7.2 BEST PRACTICE 1

REAL TIME PROJECTS TO SOLVE SOCIETAL PROBLEMS

INDEX

S.No.	Description
1.	Project titles
2.	Supporting documents
3.	Project reports

PRINCIPAL
A.R.J. COLLEGE OF ENGG. & TECH
EDAYARNATHAM, MANNARGUDI

A.R.J. COLLEGE OF ENGINEERING & TECHNOLOGY
MANNARGUDI
EDAYARNATHAM

BEST PRACTICE - 1

1. Title of the Practice

REAL TIME PROJECTS TO SOLVE SOCIETAL PROBLEMS

2. Objectives of the Practice

The objective of this practice is to

* Develop social responsibility among the students.

* Mould the students into good citizen and there by develop the nation.

* Design projects to eradicate the social issues and for the betterment of the society.

* Motivate the students to bring out their hidden talents.

* Improve the quality of education for school children through conduct of PROJECT EXPOS.

* Give exposure to school students about engineering and technology.

3. The Context

The engineering education has a variety of ethical responsibilities to society and the environment. ARJCET has taken necessary steps to improve and enhance the dissemination of environmental literacy to students. The main aim of this practice is to create awareness, impart knowledge and attitude of concern and to nurture necessary skills to handle the society related issues and challenges.

4. The Practice

The campus prides itself in providing noise free environment which ensures friction free flow of academic activities.

* Final year students are motivated to do projects which focuses on the improvement of social and environmental aspects.

* Self Interest Groups: Every year students who show immense interest in social related aspects are divided into groups and they elicit their talents in developing human as well as eco-friendly projects.

These activities improve the skills, leader ship quality and team work of the students.

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MANNARGUDI

6. Evidence of Success

The outcomes of the practices are

The real time projects to solve societal problems are guidance for all students to improve their performance in their field.Our Projects are aimed at solving societal problems should reiterate the projects goals and impact,emphasizing the importance of continued action and collaboration. It should also highlight how the project contributes to broader vision of better future,inspiring further engagement and encouraging outgoing efforts towars social change.

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www.arj.edu.in

1. LIST OF REAL TIME PROJECTS TO SOLVE SOCIETAL PROBLEMS

Sl.no	Name of the Department	Title of the project	Cost (In Rs.)	Applications of the project
2023-2024				
1	EEE	Modelling of Energy Storage Systems and Analysis of Power System Stability using Smart Grid	7,00,000	M/s. Hindusthan Transformers, No.37-B, SIDCO Industrial Estate, Thir umazhisai, Chennai-60 0124
2	MBA	Customer Profile Anslysis and Cuctomer relationship Management for brand equity in Industries	3,00,000	KN Package 17/15, 1ST Floor, Jallikadu, Appanaickenpalayam, Thudiyalur, Coimbatore641017.
4	MCA	Intelligent Robotics:Enhancing Autonomy and interaction through AI	5,00,000	Jadayu Software Technology, Powered by Jadayu Enterprises, 42/A, 1st Floor Bishop Sundaram Complex, Pudukkottai Road,Thanjavur- 613007
2022-2023				
5	ECE	Prediction of Preterm Deliveries Using EMG Signal	6,00,000	Meck Teck Research F oundation, 6/9, Kamar ajapuram 17-th Street, 1-st Cross, Pud ukkottai-92 2001, Tamilnadu, India.
6	MECH	Modelling and Analysis of IC Engine piston with Composite Material	4,00,000	Suntek Aut omation and Solutions, No.5, Pazh avandhank attalai,2nd Cross, Sri Seethalam man Nagar, Kumbakon am-612001 Tanjore- Dt, Tamilnadu.

A.R.J. COLLEGE OF ENGINEERING & TECHNOLOGY * MANNARGUDI * EDAYARNATHAM

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A.R.J. COLLEGE OF ENGG. & TECH
EDAYARNATHAM, MANNARGUDI

Supporting Documents

HINDUSTHAN TRANSSFORMERS
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10.07.2023

To

The Principal,

A.R.J College of Engineering & Technology,

Mannargudi.

