	BSc Physics	Aparna sanil kumar	PROJECT WORK
17	BSc Physics	Nikitha Antony	PROJECT WORK
18	BSc Physics	Suhana KS	PROJECT WORK
19	BSc Physics	Nahana T.A	PROJECT WORK
20	BSc Physics	Nandana Bharathan	PROJECT WORK
21	BSc Physics	Nandana Suresh	PROJECT WORK
22	BSc Physics	Athulya Anilkumar	PROJECT WORK
23	BSc Physics	Nikhil k u	PROJECT WORK
24	BSc Physics	Safrinsudheer	PROJECT WORK
25	BSc Physics	Sarika uthaman	PROJECT WORK
26	BSc Physics	FARZANA SULAIMAN	PROJECT WORK
27	BSc Physics	Nihala Nazrin CN	PROJECT WORK
28	BSc Physics	Vaishnavi.T.P	PROJECT WORK
29	Msc Physics	Abhirami Sajeev	PROJECT WORK
30	Msc Physics	Adlinbabisha S	PROJECT WORK
31	Msc Physics	Ananthu E J	PROJECT WORK
32	Msc Physics	Anukrishna R	PROJECT WORK
33	Msc Physics	Devika Biju	PROJECT WORK
34	Msc Physics	Hridika K P	PROJECT WORK
35	Msc Physics	Liyana V P	PROJECT WORK
36	Msc Physics	Meenakshi P H	PROJECT WORK
37	Msc Physics	Milin Maria Benny	PROJECT WORK
38	Msc Physics	Reshma M	PROJECT WORK
39	Msc Physics	Sreelekha T S	PROJECT WORK





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SPECIFIC ROTATION OF SUGAR SOLUTION

Project report submitted to

MAHATMA GANDHI UNIVERSITY

In partial fulfilment of the requirements for the

Degree of Bachelor of Science in Physics

Submitted by

SARIKA UTHAMAN

Under the guidance of

ALPHONSA RANI T. A



DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE 2021-2024





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CERTIFICATE

This is to certify that the project entitled "Specific Solution of Sugar Solution" is a bonafide report of the work done by Sarika Uthaman (Reg No:210021035904) under my supervision in the college during the VI semester (academic year 2020-2021) for the partial fulfilment of the requirements for the award of the BACHELOR OF SCIENCE DEGREE IN PHYSICS from MAHATMA GANDHI UNIVERSITY, KOTTAYAM.

(Project guide) Alphonsa Rani T-A *J Rani*

(Head of the department)

NAME OF THE EXTERNAL EXPERT :-

SIGNATURE OF EXTERNAL EXPERT :-

Dr. Anand Chandran
2/5/21

Dr. Vijeesh P





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SPECIFIC ROTATION OF SUGAR SOLUTION

Project report submitted to

MAHATMA GANDHI UNIVERSITY

In partial fulfilment of the requirements for the

Degree of Bachelor of Science in Physics

Submitted by

NIKHIL K.U

Under the guidance of

ALPHONSA RANI T. A



DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE 2021-2024





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CERTIFICATE

This is to certify that the project entitled "Specific Solution of Sugar Solution" is a bonafide report of the work done by Nikhil K.U (Reg No:210021035902) under my supervision in the college during the VI semester (academic year 2020-2021) for the partial fulfilment of the requirements for the award of the BACHELOR OF SCIENCE DEGREE IN PHYSICS from MAHATMA GANDHI UNIVERSITY, KOTTAYAM.


(Project guide) *Alphonsa Rani T.A* *(Paru)*
(Head of the department)

NAME OF EXTERNAL EXPERT :-

SIGNATURE OF EXTERNAL EXPERT :-

Alfonsa
2/5/24
Dr Laxmi Chandras
Prabhu

Dr Vijeesh P







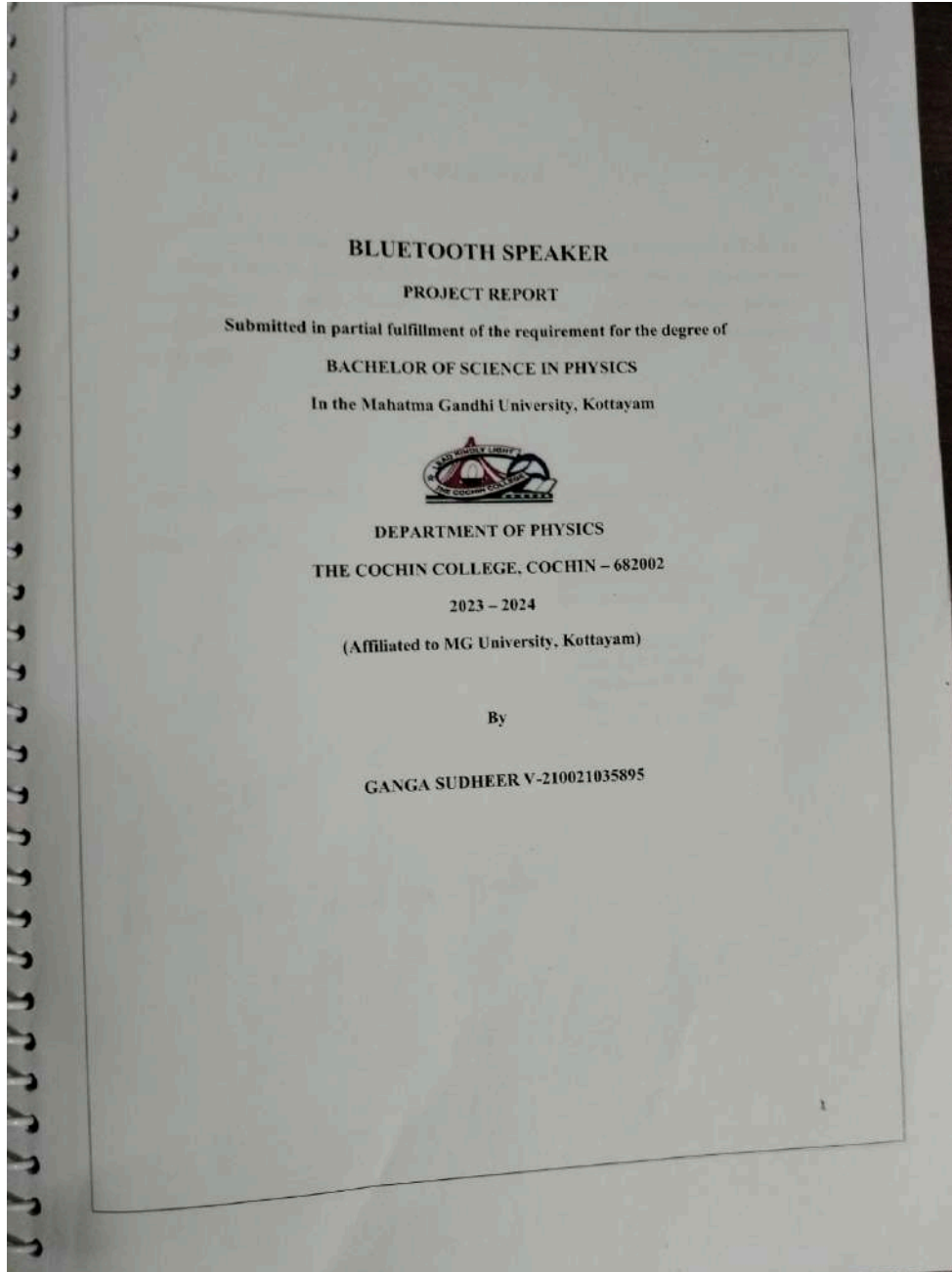
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Place : KOVALAPADAM

Date : 2-5-24

Examiner : 1

Ganga Sudheer
2/5/24

Dr. hamesh Chand ra prbu ✓

Vijeesh P
Dr. Vijeesh P

Supervising Guide

Vijeesh P
Professor
Department of Physics
The Cochin College

Dr. VIJEESH P.
Assistant Professor
Department of Physics
The Cochin College
Kochi-682002

2





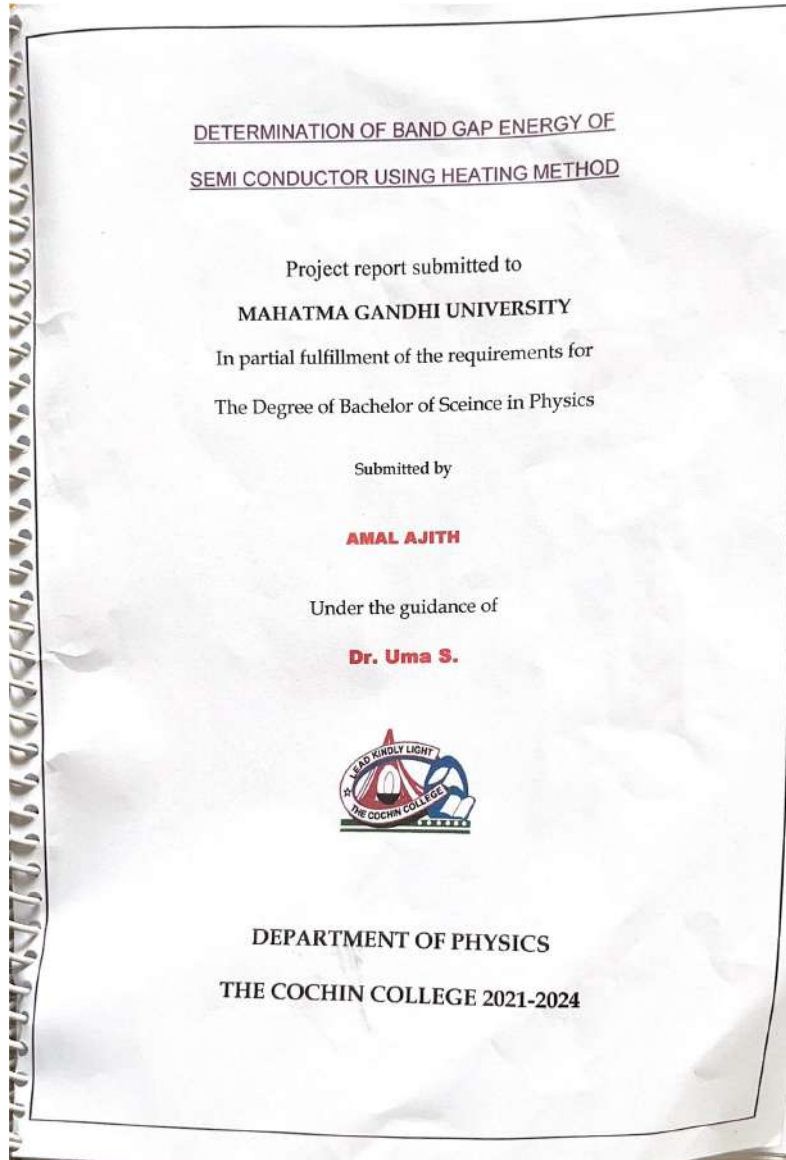
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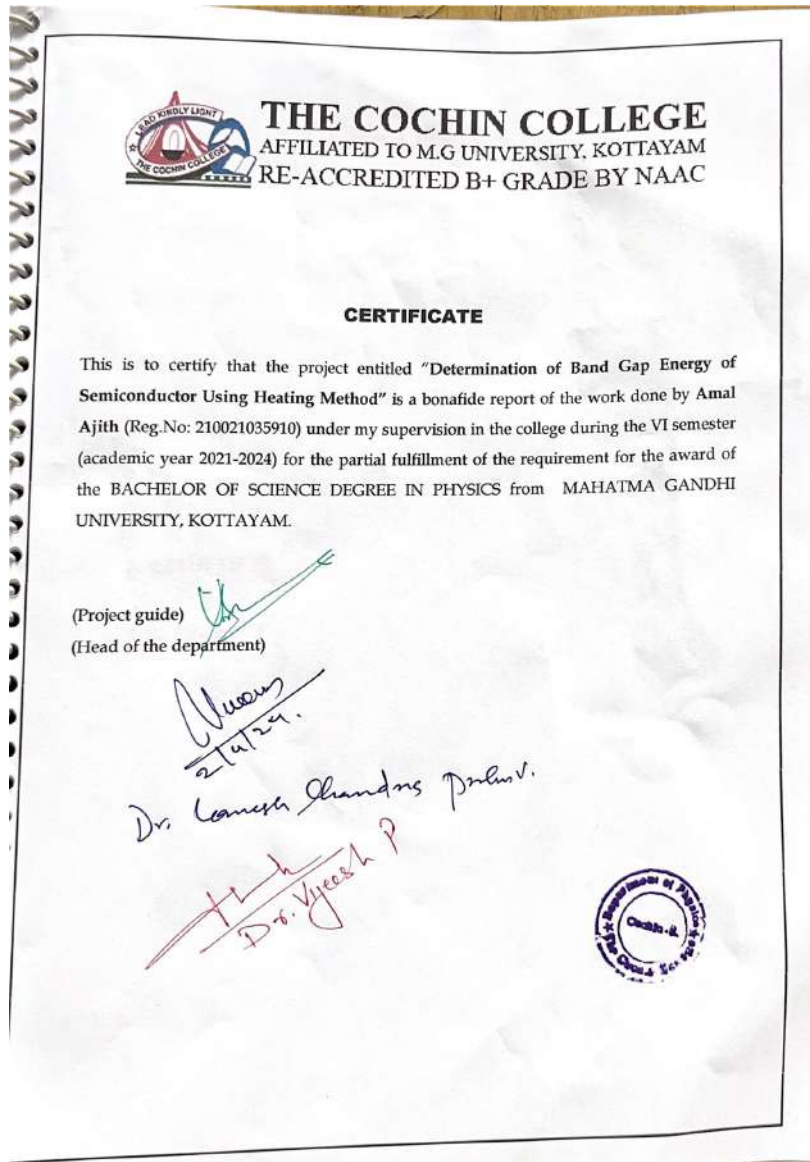
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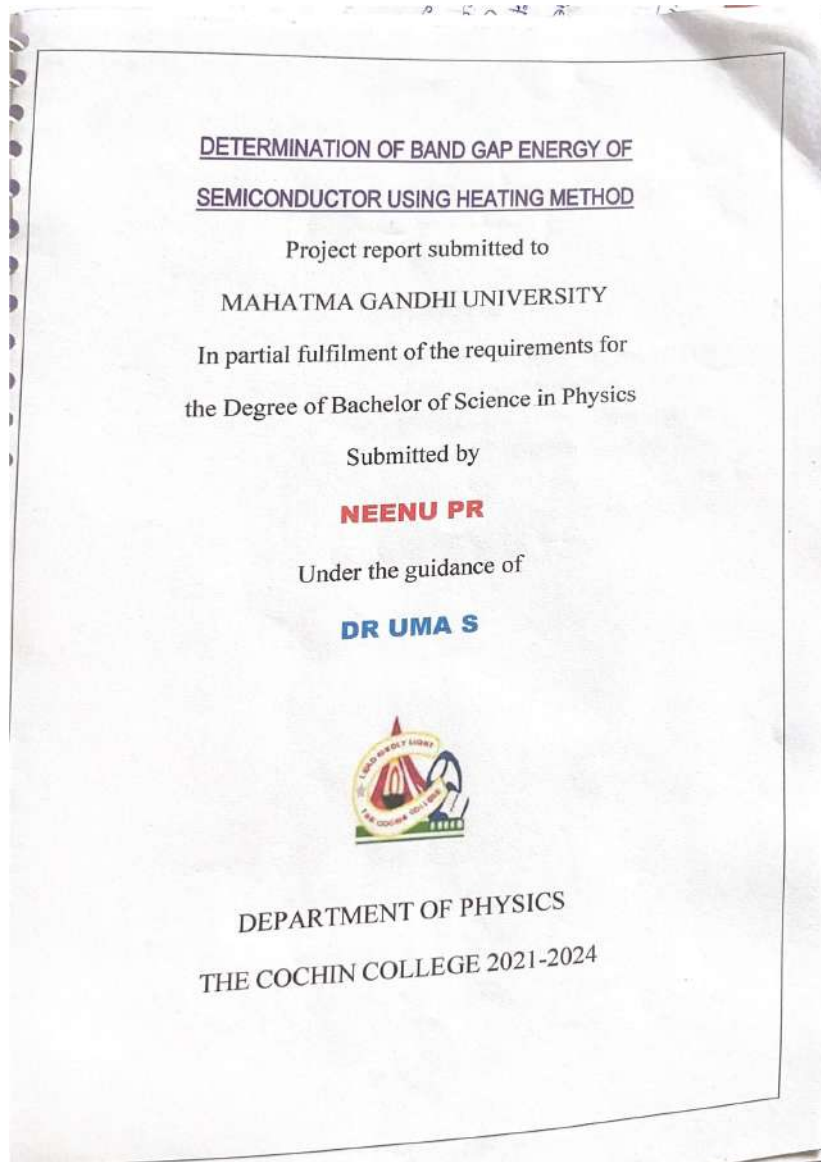
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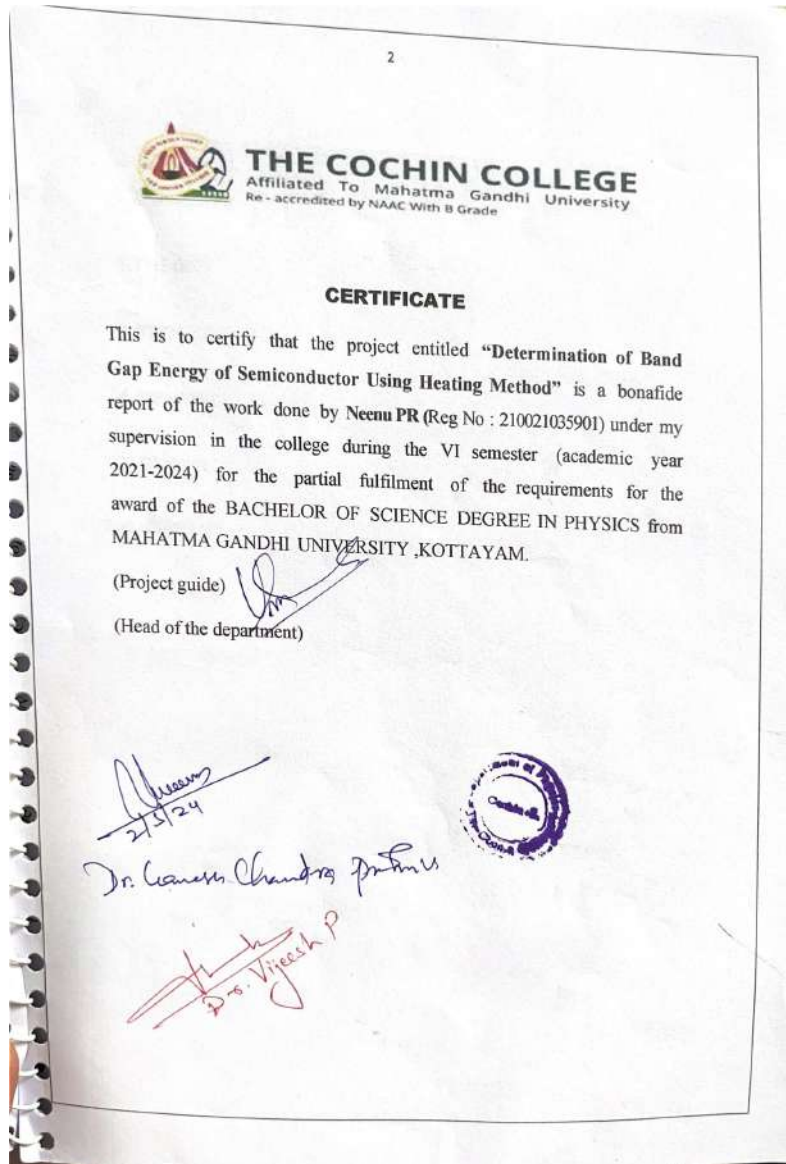
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DETERMINATION OF DIELECTRIC CONSTANT OF SOLUTIONS USING LCRPROJECT