Dear sir,

Sub: Inviting a Research Proposal - Modelling of Energy Storage Systems and Analysis of Power System Stability using Smart Grid-Reg.

With reference to the above subject I am happy to invite a Research proposal from A.R.J College of Engineering & Technology, Mannargudi. We are offering Electrical related services and applications to customers. In this connection, we need your support in R&D work on the exploration of the Analysis of Power System Stability using Smart Grid . This will be required for Modelling an Energy Storage System for storing the Renewable Energy output and enhances the Power system Stability. Therefore, I kindly request you to submit a research proposal with all necessary details such as Proposed Project objectives, Work plan, timeline, budget and expected outcome for further enhancement of Power system stability. Am looking forward to receive your response regarding the above mentioned.

Thanking you,

HINDUSTHAN TRANSSFORMERS ★ THIRUMAZHISAI CHENNAI 600 124

With Regards,

No. 37-B, SIDCO INDUSTRIAL ESTATE, THIRUMAZHISAI, CHENNAI - 600124.
Tel : 044 2681 1772 / 044 2681 1771
E-mail : hindusthantranssformer@gmail.com

A.R.J COLLEGE OF ENGINEERING AND TECHNOLOGY
Edayarnatham - Mannargudi
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(An ISO 9001:2015 Certified Institution)

19.07.2023

From

Dr. P.N. Raghunath M.E., Ph.D.,

Principal

TO

Hindustan Transformers

No 37b, Sidco Industrial Estate,

Thirumazhisai,

Chennai - 600124

Dear Sir,

Ref: Your invitation letter dated 10.07.2023

We have received your project invitation letter to work on a research project entitled "**Modelling of Energy Storage Systems and Analysis of Power System Stability using Smart Grid**", and we are happy to accept your invitation and proceed further with the project. And we wholeheartedly thank the management of **Hindustan Transformers, Chennai**. We will submit the research proposal to you as per your requirements very soon. We look forward to proceed further, and once again, we thank you for considering the Proposal.

Thanking You,

Yours Sincerely,

P.N. Raghunath

Principal.

PRINCIPAL
A.R.J. COLLEGE OF ENGG. & TECH
EDAYARNATHAM, MANNARGUDI.

A.R.J COLLEGE OF ENGINEERING AND TECHNOLOGY
Edayarnatham - Mannargudi
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27.07.2023

Dr. P.N. Raghunath M.E., Ph. D., Mobile No :9750988221
Principal Email ID :principal@arjcet.edu.in

The following faculty members are assigned for conducting the research work submitted to **HINDUSTAN TRANSFORMERS** titled "**Modelling of Energy Storage Systems and Analysis of Power System Stability using Smart Grid**"

List of Faculty Members

S.No	Name of PI & Co-PI	Designation & Specialization	Contact Information
1.	Mrs.K.R. Pavithra Devi M.E.,	Assistant Professor, Department of EEE, ARJCET, Mannargudi.	**8489033766** **krpavithradevi @gmail.com**
2.	Mrs. G. Uma Sathya M.E.,	Assistant Professor, Department of EEE, ARJCET, Mannargudi.	**7550329639** **gusathyaeee@gmail.com**

P.N. Raghunath
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27.07.2023

Dr. P.N. Raghunath M.E., Ph. D., Mobile No : 9750988221

Principal Email ID : principal@arjcet.edu.in

Proposed Budget for the Research Project Work

S.No	Nature of the Work	Time Line for the work
1.	Preliminary Studies	1,00,000
2.	Budget for the Proposed Main Work	4,00,000
3.	Travel expenses for the Project work Progress Meeting	1,00,000
4.	Miscellaneous	1,00,000

P.N.Raghunath
PRINCIPAL
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"Modelling of Energy Storage Systems and Analysis of Power System Stability using Smart Grid"