A Dissertation Presented By

KAVYA S -210021035897

Submitted to

DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE COCHIN -682002

KOCHI -2



(Affiliated to MG University, Kottayam)

In partial fulfilment

of the requirements for the degree of

BACHELOR OF SCIENCE(PHYSICS)

April 2024

1





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CERTIFICATE

This is to certify that the original and genuine. Investigation work has been carried out to Investigate about the subject matter and relative data collection and investigation has been completely, solely, sincerely, and satisfactorily done by Kavya S - 210021035897, Regarding this project for the determination of dielectric constant of solutions using LCR for the academic year 2023-2024.

Examiner 1 :-

Examiner 2 :-

Place: Kochi
Date: May 01, 2024

Dr. James Chandras Prasad

2/5/24 Dr. Vijes P

Dr. Paulbert Thomas
Assistant Professor
The Cochin College



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DETERMINATION OF BAND GAP ENERGY OF
SEMICONDUCTOR USING HEATING METHOD

Project report submitted to
MAHATMA GANDHI UNIVERSITY
In partial fulfilment of the requirements for
the Degree of Bachelor of Science in Physics

Submitted by

ABHIRAMI VR

Under the guidance of

DR UMA S



DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE 2021-2024





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CERTIFICATE

This is to certify that the project entitled "Determination of Band Gap Energy of Semiconductor Using Heating Method" is a bonafide report of the work done by Abhirami VR (Reg No : 210021035908) under my supervision in the college during the VI semester (academic year 2021-2024) for the partial fulfilment of the requirements for the award of the BACHELOR OF SCIENCE DEGREE IN PHYSICS from MAHATMA GANDHI UNIVERSITY ,KOTTAYAM.

(Project guide)

(Head of the department)

2/8/24

Dr. Laxmi Chand - Principal



Dr. Vijesh P



Mrudula Menon V.
Principal-in-Charge
The Cochin College



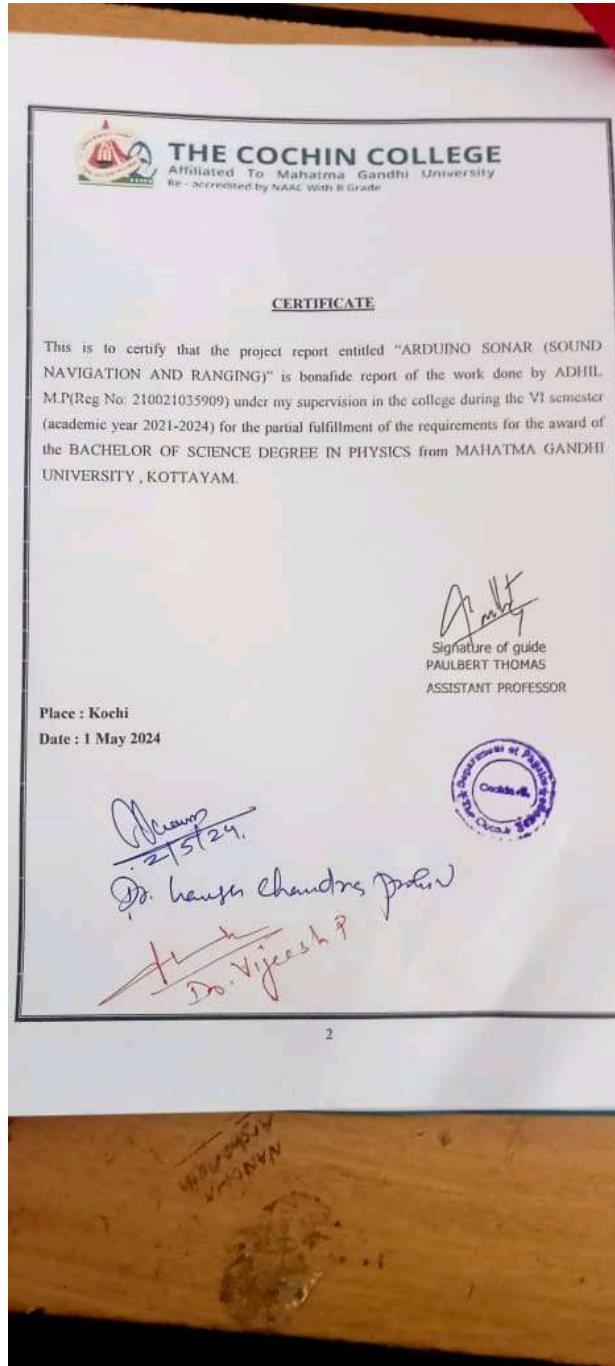
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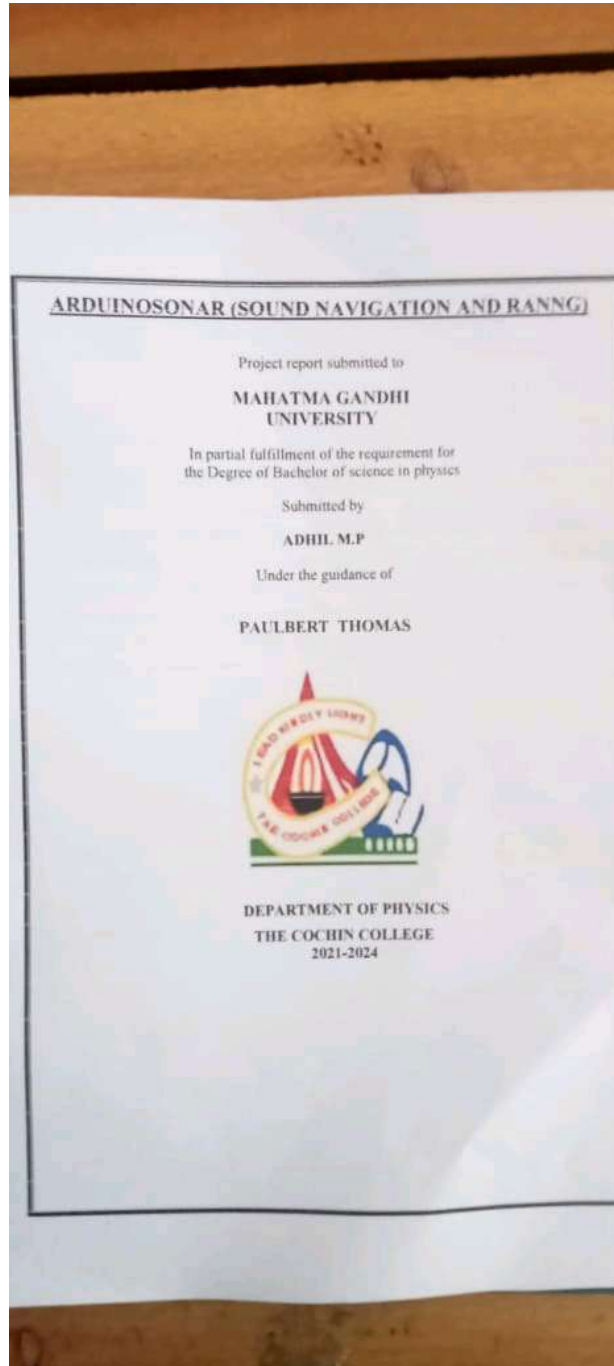
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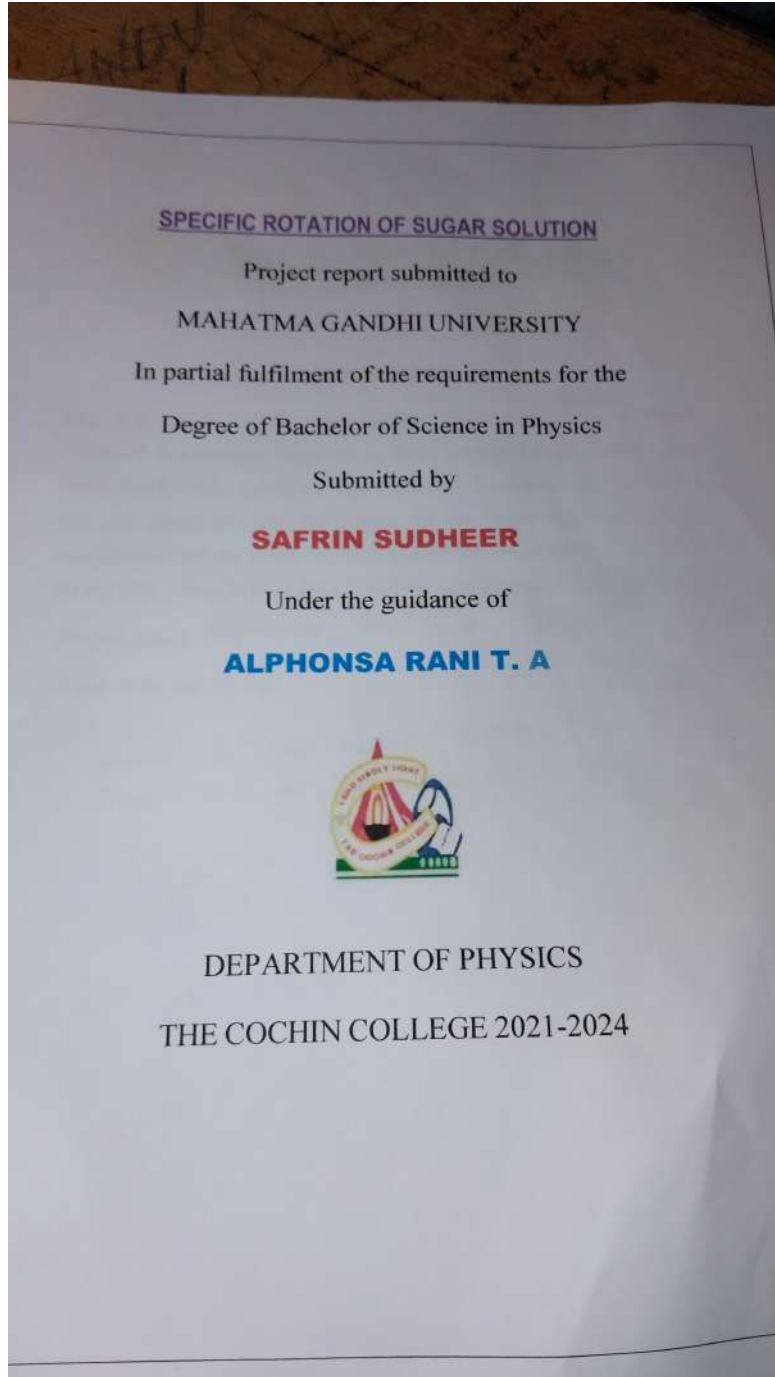
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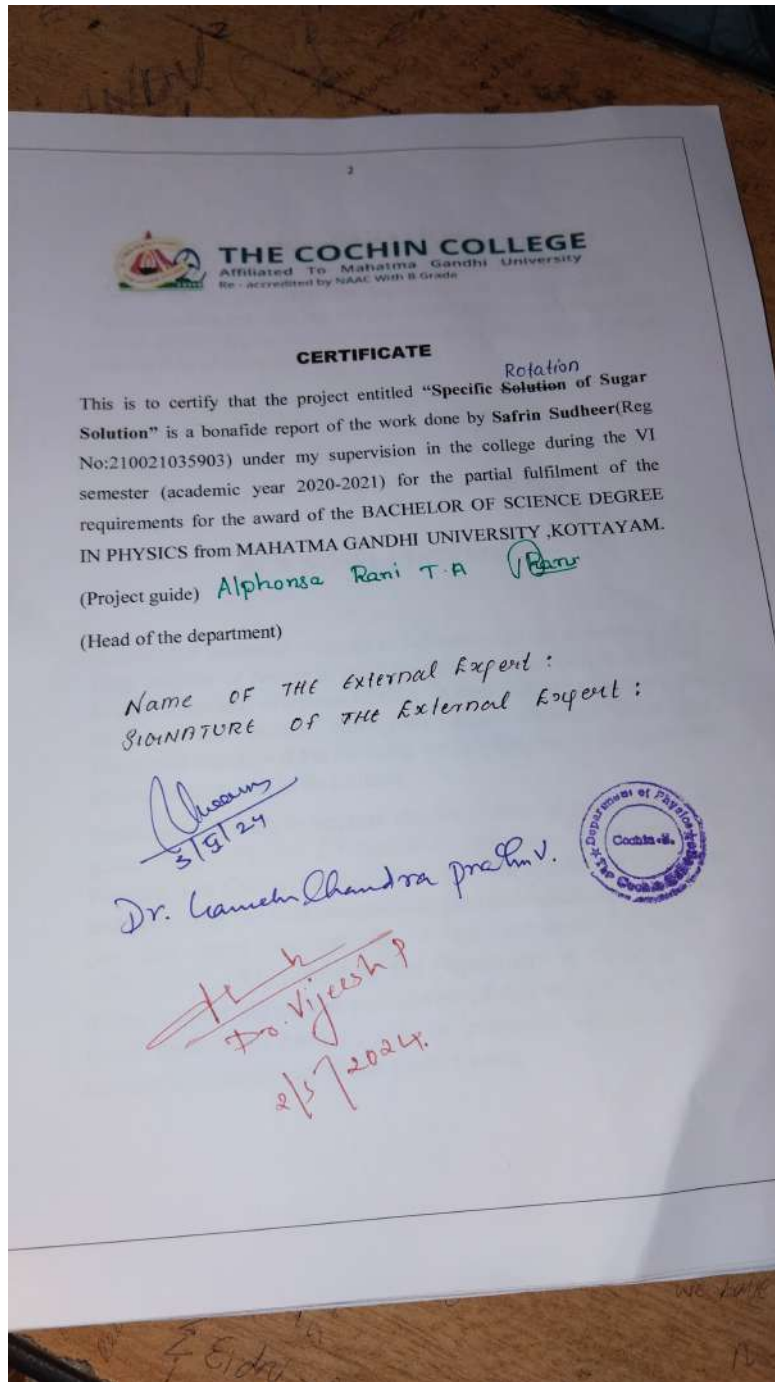
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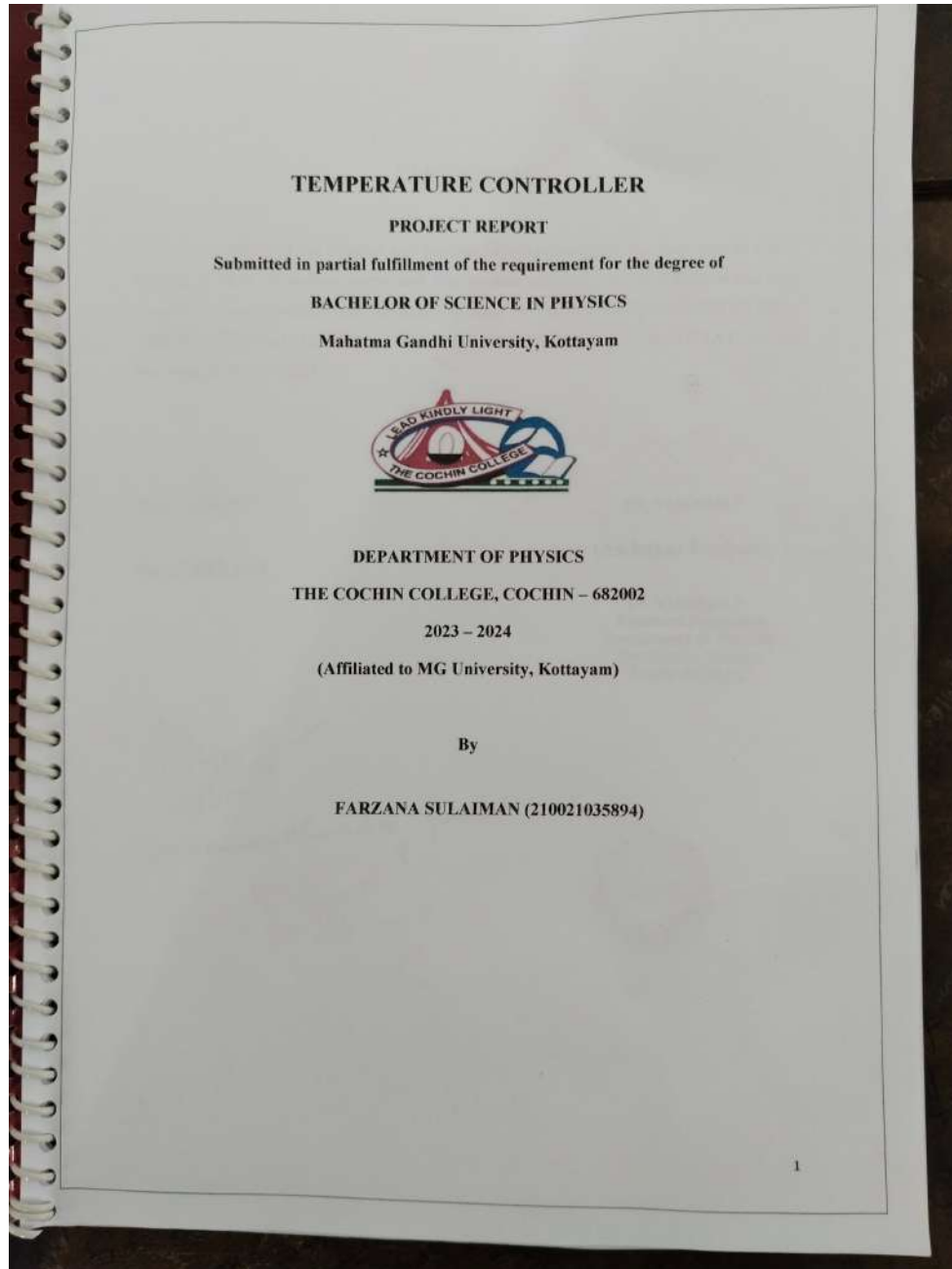
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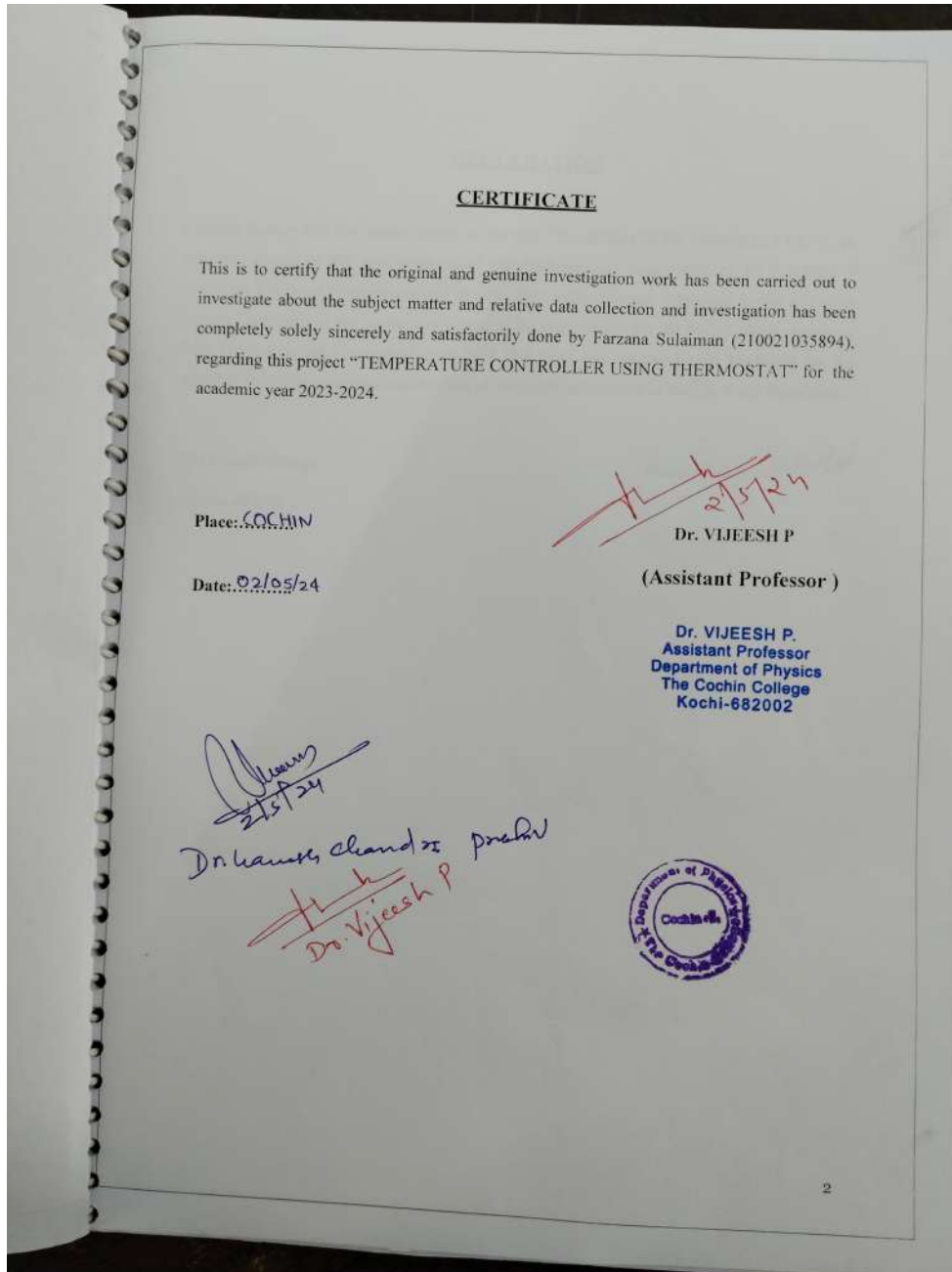
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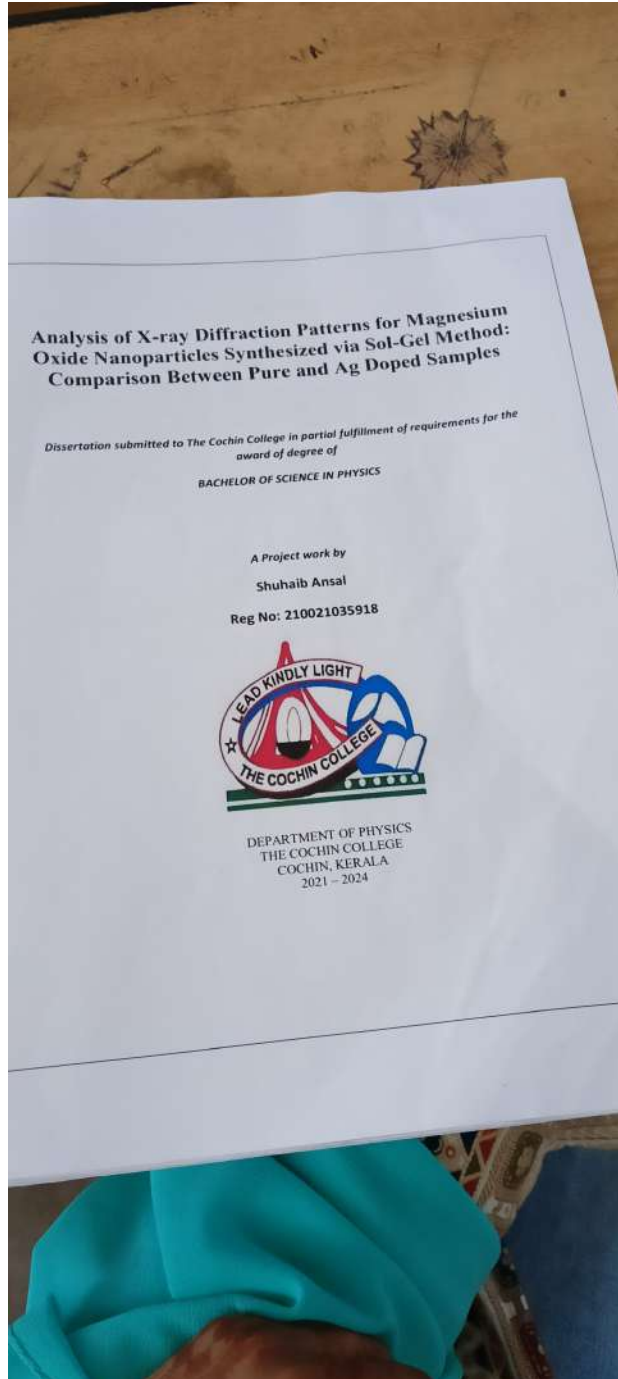
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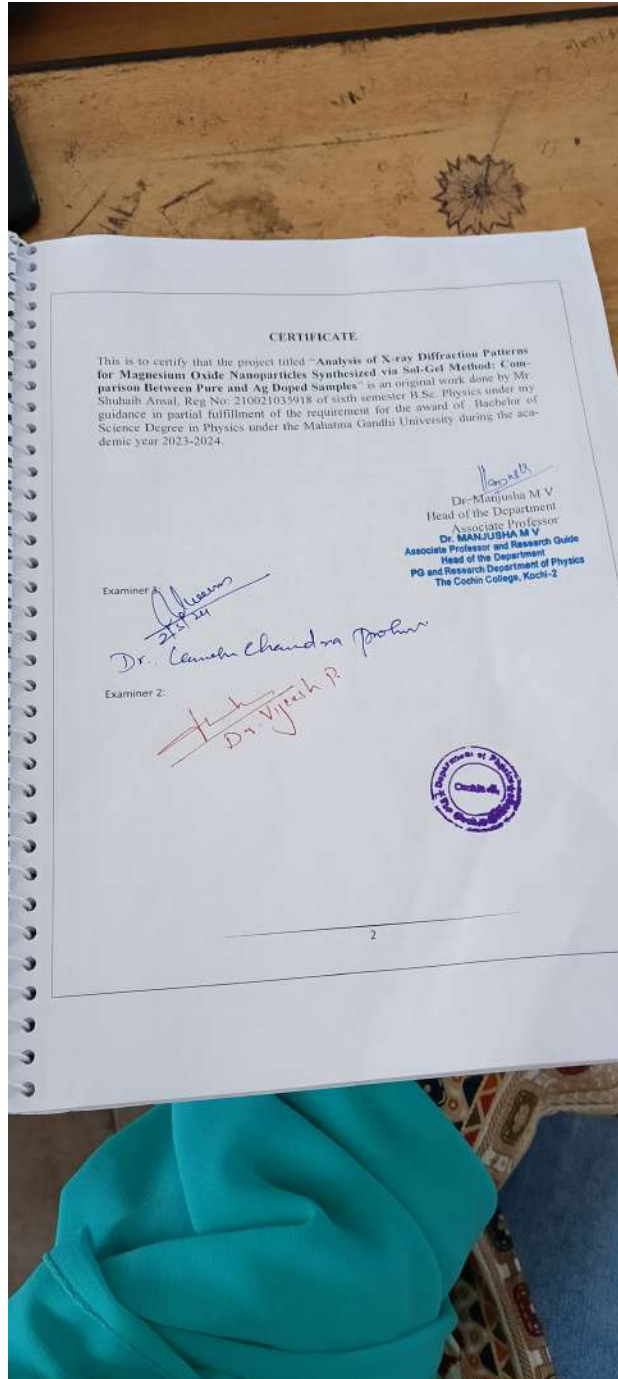
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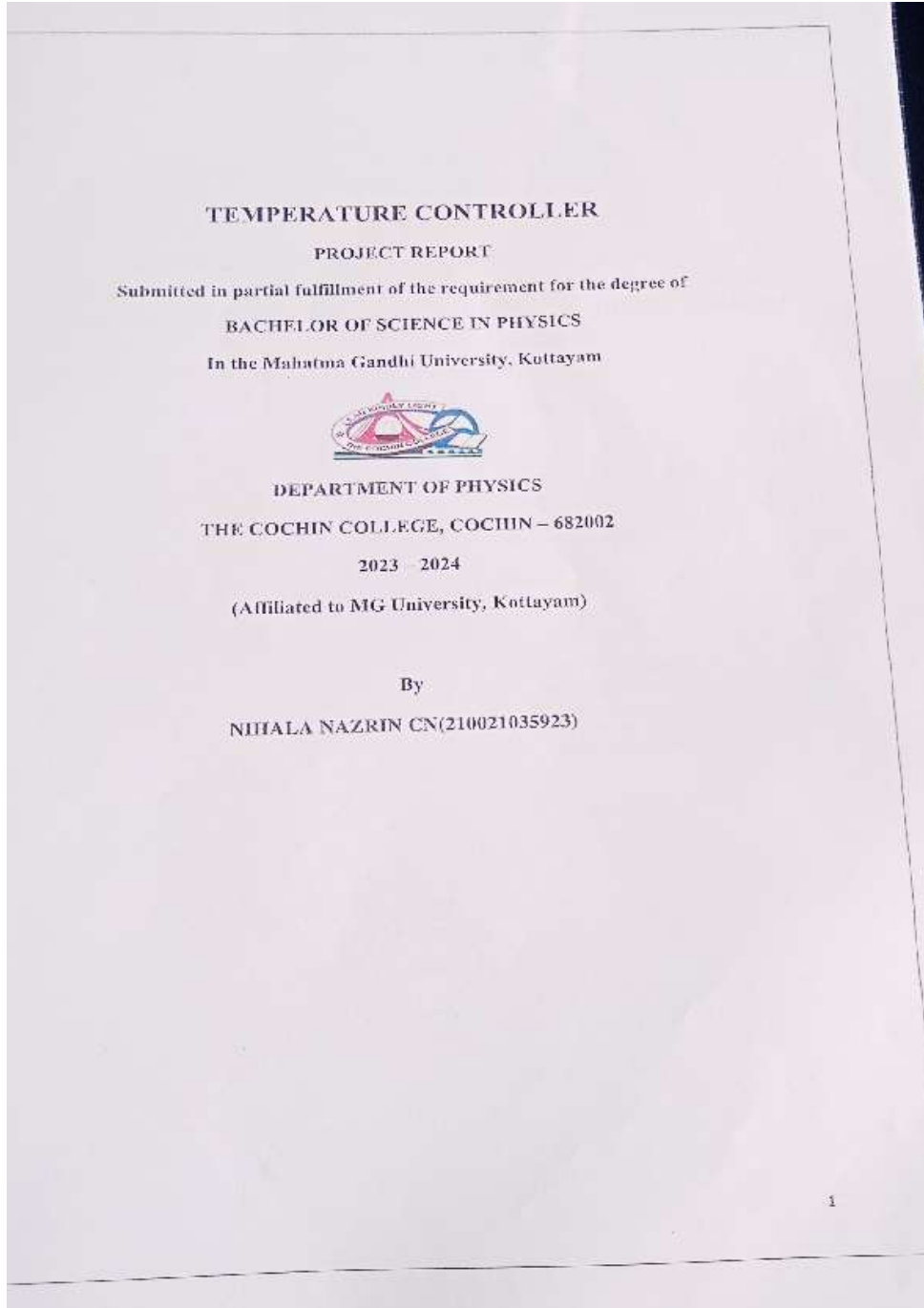
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CERTIFICATE

This is to certify that the original and genuine investigation work has been carried out to investigate about the subject matter and relative data collection and investigation has been completely solely sincerely and satisfactorily done by Nihala Nazrin C.N(210021035920) regarding this project:

"TEMPERATURE CONTROLLER USING THERMOSTAT" for the academic year 2023-2024

Place : COCHIN

Date : 21/5/24

Dr. VIJEESH P

(Assistant Professor)

Dr. VIJEESH P.
Assistant Professor
Department of Physics
The Cochin College
Kochi-682002