Project proposal

Abstract

Renewable energy sources become an important point in terms of increasing energy source diversity and decreasing the carbon emissions, power system stability suffers from increasing renewable energy and distributed generation penetration to the power system. Therefore, grid-scale energy storage systems are introduced to improve the power system stability. Large scale energy storage technologies that connected to the power system to improve the power system stability and power quality are reviewed and explained. The complexities of electrical metrology across different applications, discussing how to meet requirements, comply with regulations, and enhance revenue as well as reliability. It also showcases advanced semiconductor metering technologies that provide different degrees of integration and system partitioning. Energy storage technologies for grid scale energy storage systems, application of energy storage systems, and control methods are analyzed using Smart Grid Technology. In addition, some comparison results are given about energy storage technologies for grid-scale applications. EV chargers, solar inverters, and smart home devices, all requiring precise energy usage data and power quality monitoring has also been discussed to increase Power Quality. ST solutions simplify the BOM, design, and software development effort. Developers will benefit from our full range of evaluation boards, development software and firmware, as well as design guides and documentation throughout the entire design process.

The anticipated outcome of this Project is a comprehensive report that presents Modelling and analyzing the Energy Storage system. The report will offer practical recommendations of designing the Fuel cells and highlighting the performance of the power system using Smart Grid. The insights gained for this research will contribute to the wider understanding of Variable renewable generation increases in power systems, issues, such as grid stiffness, larger frequency deviations, and grid stability, are becoming more relevant, particularly in view of 100% renewable energy networks, which is the future of smart grids.

By undertaking this project, we aim to equip the Energy storage systems (ESSs) are proving to be indispensable for facilitating the integration of renewable energy sources (RESs), are being widely deployed in both microgrids and bulk power systems, and thus will be the hallmark of the clean electrical grids of the future. Hence, this article reviews several energy storage technologies that are rapidly evolving to address the RES integration challenge, particularly compressed air energy storage (CAES), flywheels, batteries, and thermal ESSs, and their modeling and applications in power grids. An overview of these ESSs is provided, focusing on new models and applications in microgrids and distribution and transmission grids for grid operation, markets, stability, and control.

PRINCIPAL INVESTIGATOR

P.N. Rajhonath

PRINCIPAL

PRINCIPAL
A.R.J. COLLEGE OF ENGG. & TECH
EDAYARNATHAM, MANNARGUDI.

HINDUSTHAN TRANSSFORMERS
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Date: 10.08.2023

To

The Principal,

A.R.J College of Engineering & Technology,

Mannargudi.

Dear sir,

Sub: Acceptance of Research Project with Sanction of Grant-Reg.

Ref: ARJCET/R&D/27.07.2023.

With reference to the above subject we are happy to accept the Project Proposal titled **Modelling of Energy Storage Systems and Analysis of Power System Stability using Smart Grid.** We are also happy to sanction an amount of Rs. 7,00,000 (Rupees Seven Lakhs only) for the proposed submitted by the team of **Mrs.K.R. Pavithra Devi and Mrs. G. Uma Sathya, Assistant Professors, Department of Electrical & Electronics Engineering.** We hope that this project will provide us a monetary benefit towards our Business and its development. Please contact us for getting more information needed.

Thanking You,

With Regards,

HINDUSTHAN TRANSSFORMERS
THIRUMAZHISAI
CHENNAI
600 124

No. 37-B, SIDCO INDUSTRIAL ESTATE, THIRUMAZHISAI, CHENNAI - 600124.
Tel : 044 2681 1772 / 044 2681 1771
E-mail : hindusthantranssformer@gmail.com

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Edayarnatham - Mannargudi
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16.08.2023

Dr. P.N. Raghunath M.E., Ph. D., Mobile No : 9750988221

Principal Email ID : principal@arjcet.edu.in

To

Hindustan Transformers
No 37b, Sidco Industrial Estate,
Thirumazhisai,
Chennai - 600124