Signature
21/5/24
Dr. Manjeri Chandran



Signature
Dr. Vijeesh P



Signature
Mrudula Menon V.
Principal-in-Charge
The Cochin College



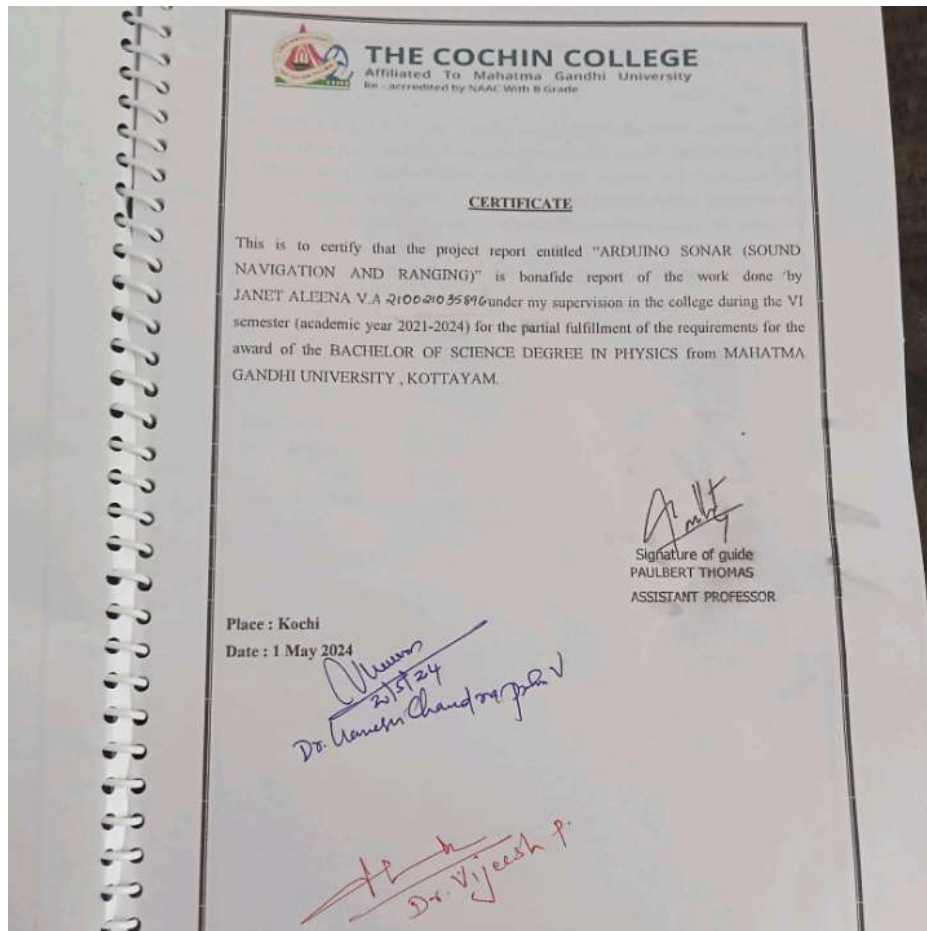
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Mrudula Menon V.
Mrudula Menon V.
Principal-in-Charge
The Cochin College



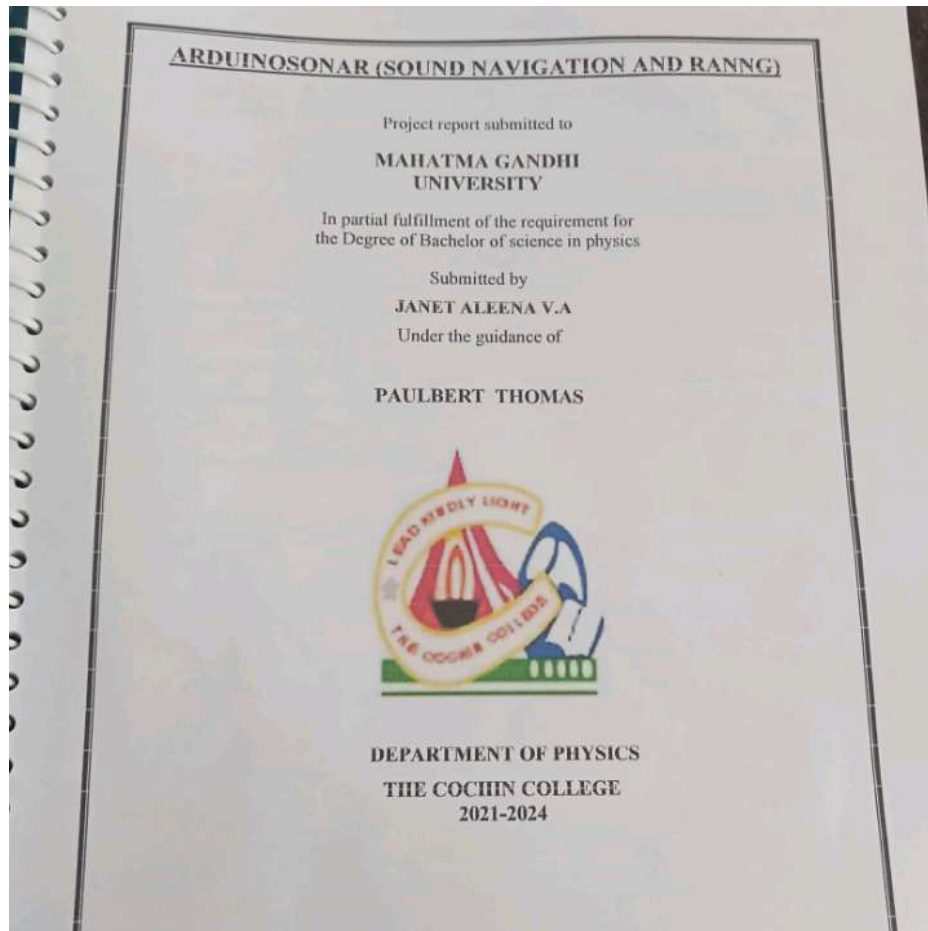
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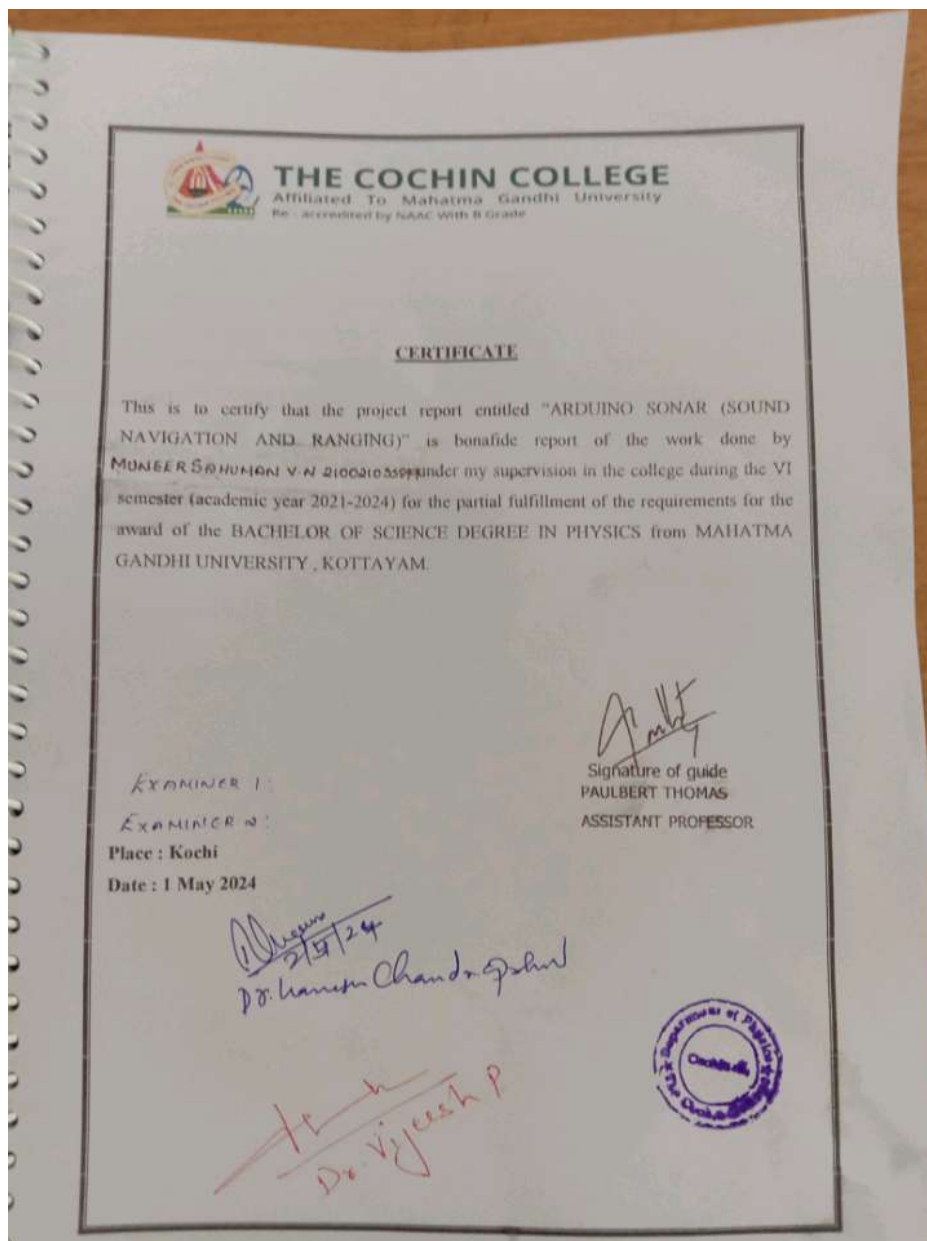
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Mrudula Menon V.
Mrudula Menon V.
Principal-in-Charge
The Cochin College



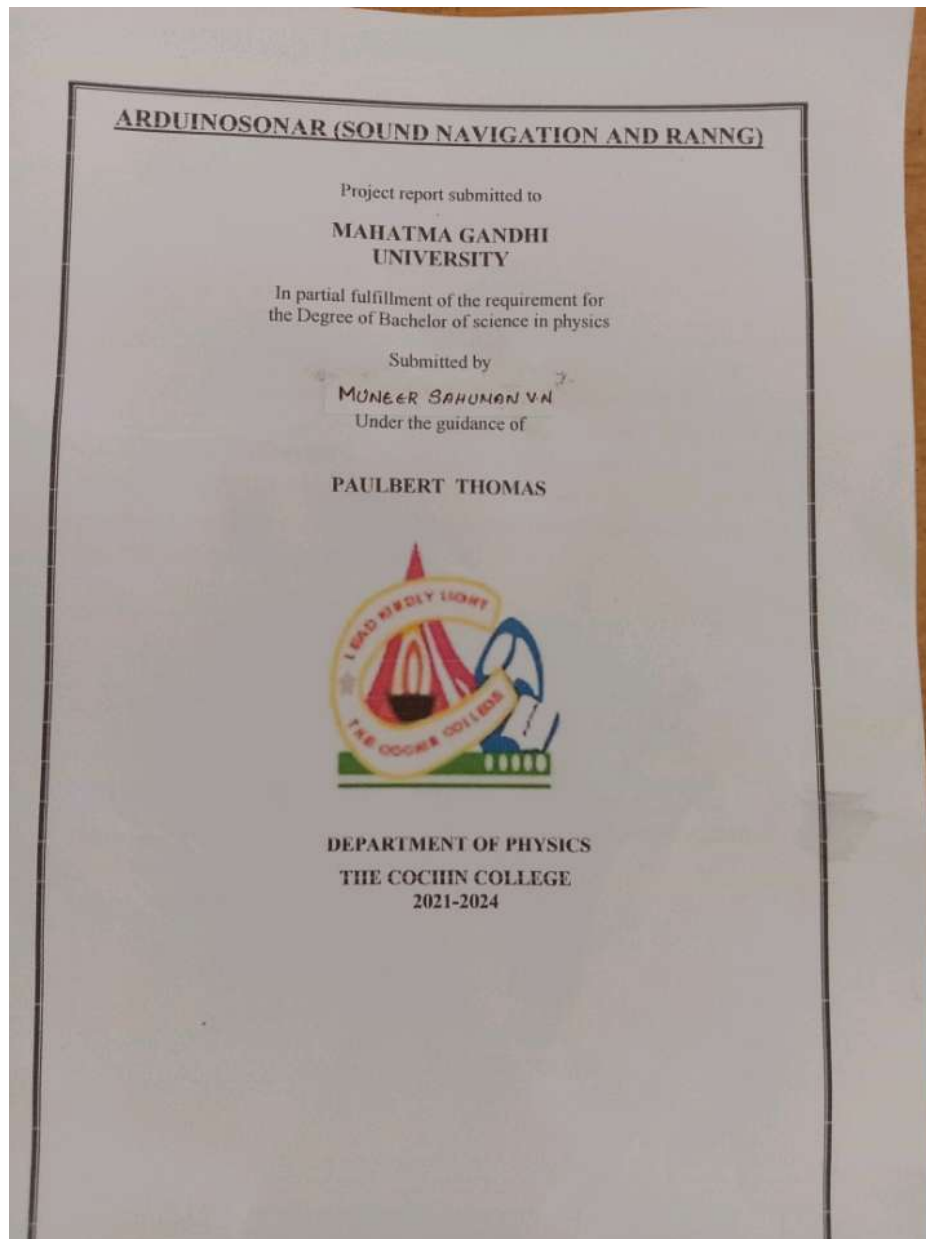
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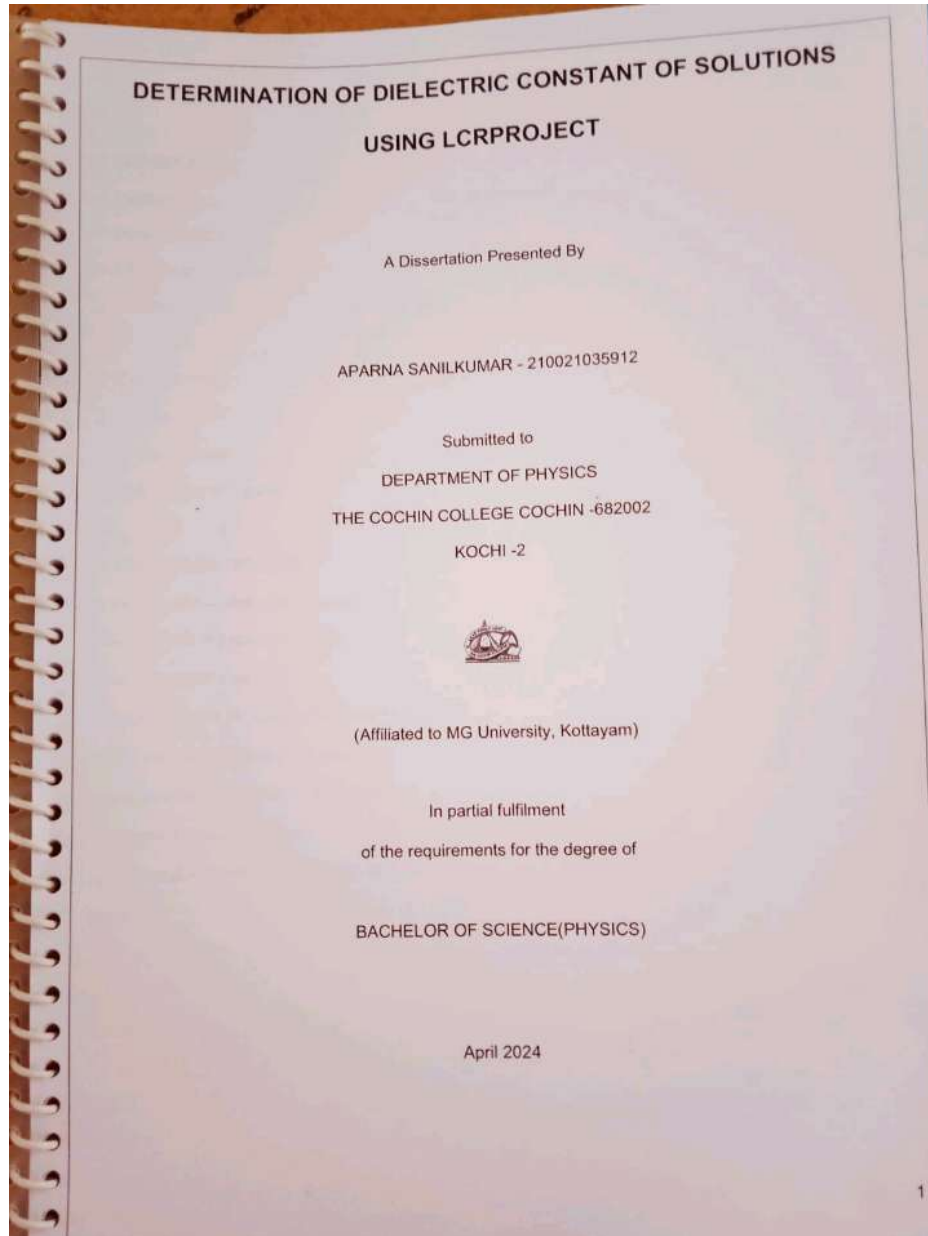
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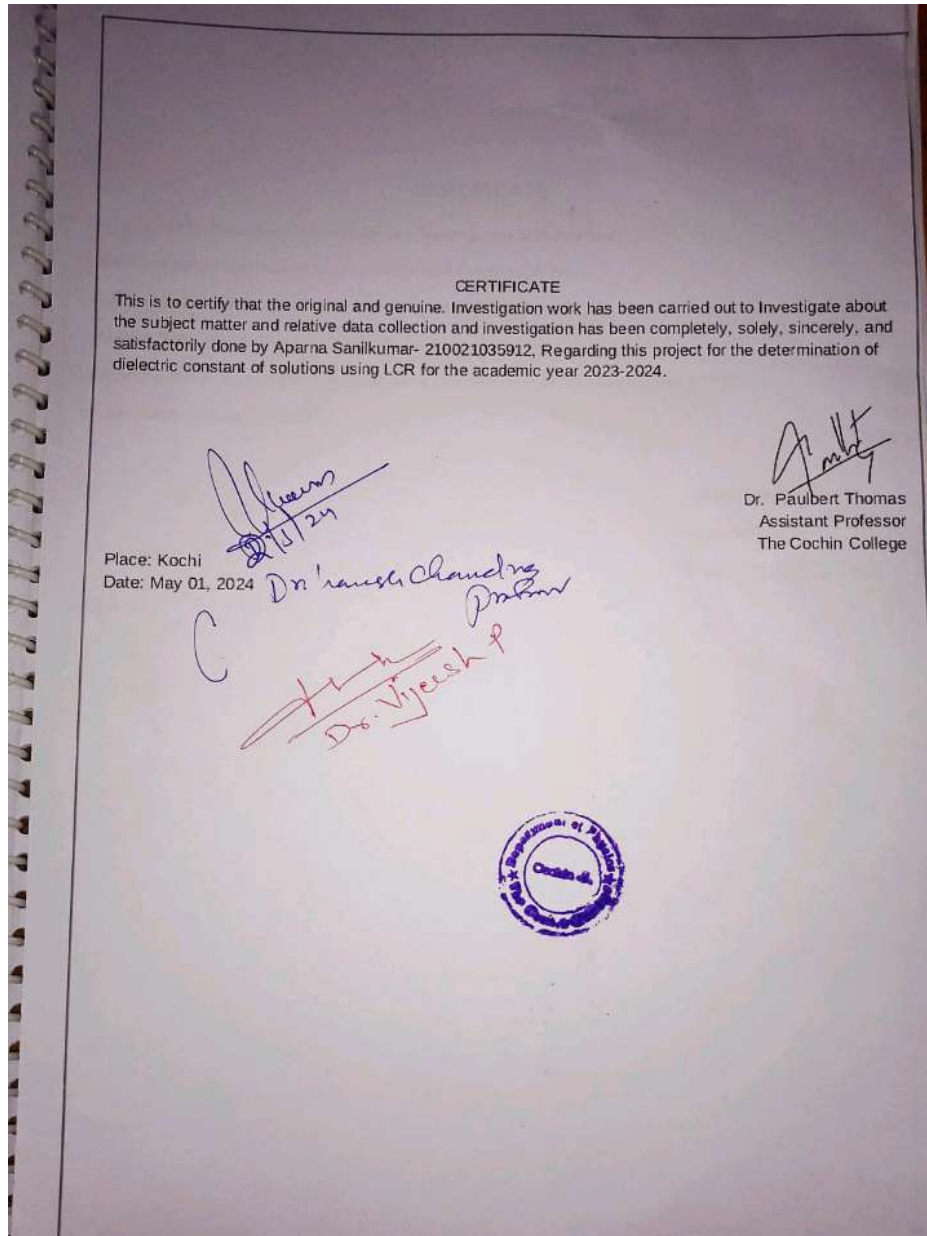
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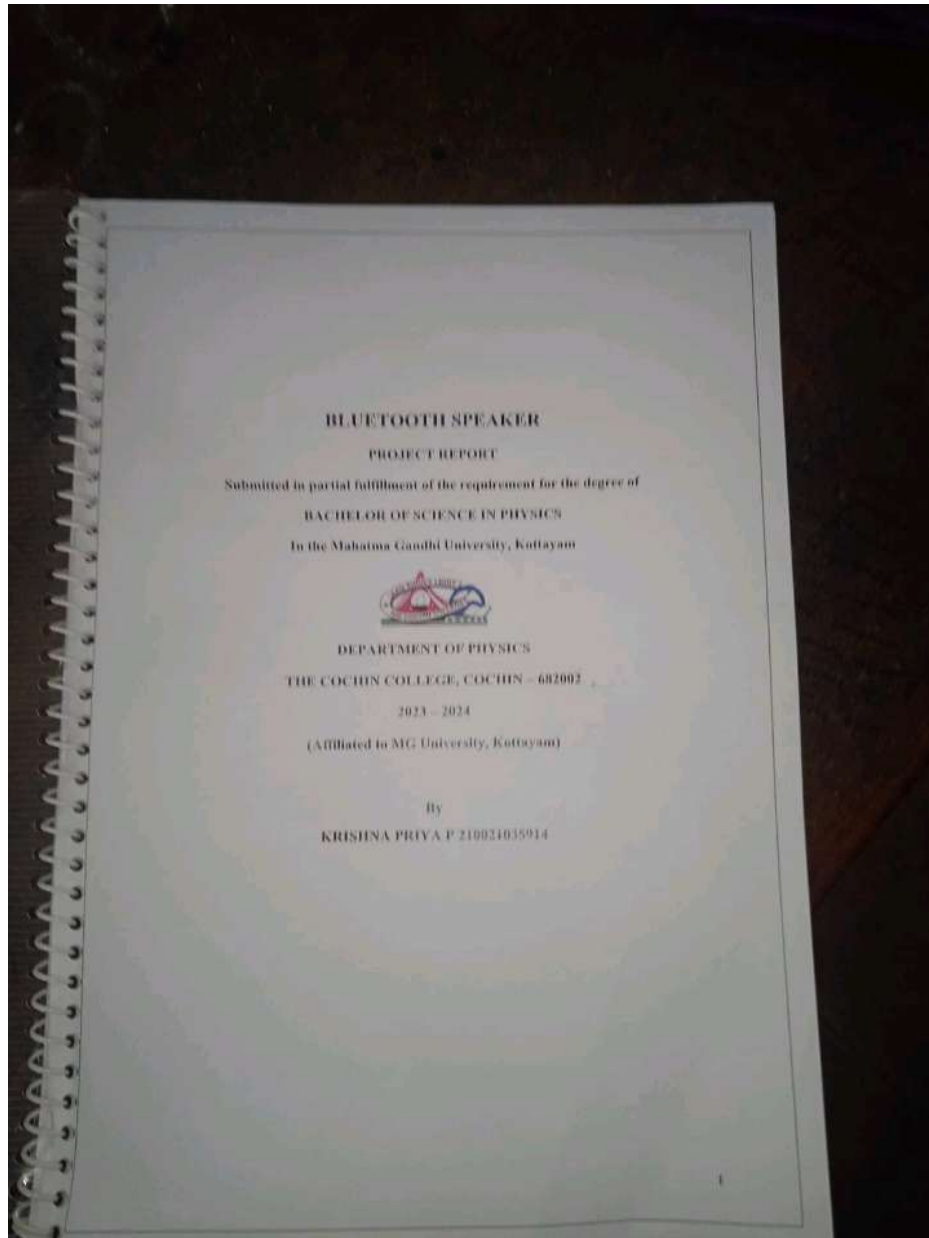
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Supervising Guide

Vijeesh P
Professor
Department of Physics
The Cochin College

Place KCCV, APADAM

Date: 2.2.24

Dr. Vaneen chandras
Principal

Dr. VIJEESH P.
Assistant Professor
Department of Physics
The Cochin College
Kochi-682002





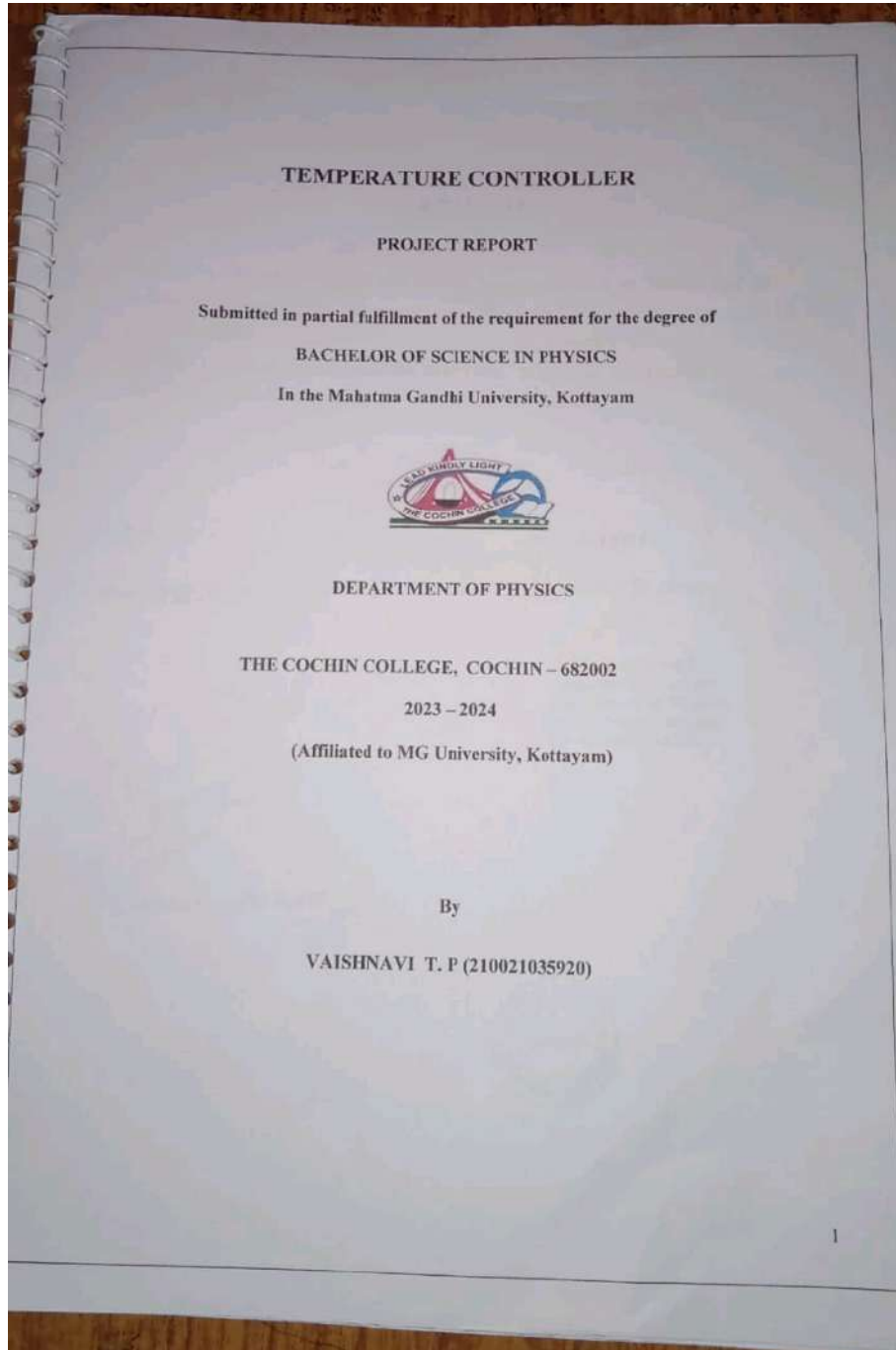
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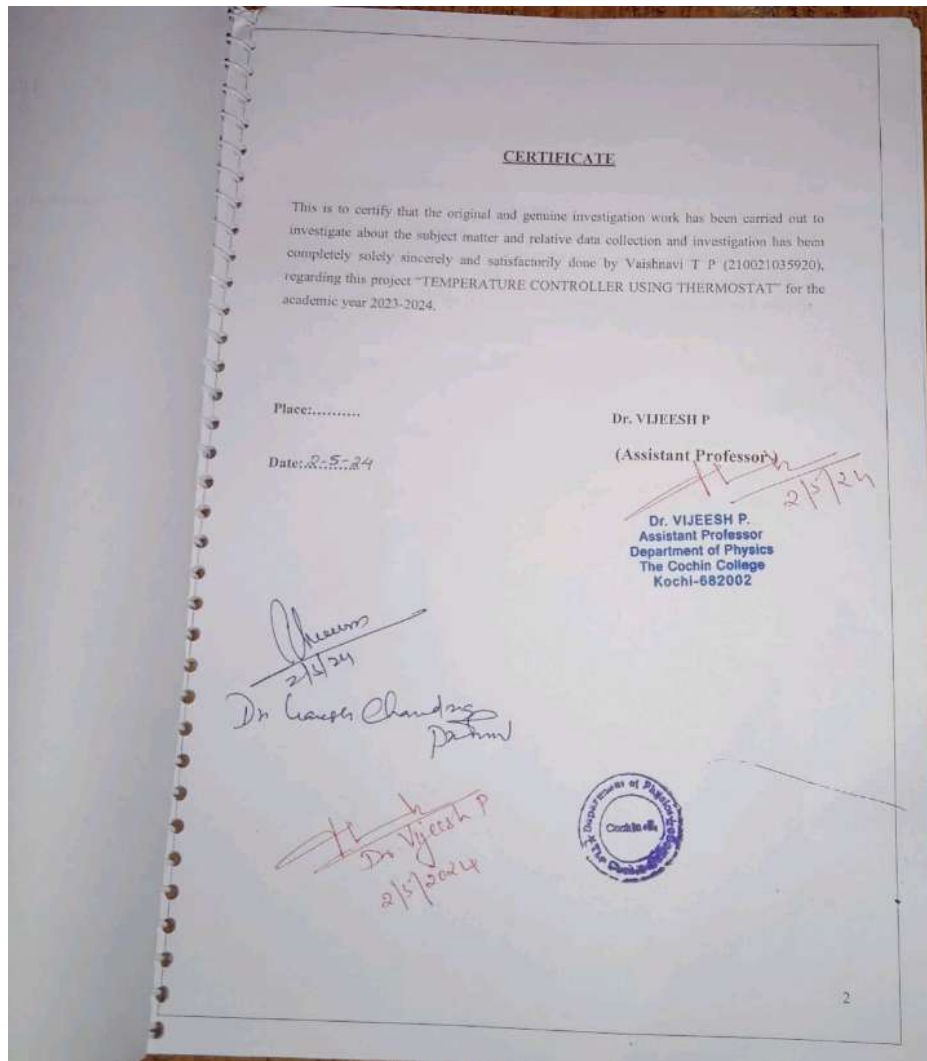
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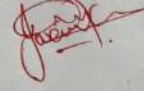
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COCHIN-682002



CERTIFICATE

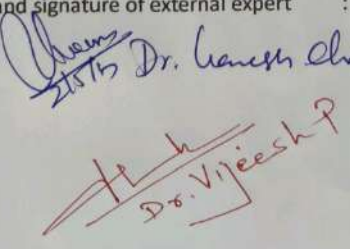
This is to certify that the project work entitled "GRAVITATIONAL THREE BODY PROBLEM AND LAGRANGE POINT" bonafide piece of study done by **NANDANA SURESH** under the guidance supervision of **DR. JOSE MATHEW**, Assistant Professor, Post Graduate and Research Department of Physics, and also no part has been presented for any other degree. The study was undertaken for a period of six months.


Name of the guide : DR. JOSE MATHEW

Signature of the guide : 

Name of the Head of Department :

Signature of the Head of Department :

Name and signature of external expert : 







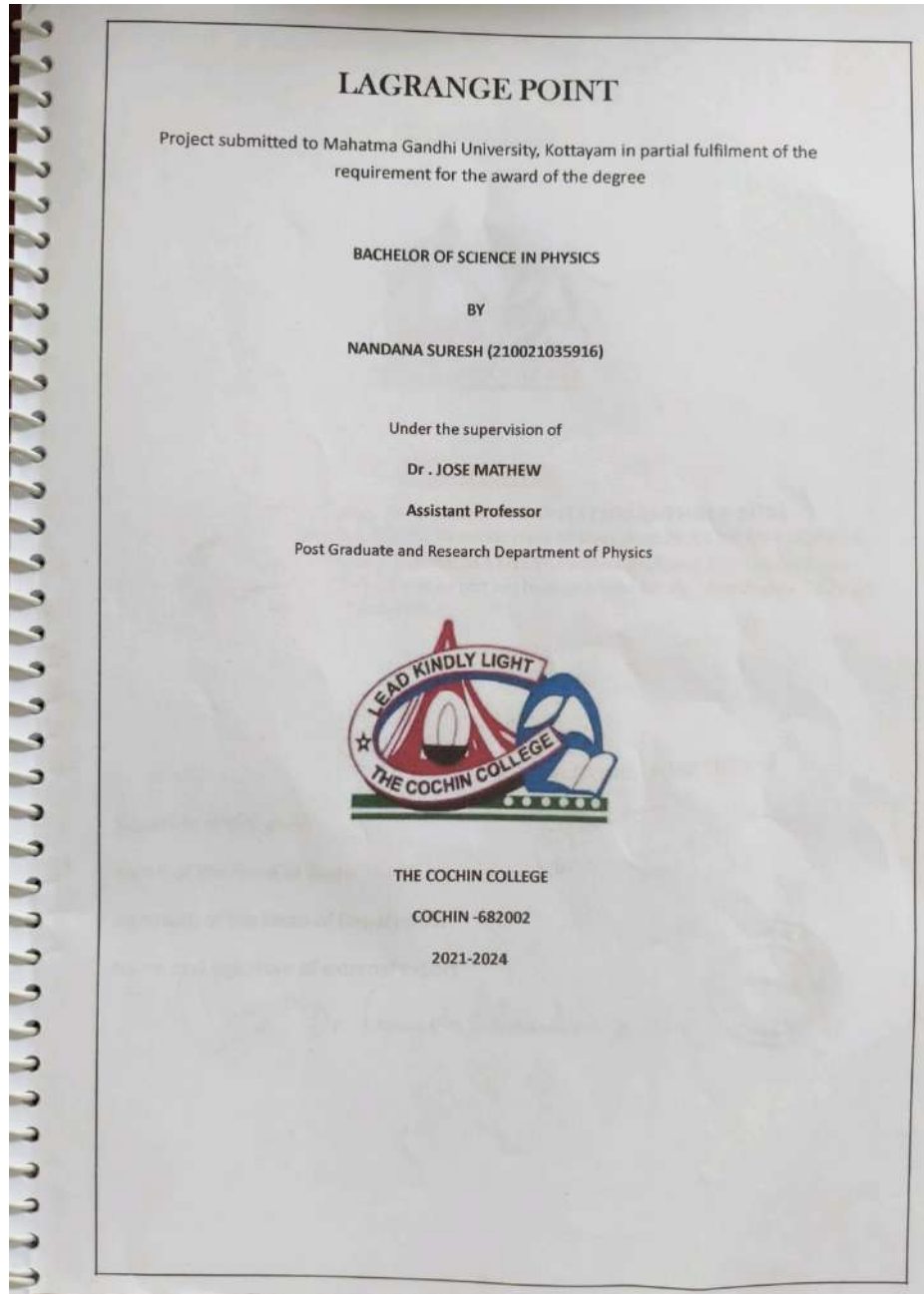
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BLUETOOTH SPEAKER

PROJECT REPORT

Submitted in partial fulfillment of the requirement for the degree of

BACHELOR OF SCIENCE IN PHYSICS

In the Mahatma Gandhi University, Kottayam



DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE, COCHIN - 682002

2023 - 2024

(Affiliated to MG University, Kottayam)

By

M. A REJI SHILSHA -210021035898

1





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CERTIFICATE

This is to certify that the original and genuine investigation work has been carried out to investigate about the subject matter and relative data collection and investigation has been completely solely sincerely and satisfactorily done by Reji Shilsha (210021035898). regarding this project BLUETOOTH SPEAKER for the academic year 2023- 2024.