Dear Sir,

Sub: "Modelling of Energy Storage Systems and Analysis of Power System Stability using Smart Grid"- Acknowledging the receipt of the project Grant- reg

Ref: Your Project Sanction letter date on 10.08.2023

We have received your project acceptance and sanction letter in regards to the project Proposal submitted on **"Modelling of Energy Storage Systems and Analysis of Power System Stability using Smart Grid"** . Our Project Team lead by Mrs. K. R. Pavithra Devi, Assistant Professor of Electrical & Electronics who will be the Principal Investigator and carry out the research work as well as update you regularly about the progress of the project work. We also thank you for sanctioning the Research project grant amount of Rs. 7,00,000/- for the above-mentioned project.

Thanking You,

Yours Sincerely,
P.N.Raghunath
PRINCIPAL

PRINCIPAL
A.R.J. COLLEGE OF ENGG. & TECH
EDAYARNATHAM, MANNAR[illegible]

HINDUSTHAN TRANSSFORMERS
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06.11.2023

To

The Principal,

A.R.J College of Engineering & Technology,

Mannargudi.

Dear sir,

Sub: M/s. Hindustan Transformers - On-going Project by the Department of EEE (2023-2024)- Approval Intimation- Grant Release- Reg.

With respect to the Project proposal by the Department of EEE has been approved by the **M/s. Hindustan Transformers, Chennai** is enclosed along with the terms and conditions. You are requested to adhere to terms and conditions including the submission of the Project in time.

S.No	Name of the Investigators	Title of the Project	Amount
1.	Mrs.K.R. Pavithra Devi M.E., Assistant Professor, Department of Electrical& Electronics Engineering, A.R.J College of Engineering & Technology, Mannargudi. (Principal Investigator)	Modelling of Energy Storage Systems and Analysis of Power System Stability using Smart Grid.	7,00,000
2.	Mrs. G. Uma Sathya M.E., Assistant Professor, Department of Electrical & Electronics Engineering, A.R.J College of Engineering & Technology, Mannargudi. (Principal Co-Investigator)		

Herewith enclosed the cheque for the approved grant and disburse the grants to the concern Faculties from Department of EEE, ARJCET from your side at the earliest:Kindly send the Utilisation Certificate (format enclosed) on completion of the project.

Thanking You,

Yours Truly,

(Managing Director)

HINDUSTHAN TRANSSFORMERS THIRUMAZHISAI CHENNAI 600 124

No. 37-B, SIDCO INDUSTRIAL ESTATE, THIRUMAZHISAI, CHENNAI - 600124.
Tel : 044 2681 1772 / 044 2681 1771
E-mail : hindusthantranssformer@gmail.com

Funding Project by the Department of EEE

ARJCET

2023-2024

Name of the Project : Modelling of Energy Storage Systems and Analysis of Power System Stability using Smart Grid.

Name of the Principal Investigator : **Mrs.K.R. Pavithra Devi M.E.,**
Assistant Professor,
Department of EEE,
ARJCET,
Mannargudi.

Name of the principal Co-Investigator : **Mrs. G. Uma Sathya M.E.,**
Assistant Professor,
Department of EEE,
ARJCET,
Mannargudi.

It is Certified that a sum of **Rs. 7,00,000 (Seven Lakh Rupees)** Sanctioned by the **M/s. Hindustan Transformers, Chennai** for carrying out for the above mentioned Project has been utilized for the purpose for which it was sanctioned and the sum of rupees **0 (Zero Rupees)** remaining unutilized is refunded.

P.N. Raghunath

Signature of the Principal

PRINCIPAL
A.R.J. COLLEGE OF ENGG. & TECH.
EDAYARNATHAM, MANNARGUDI.

Signature of the Investigators

Signature of the HOD

HEAD OF THE DEPARTMENT
DEPARTMENT OF EEE
A.R.J. COLLEGE OF ENGG. & TECH.
EDAYARNATHAM, MANNARGUDI.