Place : KODAMBAPADAM

Supervising Guide

Date : 25.5.24

Vijeesh P

Professor

Department of Physics

The Cochin College

EXAMINER 1 :

Dr. VIJEESH P.
Assistant Professor
Department of Physics
The Cochin College
Kochi-682002

Dr. Manu Chandran
Professor ✓



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LAGRANGE POINT

Project submitted to Mahatma Gandhi University, Kottayam in partial fulfilment of the requirement for the award of the degree

BACHELOR OF SCIENCE IN PHYSICS

BY

ATHULYA ANILKUMAR (210021035892)

Under the supervision of

Dr. JOSE MATHEW

Assistant Professor

Post Graduate and Research Department of Physics



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COCHIN -682002

2021-2024





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CERTIFICATE

This is to certify that the project work entitled "GRAVITATIONAL THREE BODY PROBLEM AND LAGRANGE POINT" bonafide piece of study done by ATHULYA ANILKUMAR under the guidance supervision of DR. JOSE MATHEW, Assistant Professor, Post Graduate and Research Department of Physics, and also no part has been presented for any other degree. The study was undertaken for a period of six months.

Name of the guide : DR. JOSE MATHEW

Signature of the guide :

Name of the Head of Department :

Signature of the Head of Department :

Name and signature of external expert :

Dr. Hanuman Chandra Prasad

Dr. Vijeech





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Analysis of X-ray Diffraction Patterns for Magnesium Oxide Nanoparticles Synthesized via Sol-Gel Method: Comparison Between Pure and Ag Doped Samples

Dissertation submitted to The Cochin College in partial fulfillment of requirements for the award of degree of

BACHELOR OF SCIENCE IN PHYSICS

A Project work by

Sourav K Dimithrove

Reg No: 210021035905



DEPARTMENT OF PHYSICS
THE COCHIN COLLEGE
COCHIN, KERALA
2021 - 2024





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DECLARATION

I declare that the dissertation entitled "Analysis of X-ray Diffraction Patterns for Magnesium Oxide Nanoparticles Synthesized via Sol-Gel Method: Comparison Between Pure and Ag Doped Samples" submitted by me in partial fulfillment of the requirements for the award of the Degree of Bachelor of Science in Physics, is my group work and has not been previously submitted for the award of any other degree of this or any other university.

Place: Cochin

Sourav K Dimithrove

Date: 2/5/2024





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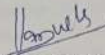
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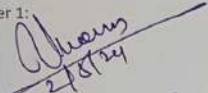
email: email@thecochoincollege.edu.in

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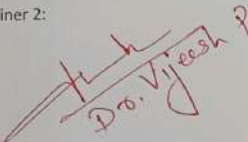
This is to certify that the project titled "Analysis of X-ray Diffraction Patterns for Magnesium Oxide Nanoparticles Synthesized via Sol-Gel Method: Comparison Between Pure and Ag Doped Samples" is an original work done by Mr. Sourav K Dimithrove, Reg No: 210021035905 of sixth semester B.Sc. Physics under my guidance in partial fulfillment of the requirement for the award of Bachelor of Science Degree in Physics under the Mahatma Gandhi University during the academic year 2023-2024.


Dr. Manjusha M V
Head of the Department
Associate Professor
Dr. MANJUSHA M V
Associate Professor and Research Guide
Head of the Department
PG and Research Department of Physics
The Cochin College, Kochi-2


Examiner 1:


Dr. Leena Chandras Professor.

Examiner 2:


Dr. Vijeesh P




Mrudula Menon V.
Principal-in-Charge
The Cochin College



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ACKNOWLEDGEMENT

I would like to take this opportunity to express my profound gratitude to all the people who have inspired and motivated me to make this project a success.

First of all I express my gratitude to the God Almighty for the inspiration throughout this project.

I have immense pleasure, to place on record, my whole gratitude to my project guide, Dr. Manjusha M V, Associate Professor of The Cochin College, Ernakulam. I thank her for her insightful suggestions, scholarly guidance and support without which I would not have completed this work. I wish to record my deep sense of gratitude to the HOD of Physics Dr. Manjusha M V for permitting me to take up the study.

I acknowledge the college management and the principle for giving us an opportunity to utilize the unique facilities of the college, especially the research laboratory. I express my sincere gratitude to all the faculty members, research scholars & lab assistants for their sharing of knowledge and encouraging attitude. Finally, I thank all my classmates, friends and parents who gave me encouragement and self-confidence whenever I needed.

Date: 2/4/2024

Signature:

Sourav K Dimithrove

The Cochin College, Cochin

3





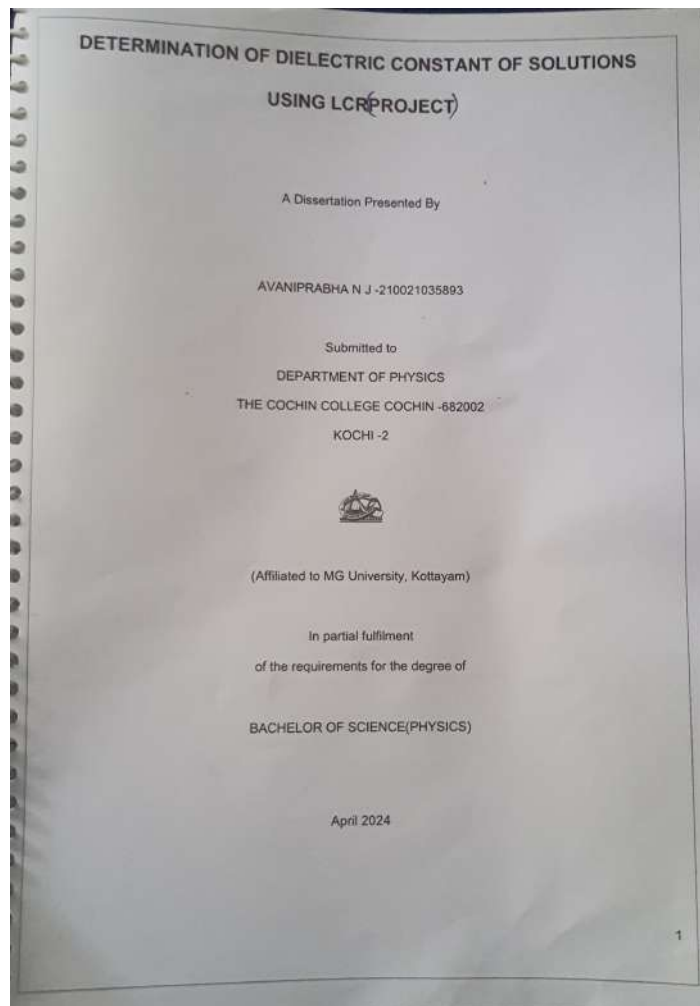
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 Mrudula Menon V.
 Principal-in-Charge
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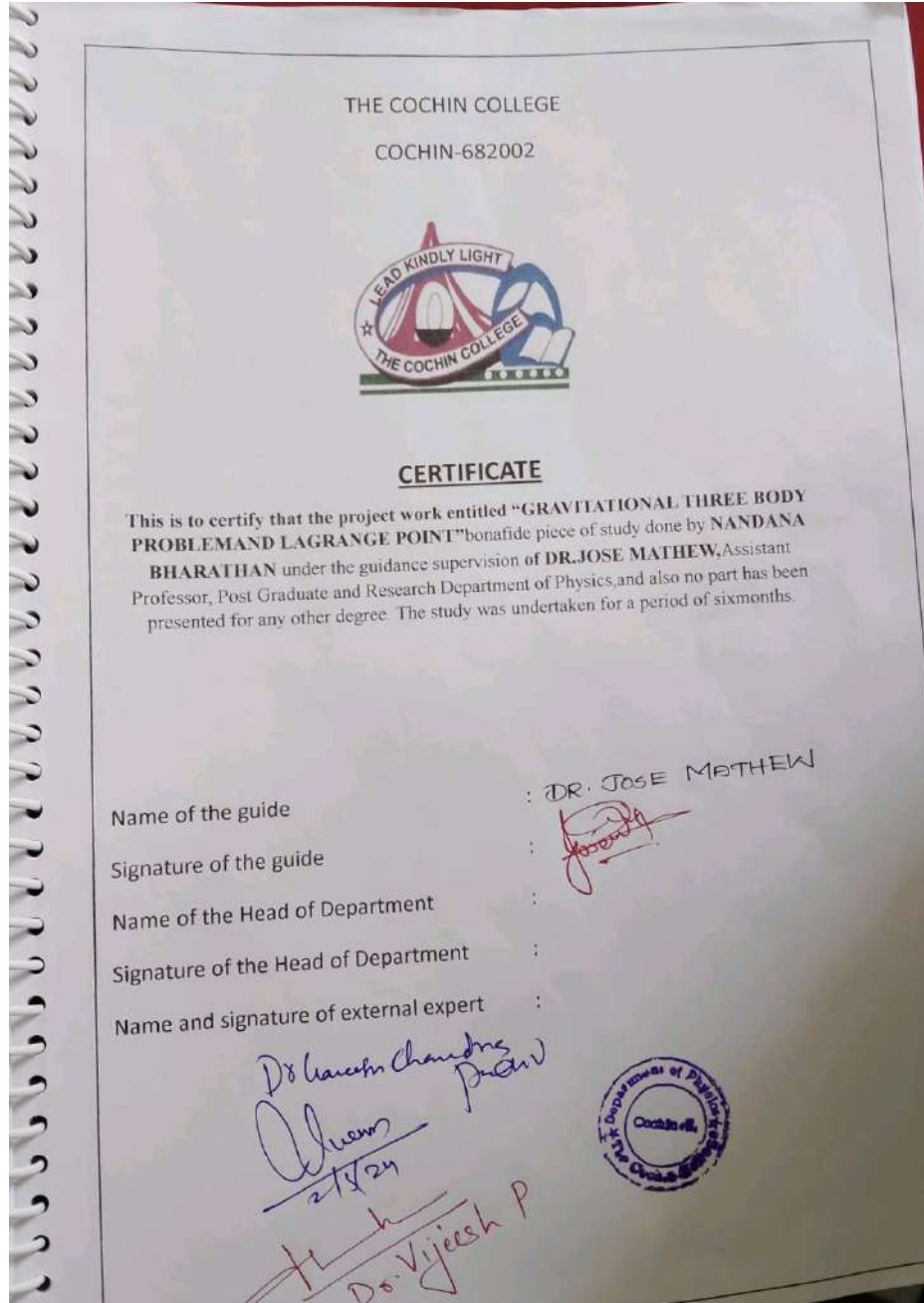
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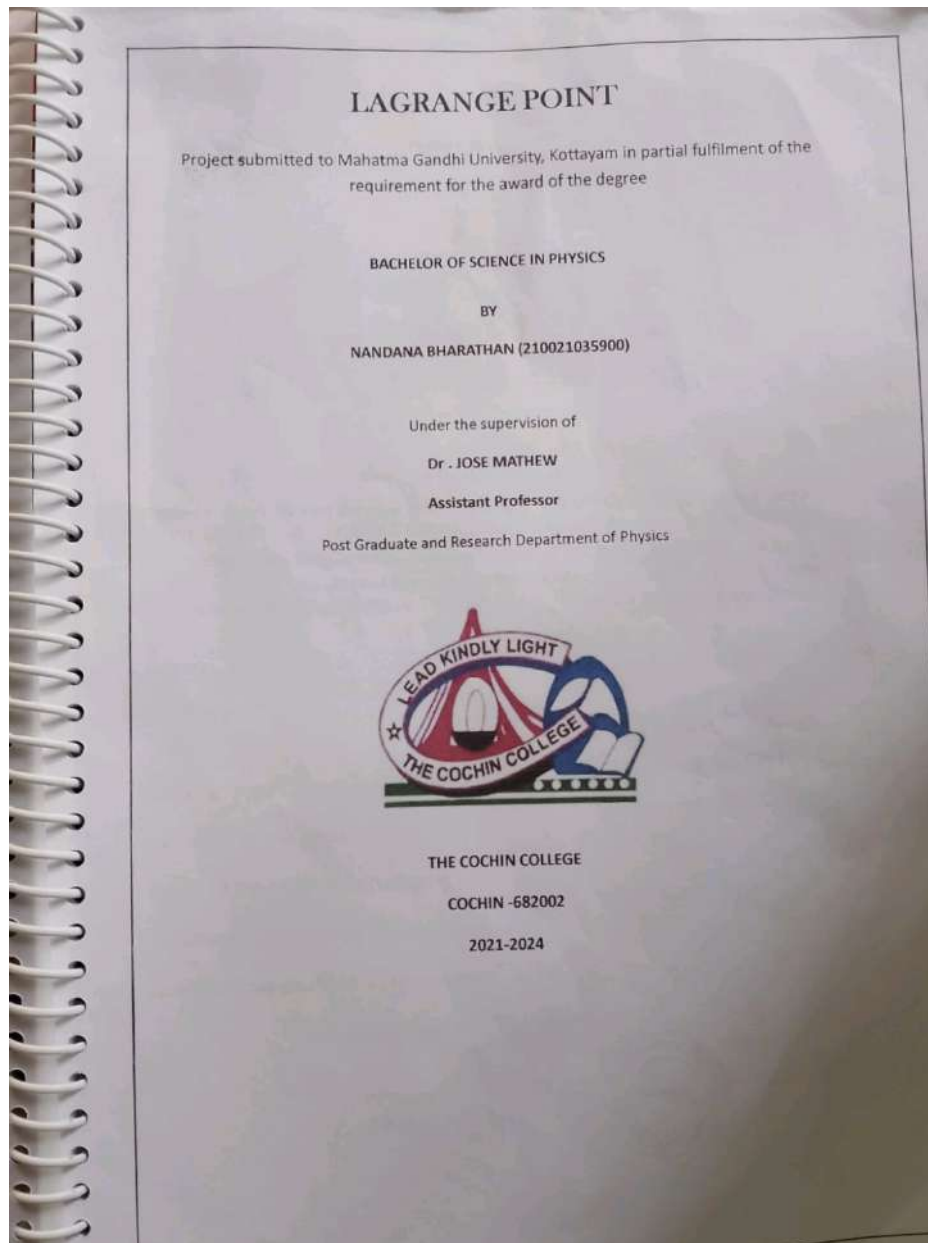
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ESTIMATION OF AGE OF OUR UNIVERSE

Submitted to The Cochin College, Cochin-682002 affiliated to Mahatma Gandhi University in partial fulfillment of the requirements for the award of the degree of Bachelor of Science in Physics

by

Ms. NAHANA TA (210021035922)
Ms. NIKITHA ANTONY (210021035924)
Ms. SUHANA KS (210021035925)



Under the guidance of

Dr. SATHYA NARAYANAN K

DEPARTMENT OF PHYSICS
THE COCHIN COLLEGE, COCHIN
ERNAKULAM, Kerala, INDIA - 682002

MAY - 2024





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CERTIFICATE

This is to certify that this project entitled "ESTIMATION OF AGE OF OUR UNIVERSE" submitted to The Cochin College, Cochin-682002 affiliated to Mahatma Gandhi University in partial fulfillment of requirement for the award of degree of BACHELOR OF SCIENCE IN PHYSICS is a record of original work done by _____ during the period of his/her study in the department of physics at The Cochin College, Cochin-682002 under my supervision and guidance. The dissertation has not formed the basis for the award of any degree or other similar titles to any candidate of any university.

Dr. Sathya Narayanan K
Assistant Professor
Department of Physics

Counter signed

Head of the department

Submitted for viva-voce examination held on _____
Cochin-682002.

at The Cochin College,

Name & Signature of examiners:

- 1.
- 2.

27/5/24
Dr. Sathya Narayanan K

Dr. Vijesh P.





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Analysis of X-ray Diffraction Patterns for Magnesium Oxide Nanoparticles Synthesized via Sol-Gel Method: Comparison Between Pure and Ag Doped Samples

Dissertation submitted to The Cochin College in partial fulfillment of requirements for the award of degree of

BACHELOR OF SCIENCE IN PHYSICS

A Project work by

Vyshnav P V

Reg No: 210021035921



DEPARTMENT OF PHYSICS
THE COCHIN COLLEGE
COCHIN, KERALA
2021 – 2024





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CERTIFICATE

This is to certify that the project titled "Analysis of X-ray Diffraction Patterns for Magnesium Oxide Nanoparticles Synthesized via Sol-Gel Method: Comparison Between Pure and Ag Doped Samples" is an original work done by Mr. Vyshnav P V, Reg No: 210021035921 of sixth semester B.Sc. Physics under my guidance in partial fulfillment of the requirement for the award of Bachelor of Science Degree in Physics under the Mahatma Gandhi University during the academic year 2023-2024.

Manjusha

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Associate Professor
Dr. MANJUSHA M V
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2/5/24

Dr. Manjusha M V

Examiner 2:

Vijesh P
Dr. Vijesh P





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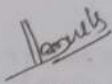
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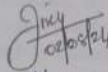
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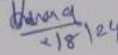
This is to certify that the project titled "Exploration of the Structural and Optical Characteristics of Bismuth Ferrite and Cobalt-Doped Bismuth Ferrite Nanoparticles: Investigating their Dielectric Properties and Antibacterial Potential." is an original work done by Ms. Adlin Babisha, Reg No: 220011015168 of fourth semester M.Sc Physics under my guidance in partial fulfilment of the requirement for the award of Master of Science Degree in Physics under the Mahatma Gandhi University during the academic year 2022- 2024.


Dr. Manjusha M V
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Head of the Department
P.G and Research Department of Physics
The Cochin College, Kochi

Examiner 1: Jixy JOSEPH



Examiner 2: Dr Swamy K S



Dr. MANJUSHA M V
Associate Professor and Research Guide
Head of the Department
PG and Research Department of Physics
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[3]





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INFLATION IN SCALAR TENSOR THEORIES OF GRAVITY

Project report submitted in partial fulfillment

of the Requirement for the award of

Post graduate Degree in Physics

Mahatma Gandhi University Kottayam

By

ANUKRISHNA R (Reg no:22001015170)

Under the supervision and guidance of

DR.JOSE MATHEW

Assistant professor Department of physics



DEPARTMENT OF PHYSICS, THE COCHIN
COLLEGE, KOCHI

(Affiliated to Mahatma Gandhi University, Kottayam, Kerala)

July 2024





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DECLARATION

I, ANUKRISHNA R - 220011015170, hereby declare that, this report entitled "INFLATION IN SCALAR TENSOR THEORIES OF GRAVITY" submitted to THE COCHIN COLLEGE towards the partial fulfillment of the requirement of MASTER OF SCIENCE in PHYSICS, is an original work carried out by me under the supervision of DR. JOSE MATHEW and has not formed the basis for the award of any degree or diploma, in this or any other institution or university. I have sincerely tried to uphold academic ethics and honesty. Whenever a piece of external information or statement or result is used then, that has been duly acknowledged and cited.

COCHIN 682001

July 2024

ANUKRISHNA R





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CERTIFICATE

This is to certify that the project entitled "INFLATION IN SCALAR TENSOR THEORIES OF GRAVITY" is an original work conducted by ANUKRISHNA R 210011015170 under the supervision and guidance of Dr. Jose Mathew, Assistant professor, Department of physics, The Cochin College, Kochi in partial fulfillment of the requirements for the award of degree of master of science in Physics under the faculty of the Cochin college, Kochi affiliated to Mahatma Gandhi University, during the academic year 2022-2024.

Dr. Jose Mathew

Project Supervisor
Department of Physics
The cochin college,kochi

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CERTIFICATE

This is to certify that the project entitled "INFLATION IN SCALAR TENSOR THEORIES OF GRAVITY" is an original work conducted by ANUKRISHNA R 210011015170 under the supervision of Dr. Jose Mathew, Assistant professor, department of physics, The Cochin College, Kochi, during the period of her course of study in MSc physics, 2022-2024 in The cochin college, kochi and submitted to MG University, Kottayam, in partial fulfillment of the requirement for the degree of Master of science.

place: *Kochi*
Date: *29/7/2024*

Examiners:

1. Dr. SIVARAJ K. S. *Sivaraj 21/8/24*
2. JIJY JOSEPH *Jijy 21/8/24*

Manjusha 29/7/24
DR. MANJUSHA M V

Head of the Department
Department of Physics
The Cochin College

Dr. MANJUSHA M V
Associate Professor and Research Guide
Head of the Department
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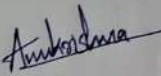
ACKNOWLEDGEMENT

I thank everyone who has assisted me in seeing this project through to its completion. I would like to first express my profound gratitude and deepest regards to Jose Mathew, Assistant Professor, The Cochin College Kochi and sincerely wish to acknowledge his vision, guidance, valuable feedback and constant support throughout the duration of this project.

I am indebted to Jose Mathew for their steadfast encouragement and time. I am lastly grateful to the Cochin College Kochi for providing the necessary resources and facilities to complete this project to the best of my ability.

COCHIN

July 2024


ANUKRISHNA R.

v





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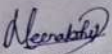
email: email@thecochincollege.edu.in

DECLARATION

I, MEENAKSHI PH - 220011015174, hereby declare that, this report entitle "INFLATION IN SCALAR TENSOR THEORIES OF GRAVITY" submitted to THE COCHIN COLLEGE, COCHIN towards the partial requirement of MASTER OF SCIENCE in PHYSICS, is an original work carried out by me under the supervision of DR. JOSE MATHEW and has not formed the basis for the award of any degree or diploma, in this or any other institution or university. I have sincerely tried to uphold academic ethics and honesty. Whenever a piece of external information or statement or result is used then, that has been duly acknowledged and cited.

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July 2024


MEENAKSHI PH

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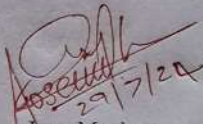
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CERTIFICATE

This is to certify that the work entitled "INFLATION IN SCALAR TENSOR THEORIES OF GRAVITY" is an original work done by MEENAKSHI PH (Roll No : 220011015174) under the supervision of Dr. JOSE MATHEW, Assistant Professor, Department of Physics, The Cochin college in the partial fulfilment for the award of the degree of **MASTER OF SCIENCE in PHYSICS** under the faculty of the cochin college, kochi affiliated to Mahatma Gandhi University, during the academic year 2022-2024.


29/7/24
Dr. Jose Mathew

Project Supervisor
Department of Physics
The cochin college, kochi

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CERTIFICATE

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place: *Kochi*

Date: *29/7/24*

Examiners:

1. *JAY JOSEPH* *Jay 29/7/24*
2. *Dr. Sivaraj K.S* *Sivaraj 29/7/24*

Manu M V
29/7/24
DR. MANJUSHA M V

Head of the Department

Department of Physics

The Cochin College

Dr. MANJUSHA M V
Associate Professor and Research Guide
Head of the Department
PG and Research Department of Physics
The Cochin College, Kochi-2

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ACKNOWLEDGEMENT

I thank everyone who helped me see this project through to completion. I would like to first express my profound gratitude and deep regard to Dr. JOSE MATHEW, THE COCHIN COLLEGE, and sincerely wish to acknowledge his vision, guidance, valuable feedback and constant support throughout the duration of this project.

I am indebted to DR. JOSE MATHEW for their steadfast encouragement and time. I am lastly grateful to THE COCHIN COLLEGE for providing the necessary resources and facilities to complete this project to the best of my ability.

COCHIN-682002

July 2024


MEENAKSHI PH

v





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INFLATION IN SCALAR TENSOR THEORIES OF GRAVITY

A Dissertation Submitted in Partial Fulfilment
of the Requirements for the award of
MASTER OF SCIENCE IN PHYSICS

by

MEENAKSHI PH

Roll No. 220011015174

Guided by

DR. JOSE MATHEW



DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE

(Affiliated to Mahatma Gandhi University kottayam ,kerala)

July 2024





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Website: www.thecochincollege.edu.in

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DECLARATION

I, MEENAKSHI PH - 220011015174, hereby declare that, this report entitle "INFLATION IN SCALAR TENSOR THEORIES OF GRAVITY" submitted to THE COCHIN COLLEGE ,COCHIN towards the partial requirement of MASTER OF SCIENCE in PHYSICS, is an original work carried out by me under the supervision of DR. JOSE MATHEW and has not formed the basis for the award of any degree or diploma, in this or any other institution or university. I have sincerely tried to uphold academic ethics and honesty. Whenever a piece of external information or statement or result is used then, that has been duly acknowledged and cited.

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July 2024

MEENAKSHI PH

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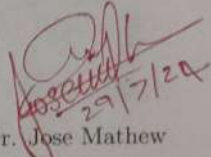
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Dr. Jose Mathew

Project Supervisor
Department of Physics
The cochin college, kochi

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place: Kochi

Date: 29/7/24

Examiners:

1. Jixy Joseph *Jixy Joseph*
2. Dr. Sivasay K.S. *Sivasay K.S.*

Manjusha M V
29/7/24
DR. MANJUSHA M V

Head of the Department

Department of Physics

The Cochin College

Dr. MANJUSHA M V
Associate Professor and Research Guide
Head of the Department
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The Cochin College, Kochi-2

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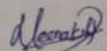
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I thank everyone who helped me see this project through to completion. I would like to first express my profound gratitude and deep regard to Dr. JOSE MATHEW, THE COCHIN COLLEGE, and sincerely wish to acknowledge his vision, guidance, valuable feedback and constant support throughout the duration of this project.

I am indebted to DR. JOSE MATHEW for their steadfast encouragement and time. I am lastly grateful to THE COCHIN COLLEGE for providing the necessary resources and facilities to complete this project to the best of my ability.

COCHIN-682002

July 2024


MEENAKSHI PH





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'SUDDEN IONOSPHERIC DISTURBANCE MONITOR'

*Dissertation submitted to The Cochin College in partial
fulfilment of requirements for the award of degree of*

MASTER OF SCIENCE IN PHYSICS

A Project work by

MILIN MARIA BENNY

Reg No: 220011015175

Under the supervision of

Dr. MATHEW GEORGE

Assistant professor,

Department of Physics

Sacred Heart College (Autonomous), Thevara



DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE

COCHIN, KERALA

2022-2024





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CERTIFICATE OF EVALUATION

This is to certify that the work **Sudden Ionospheric Disturbance Monitor** is a bonafide work done and submitted by **MILIN MARIA BENNY**(Reg:220011015175) in partial fulfilment for the award of M.Sc. Physics during the academic year 2022-2024 of Mahatma Gandhi University ,Kottayam.

Examiners

1. Jixy JOSEPH

Jixy
5/8/24

2. Dr. Sivaraj K.S.

Sivaraj
5/8/24





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DEPARTMENT OF PHYSICS

SACRED HEART COLLEGE



CERTIFICATE

This is to certify that the work **Sudden Ionospheric Disturbance Monitor** is a bonafide work done and submitted by **MILIN MARIA BENNY (Reg:220011015175)** in Department of Physics, The Cochin College, under my supervision and guidance in partial fulfilment for the award of M.Sc. Physics during the academic year 2022-2024 of Mahatma Gandhi University, Kottayam.

Dr. MATHEW GEORGE

ASSISTANT PROFESSOR

SACRED HEART COLLEGE

(AUTONOMOUS), THEVARA

DR. MATHEW GEORGE
Assistant Professor
PG and Research Department of Physics
Sacred Heart College (Autonomous)
Thevara, Kochi - 682013





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DEPARTMENT OF PHYSICS
THE COCHIN COLLEGE, KOCHI



CERTIFICATE

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Manjusha M V
21/12/24

Dr. MANJUSHA M V
ASSOCIATE PROFESSOR
HEAD OF DEPARTMENT

Dr. MANJUSHA M V
Associate Professor and Research Guide
Head of the Department
PG and Research Department of Physics
The Cochin College, Kochi-2



Mrudula Menon V
Mrudula Menon V.
Principal-in-Charge
The Cochin College



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DECLARATION

We , **HRIDIKA KP and MILIN MARIA BENNY** hereby declare that the project entitled 'SUDDEN IONOSPHERIC DISTURBANCE MONITOR' is entirely original work done by us under the supervision and guidance of **Dr. MATHEW GEORGE, ASSISTANT PROFESSOR, DEPARTMENT OF PHYSICS, SACRED HEART COLLEGE, THEVARA** . During the academic year 2022-2024 in partial fulfilment of the requirement for the award of degree of M.Sc. Physics. We also affirm that this work has not been submitted before for the award of any degree or diploma elsewhere.

Hridika KP

Milin Maria Benny

Place: Cochin

Date: 29/07/2024





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ACKNOWLEDGEMENT

I would like to take this opportunity to express my profound gratitude to all the people who have inspired and motivated me to make this project a success. First of all, I express my gratitude to the God Almighty for the inspiration throughout this project.

We especially thank Dr. Mathew George, Assistant Professor at Sacred Heart College, Thevara, who served as our project mentor and provided vital advice, prompt assistance, knowledgeable insights, and unflinching support throughout our endeavour.

I'm much obliged to Mr Paulbert Thomas & Sathya Narayanan K (Assistant professor) department of physics, The Cochin College-Cochin affiliated to Mahatma Gandhi University Kottayam for their enormous help and all resources provided during the project work.

I acknowledge the college management and the principal for giving me an opportunity to utilize the unique facilities of the college. I express my sincere gratitude to all the faculty members, research scholars, lab assistants for their sharing of knowledge and encouraging attitude. Finally, I thank all my classmates, friends and parents who gave me encouragement and self-confidence whenever I needed.

Signature: 

MILIN MARIA BENNY

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"Eco-Friendly Synthesis of Magnesium Oxide & Silver-Doped Magnesium Oxide Nanoparticles: Investigating Their Antibacterial Effects and Dielectric Properties."

Dissertation submitted to The Cochin College in partial fulfilment of requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

A Project work by

Devika Biju
Reg No: 220011015171

Under the Supervision of

Dr. Manjusha M V
Associate Professor & Research Guide
Head of the Department
P.G and Research Department of Physics
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DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE

COCHIN, KERALA

2022 - 2024





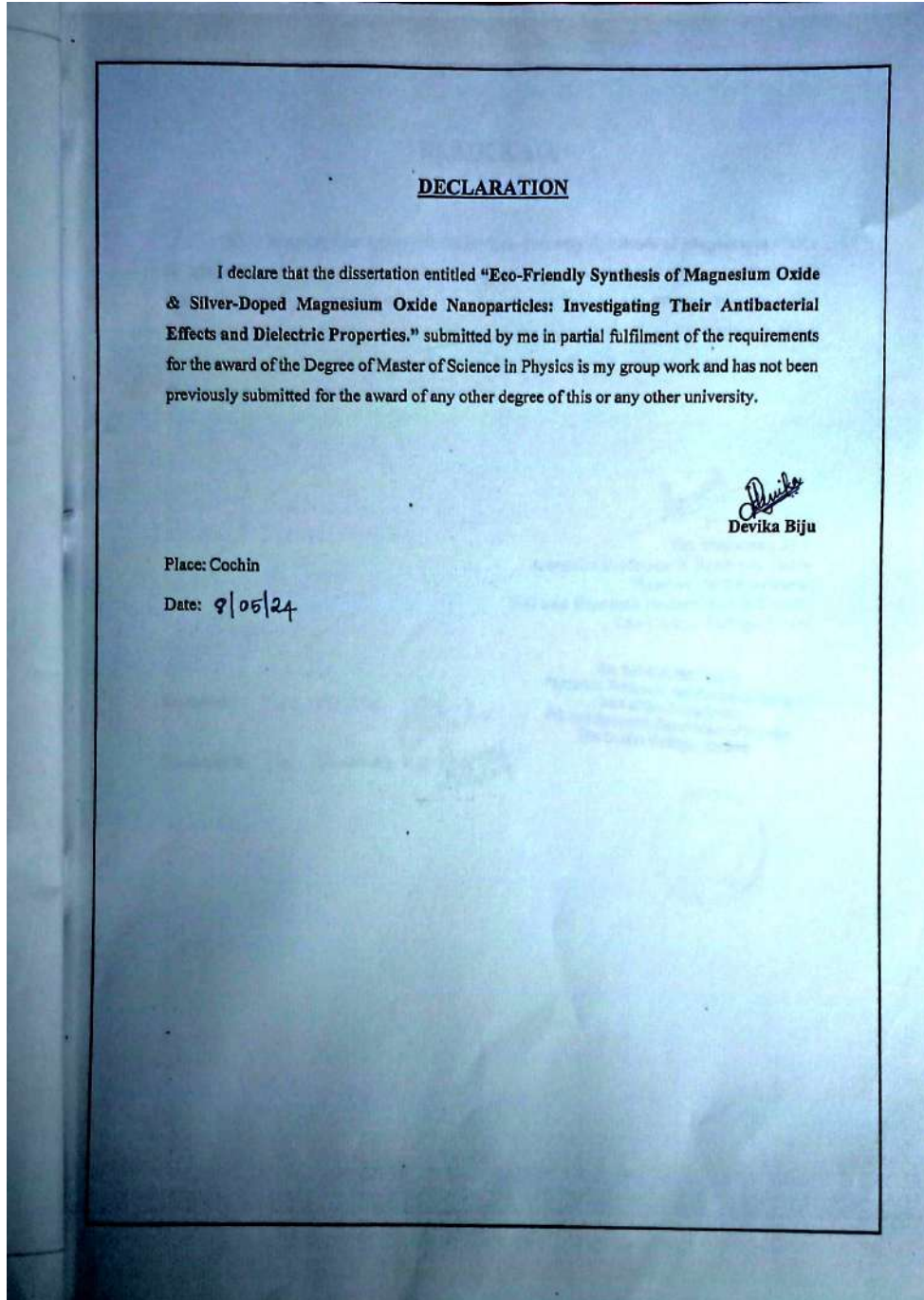
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CERTIFICATE

This is to certify that the project titled "Eco-Friendly Synthesis of Magnesium Oxide & Silver-Doped Magnesium Oxide Nanoparticles: Investigating Their Antibacterial Effects and Dielectric Properties." is an original work done by Ms. Devika Biju, Reg No: 220011015171 of fourth semester M.Sc Physics under my guidance in partial fulfilment of the requirement for the award of Master of Science Degree in Physics under the *Mahatma Gandhi University* during the academic year 2022-2024.