For HINDUSTHAN TRANSSFORMERS

Managing Partner

Signature of the Managing Director

KN PACKAGE

-PACKAGE-

17/15, 1st Floor, Jallikadu, Appanaickenpalayam, Thudiyalur, Coimbatore-641017
GST: 33AAPFK6951R1ZF E-mail: knpackage@gmail.com Mob: 9965508440

Date: 14.06.2023

To

The Principal,

A.R.J College of Engineering & Technology,

Mannargudi.

Dear sir,

Sub: Inviting a Research Proposal – "Customer Profile Analysis and Customer Relationship Management for Brand Equity in Industries"-Reg.

With reference to the above subject, I am happy to invite a Research proposal from ARJCET, Mannargudi. We are offering Management and Product related services and applications to customers. In this connection, we need your support in R&D work on the exploration of the **"Customer Profile Analysis and Customer Relationship Management for Brand Equity in Industries"**. The Profile of different customer in different industries has been analyzed using Digital Techniques. The customer Satisfaction plays major role in marketing and selling a product in which using the profile obtained from the Data Base, their satisfaction has been analyzed. The Customer and the Management relationship is also being analyzed in various industries by the re-appearance of the customers to the same industry for buying the product according to the quality of the product. The Quality in every industry is checked and the evaluation of Brand equity is also done for the improvement of Services and customer satisfaction. Therefore, I kindly request you to submit a research proposal with all necessary details such as Proposed Project objectives, Work plan, timeline, budget and expected outcome for further development of Modelling of IC Engine Piston. Am looking forward to receive your response regarding the above mentioned.

Thanking you,

With Reg

AuthorisedSeal

AuthorisedSignature.

A.R.J COLLEGE OF ENGINEERING AND TECHNOLOGY
Edayarnatham - Mannargudi
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai-25
(An ISO 9001:2015 Certified Institution)

16.06.2023

From

Dr. P.N. Raghunath M.E., Ph.D.,

Principal

To

KN Package
17/15,1st Floor,
Jallikadu, Appanaickenpalayam,
Thudiyalur, Coimbatore-641017

Dear Sir,

Ref: Your invitation letter dated 14.06.2023

We have received your project invitation letter to work on a research project entitled **"Customer Profile Analysis and Customer Relationship Management for Brand Equity in Industries."**, and we are happy to accept your invitation and proceed further with the project. And we wholeheartedly thank the management of **KN Package, Coimbatore** . We will submit the research proposal to you as per your requirements very soon. We look forward to proceed further, and once again, we thank you for considering the Proposal.

Thanking You,

Yours Sincerely,
P.N. Raghunath
Principal.

PRINCIPAL
A.R.J. COLLEGE OF ENGG. & TECH
EDAYARNATHAM, MANNARGUDI.

KN PACKAGE
-PACKAGE-

17/15, 1st Floor, Jallikadu, Appanaickenpalayam, Thudiyalur, Coimbatore-641017
GST: 33AAPFK6951R1ZF E-mail: knpackage@gmail.com Mob: 9965508440

Date: 07.08.2023

To

The Principal,

A.R.J College of Engineering & Technology,

Mannargudi.

Dear sir,

Sub:KN PACKAGES, COIMBATORE -- Project completion by the Department of MBA (2023-2024)- Approval Intimation- Grant Release-Reg.

With respect to the Project proposal by the Department of MBA has been approved by the **KN Packages, Coimbatore** is enclosed along with the terms and conditions. You are requested to adhere to terms and conditions including the submission of the Project in time.