Dr. Manjusha M V
Associate Professor & Research Guide
Head of the Department
P.G and Research Department of Physics
The Cochin College, Kochi

Examiner 1: Jixy Josephi

Examiner 2: Dr. Sivarai K-S

Dr. MANJUSHA M V
Associate Professor and Research Guide
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I have immense pleasure, to place on record, my whole gratitude to my project guide, **Dr. Manjusha M V**, Assistant Professor of The Cochin College, Ernakulam. I thank her for her insightful suggestions, scholarly guidance and support without which I would not have completed this work. I wish to record my deep sense of gratitude to the Head of the Department of Physics **Dr. Manjusha M V** for permitting me to take up the study.

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Date: 08/05/24

Signature:

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Department of Physics
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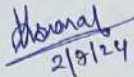

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CERTIFICATE OF EVALUATION

This is to certify that the work "Synthesis and Optical Characterization Studies of Gelatin based Pure and Doped Quantum Dots" is a bonafide work done and submitted by ANANTHU E J (REG NO:220011015169) in partial fulfillment for the award of M.Sc. degree in Physics during the academic year 2022-2024 of Mahatma Gandhi University Kottayam.

EXAMINERS

1. Dr. Sivaraj K S 
2/8/24
2. JIJY JOSEPH 
02/08/24





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Synthesis And Optical Characterization Studies of Gelatin based Pure and Doped Quantum Dots

Project report submitted in partial fulfillment
of the requirement for the award of
Post graduate Degree in Physics
Mahatma Gandhi University Kottayam

By

ANANTHU E J (Reg no:220011015169)

Under the supervision and guidance of

Dr. VIJEESH P

Assistant professor Department of Physics



DEPARTMENT OF PHYSICS , THE COCHIN COLLEGE, KOCHI

(Affiliated to Mahatma Gandhi University, Kottayam, Kerala)

2022-2024





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CERTIFICATE

This is to certify that the work titled “**Synthesis and Optical Characterization Studies of Gelatin based Pure and Doped Quantum Dots**” is an authentic record of the work carried out by **ANANTHU EJ (REG NO:220011015169)** in Department of Physics, The Cochin College, Kochi, in the partial fulfillment for the award of **M.Sc degree in Physics** during academic year **2022-2024** has been completed under my supervision and guidance.

Dr. VIJEESH P

ASSISTANT PROFESSOR

DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE

Dr. VIJEESH P.
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Department of Physics
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Kochi-682002





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Manjusha
1/8/24

Dr. MANJUSHA M V
ASSOCIATE PROFESSOR
HEAD OF DEPARTMENT
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Dr. MANJUSHA M V
Associate Professor and Research Guide
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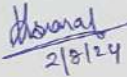
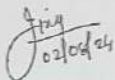
Website: www.thecochincollege.edu.in

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CERTIFICATE OF EVALUATION

This is to certify that the work "Synthesis and Optical Characterization Studies of Gelatin based Pure and Doped Quantum Dots" is a bonafide work done and submitted by ANANTHU E J(REG NO:220011015169) in partial fulfillment for the award of M.Sc. degree in Physics during the academic year 2022-2024 of Mahatma Gandhi University Kottayam.

EXAMINERS

1. Dr. Sivaraj K's 
2/8/24
2. Jixt JOSEPH 
02/09/24





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DECLARATION

I ANANTHU E J hereby declare that this project work entitled "Synthesis, and Optical Characterization of Gelatin based Pure and Doped Quantum Dots" is entirely original work and has been carried out by me independently under the supervision and guidance of Dr. VIJEESH P, ASSISTANT PROFESSOR, DEPARTMENT OF PHYSICS, THE COCHIN COLLEGE, KOCHI during the academic year 2021-2023 in the partial fulfillment of the requirement for the award of the degree of Master of Science in Physics and this work has not been submitted for any degree.

Date: 19/07/2024

Place: Kochi


ANANTHU E J





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ACKNOWLEDGEMENT

It is with great pleasure that we present my project entitled "Synthesis and Optical Characterization Studies of Gelatin based Pure and Doped Quantum Dots". For this I owe too much to many and it is my pleasure to record my gratitude. I have been fortunate enough to be able to secure co-operation, guidance and assistance from a number of people. I am at a loss of words of how to express the deep sense of gratitude I have towards all of them.

First and foremost, let me express my deep sense of gratitude and respect to Dr. VIJESH P, Assistant Professor, Department of Physics, THE COCHIN COLLEGE, KOCHI for his valuable guidance throughout the course of this work.

I would like to express my thanks to Dr. MANJUSHA M V, Associate Professor, Head of the department of Physics, The Cochin College, Kochi for her support and encouragement. I feel indebted to my teachers for their kind co-operation towards the completion of this project.

I would like to take a while to acknowledge the blessings we got throughout the time from Almighty. Last but not least, I would like to record my gratitude to my parents, and classmates for their support. In my work, I have incurred obligations to many and I am gratefully indebted to each and every one of them and may I place and record our thanks to all of them.

ANANTHU E J





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"Eco-Friendly Synthesis of Magnesium Oxide & Silver-Doped Magnesium Oxide Nanoparticles: Investigating Their Antibacterial Effects and Dielectric Properties."

Dissertation submitted to The Cochin College in partial fulfilment of requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

A Project work by

Abhirami Sajeer
Reg No: 220011015167

Under the Supervision of

Dr. Manjusha M V
Associate Professor & Research Guide
Head of the Department
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DEPARTMENT OF PHYSICS

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COCHIN, KERALA

2022 - 2024





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DECLARATION

I declare that the dissertation entitled "Eco-Friendly Synthesis of Magnesium Oxide & Silver-Doped Magnesium Oxide Nanoparticles: Investigating Their Antibacterial Effects and Dielectric Properties." submitted by me in partial fulfilment of the requirements for the award of the Degree of Master of Science in Physics is my group work and has not been previously submitted for the award of any other degree of this or any other university.


Abhirami Sajeev

Place: Cochin

Date: 08/05/24





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CERTIFICATE

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Manjusha

Dr. Manjusha M V
Associate Professor & Research Guide
Head of the Department
P.G and Research Department of Physics
The Cochin College, Kochi

Examiner 1: Jixy JOSEPH *Jixy Joseph*

Examiner 2: Dr. Sivagay K.S. *Sivagay K.S.*

Dr. MANJUSHA M V
Associate Professor and Research Guide
Head of the Department
PG and Research Department of Physics
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ACKNOWLEDGEMENT

I would like to take this opportunity to express my profound gratitude to all the people who have inspired and motivated me to make this project a success.

First of all, I express my gratitude to the God Almighty for the inspiration throughout this project.

I have immense pleasure to place on record my whole gratitude to my project guide, Dr. **Manjusha M V**, Assistant Professor of The Cochin College, Ernakulam. I thank her for her insightful suggestions, scholarly guidance and support without which I would not have completed this work. I wish to record my deep sense of gratitude to the Head of the Department of Physics Dr. **Manjusha M V** for permitting me to take up the study.

I'm much obliged to **Mr. Vishnu K Kumar, Ms. Dhanya Raj (Research Scholars) and Mr. Venkidesh T V (Senior Research Fellow)**, department of physics, The Cochin College-Cochin affiliated to Mahatma Gandhi University Kottayam for their enormous help and all resources provided during the project work.

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Date: 08/05/24

Signature:

Abhirami Sajeer
Reg No: 220011015167
Department of Physics
The Cochin College, Cochin





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"Exploration of the Structural and Optical Characteristics of Bismuth Ferrite and Cobalt-Doped Bismuth Ferrite Nanoparticles: Investigating their Dielectric Properties and Antibacterial Potential."

Dissertation submitted to The Cochin College in partial fulfilment of requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

A Project work by

Reshma M

Reg No: 220011015176

Under the Supervision of

Dr. Manjusha M V

Associate Professor & Research Guide

Head of the Department

P.G and Research Department of Physics

The Cochin College, Kochi



DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE

COCHIN, KERALA

2022 - 2024





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
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Website: www.thecochincollege.edu.in

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DECLARATION

I declare that the dissertation entitled "Exploration of the Structural and Optical Characteristics of Bismuth Ferrite and Cobalt-Doped Bismuth Ferrite Nanoparticles: Investigating their Dielectric Properties and Antibacterial Potential." submitted by me in partial fulfilment of the requirements for the award of the Degree of Master of Science in Physics is my group work and has not been previously submitted for the award of any other degree of this or any other university.


Reshma M

Place: Cochin

Date: 08/05/24

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CERTIFICATE

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Dr. Manjusha M V
Associate Professor & Research Guide
Head of the Department
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The Cochin College, Kochi

Examiner 1: JIXY JOSEPH

Examiner 2: Dr. SUARAJ KS

Dr. MANJUSHA M V
Associate Professor and Research Guide
Head of the Department
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The Cochin College, Kochi-2



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Date: 08/05/24

Signature:

Reshma M
Reg No: 220011015176
Department of Physics
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Dissertation submitted to The Cochin College in partial fulfilment of requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

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Reshma M

Reg No: 220011015176

Under the Supervision of

Dr. Manjusha M V

Associate Professor & Research Guide

Head of the Department

P.G and Research Department of Physics

The Cochin College, Kochi



DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE

COCHIN, KERALA

2022 - 2024





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Reshma M

Place: Cochin

Date: 08/05/24

[2]





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Manjusha

Dr. Manjusha M V
Associate Professor & Research Guide
Head of the Department
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The Cochin College, Kochi

Examiner 1: JIXY JOSEPH

Jixy
05/08/24

Examiner 2: Dr. SUARAJ KS

Suaraj
5/8/24

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Associate Professor and Research Guide
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ACKNOWLEDGEMENT

I would like to take this opportunity to express my profound gratitude to all the people who have inspired and motivated me to make this project a success.

First of all, I express my gratitude to the God Almighty for the inspiration throughout this project.

I have immense pleasure, to place on record, my whole gratitude to my project guide, **Dr. Manjusha M V**, Assistant Professor of The Cochin College, Ernakulam. I thank her for her insightful suggestions, scholarly guidance and support without which I would not have completed this work. I wish to record my deep sense of gratitude to the Head of the Department of Physics **Dr. Manjusha M V** for permitting me to take up the study.

I'm much obliged to **Mr. Venkidesh T V**, (Senior Research Fellow), **Ms. Dhanya Raj** and **Mr. Vishnu K Kumar** (Research Scholars) department of physics, The Cochin College-Cochin affiliated to Mahatma Gandhi University Kottayam for their enormous help and all resources provided during the project work.

I acknowledge the college management and the principal for giving me an opportunity to utilize the unique facilities of the college, especially the research laboratory. I express my sincere gratitude to all the faculty members, research scholars, lab assistants for their sharing of knowledge and encouraging attitude. Finally, I thank all my classmates, friends and parents who gave me encouragement and self-confidence whenever I needed.

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'SUDDEN IONOSPHERIC DISTURBANCE MONITOR'

*Dissertation submitted to The Cochin College in partial
fulfilment of requirements for the award of degree of*

MASTER OF SCIENCE IN PHYSICS

A Project work by

MILIN MARIA BENNY

Reg No: 220011015175

Under the supervision of

Dr. MATHEW GEORGE

Assistant professor,

Department of Physics

Sacred Heart College (Autonomous), Thevara



DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE

COCHIN, KERALA

2022-2024





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CERTIFICATE OF EVALUATION

This is to certify that the work **Sudden Ionospheric Disturbance Monitor'** is a bonafide work done and submitted by **MILIN MARIA BENNY(Reg:220011015175)** in partial fulfilment for the award of M.Sc. Physics during the academic year 2022-2024 of Mahatma Gandhi University ,Kottayam.

Examiners

1. Jixy JOSEPH

Jixy
5/8/24

2. Dr. Sivaraj K.S.

Sivaraj
5/8/24





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INFLATION IN $F(R)$ THEORIES OF GRAVITY

A Dissertation Submitted
in Partial Fulfillment of the Requirements
for the Degree of

MASTER OF SCIENCE
In
PHYSICS

By

SREELEKHA.T.S
reg no- 220011015177

Guided By Dr. Jose Mathew



DEPARTMENT OF PHYSICS
THE COCHIN COLLEGE
KOCHI-682001 ,KERALA INDIA

(Affiliated to Mahatma Gandhi University, Kottayam, Kerala)

July 2024





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DECLARATION

I, Sreelekha.T.S-220011015177, hereby declare that, this project entitled "INFLATION IN F(R) THEORIES OF GRAVITY" submitted to The Cochin College Kochi towards the partial fulfillment of the requirement for the **Master of Science in Physics**, is an original work carried out by me under the supervision of **Dr. Jose Mathew** and has not formed the basis for the award of any degree or diploma, in this or any other institution or university. I have sincerely tried to uphold academic ethics and honesty. Whenever a piece of external information or statement or result is used then, that has been duly acknowledged and cited.

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July 2024

Sreelekha.T.S





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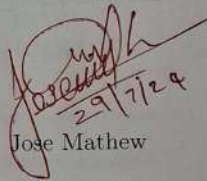
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CERTIFICATE

This is to certify that the project entitled "INFLATION IN F(R) THEORIES OF GRAVITY" is an original work submitted by Sreelekha TS- 220011015177 under the supervision and guidance of Dr. Jose Mathew, Assistant professor, Department of physics, The Cochin College, Kochi in partial fulfillment of the requirements for the award of degree of master of science in Physics under the faculty of the Cochin college, Kochi affiliated to Mahatma Gandhi University, during the academic year 2022-2024.


29/7/24
Dr. Jose Mathew

Project Supervisor
Department of Physics
The cochin college,kochi

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place: Kochi
Date: 29/07/2024

Examiners:

- Jixy JOSEPH *Jixy 5/8/24*
- Dr. Swamy K S *Swamy 5/8/24*

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ACKNOWLEDGEMENT

I thank everyone who helped me see this project through to completion. I would like to first express my profound gratitude and deep regard to Dr. Jose Mathew, Assistant Professor, The Cochin College Kochi and sincerely wish to acknowledge his vision, guidance, valuable feedback and constant support throughout the duration of this project.

I am indebted to Dr. Jose Mathew for his steadfast encouragement and time. I am lastly grateful to the Cochin College Kochi for providing the necessary resources and facilities to complete this project to the best of my ability.

Kochi-2

July 2024


Sreelekha T S





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'SUDDEN IONOSPHERIC DISTURBANCE MONITOR'

*Dissertation submitted to The Cochin College in partial
fulfilment of requirements for the award of degree of
MASTER OF SCIENCE IN PHYSICS*

A Project work by

HRIDIKA KP

Reg No: 220011015172

Under the supervision of

Dr. MATHEW GEORGE

Assistant professor,

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DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE

COCHIN, KERALA

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CERTIFICATE OF EVALUATION

This is to certify that the work **Sudden Ionospheric Disturbance Monitor** is a bonafide work done and submitted by **HRIDIKA KP(Reg:220011015172)** in partial fulfilment for the award of M.Sc. Physics during the academic year 2022-2024 of Mahatma Gandhi University, Kottayam.

Examiners

1. JIXY JOSEPH

Jixy Joseph
21/8/24

2. DR. SIVARAJ K.S.

Dr. Sivraj K.S.
21/8/24





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DEPARTMENT OF PHYSICS
SACRED HEART COLLEGE



CERTIFICATE

This is to certify that the work **Sudden Ionospheric Disturbance Monitor** is a bonafide work done and submitted by **HRIDIKA KP(Reg:220011015172)** in Department of Physics, The Cochin College, under my supervision and guidance in partial fulfilment for the award of M.Sc. Physics during the academic year 2022-2024 of Mahatma Gandhi University, Kottayam.

Dr. MATHEW GEORGE
ASSISTANT PROFESSOR
SACRED HEART COLLEGE
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DR. MATHEW GEORGE
Assistant Professor
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DEPARTMENT OF PHYSICS
THE COCHIN COLLEGE, KOCHI



CERTIFICATE

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Manjusha
29/7/24.
Dr. MANJUSHA M V

ASSOCIATE PROFESSOR

HEAD OF DEPARTMENT
Dr. MANJUSHA M V
Associate Professor and Research Guide
Head of the Department
PG and Research Department of Physics
The Cochin College, Kochi-2

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DECLARATION

We , HRIDIKA KP and MILIN MARIA BENNY hereby declare that the project entitled 'SUDDEN IONOSPHERIC DISTURBANCE MONITOR' is entirely original work done by us under the supervision and guidance of Dr. MATHEW GEORGE, ASSISTANT PROFESSOR, DEPARTMENT OF PHYSICS, SACRED HEART COLLEGE, THEVARA . During the academic year 2022-2024 in partial fulfilment of the requirement for the award of degree of M.Sc. Physics. We also affirm that this work has not been submitted before for the award of any degree or diploma elsewhere.

Hridika KP

Milin Maria Benny

Place: Cochin

Date: 29/07/2024

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We especially thank Dr. Mathew George, Assistant Professor at Sacred Heart College, Thevara, who served as our project mentor and provided vital advice, prompt assistance, knowledgeable insights, and unflinching support throughout our endeavour.

I'm much obliged to Mr Paulbert Thomas & Sathya Narayanan K (Assistant professor) department of physics, The Cochin College-Cochin affiliated to Mahatma Gandhi University Kottayam for their enormous help and all resources provided during the project work.

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Signature: 

HRIDIKA KP

Reg: 220011015172

DEPARTMENT OF PHYSICS

THE COCHIN COLLEGE, KOCHI

Date: 29/07/2024