S.No	Name of the Investigators	Title of the Project	Amount
1.	Mrs. M. Ganga, MBA., Assistant Professor, Department of MBA, A.R.J College of Engineering & Technology, Mannargudi. (Principal Investigator)	Customer Profile Analysis and Customer Relationship Management for Brand Equity in Industries	3,00,000
2.	Mr. S. Mukeshwaran, MBA., Assistant Professor, Department of MBA, A.R.J College of Engineering & Technology, Mannargudi. (Principal Co-Investigator)		

Herewith enclosed the cheque for the approved grant and disburse the grants to the concern Faculties from Department of MBA, ARJCET from your side at the earliest. Kindly send the Utilisation Certificate (format enclosed) on completion of the project.

Thanking You,

AuthorisedSeal

AuthorisedSignature.

A.R.J COLLEGE OF ENGINEERING AND TECHNOLOGY
Edayarnatham - Mannargudi
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai-25
(An ISO 9001:2015 Certified Institution)

16.08.2023

Dr. P.N. Raghunath M.E., Ph. D.,
Principal

Mobile No : 9750988221
Email ID : principal@arjcet.edu.in

Proposed Budget for the Research Project Work

S.No	Nature of the Work	Time Line for the work
1.	Preliminary Studies	1,00,000
2.	Budget for the Proposed Main Work	1,00,000
3.	Travel expenses for the Project work Progress Meeting	50,000
4.	Miscellaneous	50,000

P. N. Raghunath

PRINCIPAL

PRINCIPAL
A.R.J. COLLEGE OF ENGG. & TECH
EDAYARNATHAM, MANNARGUDI

"Customer Profile Analysis and Customer Relationship Management for Brand Equity in Industries"

Project proposal

Abstract

Renewable energy sources become an important point in terms of increasing energy source diversity and decreasing the carbon emissions, power system stability suffers from increasing renewable energy and distributed generation penetration to the power system. Therefore, grid-scale energy storage systems are introduced to improve the power system stability. Large scale energy storage technologies that connected to the power system to improve the power system stability and power quality are reviewed and explained. The complexities of electrical metrology across different applications, discussing how to meet requirements, comply with regulations, and enhance revenue as well as reliability. It also showcases advanced semiconductor metering technologies that provide different degrees of integration and system partitioning. Energy storage technologies for grid scale energy storage systems, application of energy storage systems, and control methods are analyzed using Smart Grid Technology. In addition, some comparison results are given about energy storage technologies for grid-scale applications. EV chargers, solar inverters, and smart home devices, all requiring precise energy usage data and power quality monitoring has also been discussed to increase Power Quality. ST solutions simplify the BOM, design, and software development effort. Developers will benefit from our full range of evaluation boards, development software and firmware, as well as design guides and documentation throughout the entire design process.

The anticipated outcome of this Project is a comprehensive report that presents Modelling and analyzing the Energy Storage system. The report will offer practical recommendations of designing the Fuel cells and highlighting the performance of the power system using Smart Grid. The insights gained for this research will contribute to the wider understanding of Variable renewable generation increases in power systems, issues, such as grid stiffness, larger frequency deviations, and grid stability, are becoming more relevant, particularly in view of 100% renewable energy networks, which is the future of smart grids.

By undertaking this project, we aim to equip the Energy storage systems (ESSs) are proving to be indispensable for facilitating the integration of renewable energy sources (RESs), are being widely deployed in both microgrids and bulk power systems, and thus will be the hallmark of the clean electrical grids of the future. Hence, this article reviews several energy storage technologies that are rapidly evolving to address the RES integration challenge, particularly compressed air energy storage (CAES), flywheels, batteries, and thermal ESSs, and their modeling and applications in power grids. An overview of these ESSs is provided, focusing on new models and applications in microgrids and distribution and transmission grids for grid operation, markets, stability, and control.

M. L

PRINCIPAL INVESTIGATOR

P. N. Raghunath

PRINCIPAL

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EDAYARNATHAM, MANNARGUDI.

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai-25
(An ISO 9001:2015 Certified Institution)

16.08.2023

Dr. P.N. Raghunath M.E., Ph. D., Mobile No : 9750988221

Principal Email ID :principal@arjcet.edu.in

To

KN Package
17/15,1st Floor,
Jallikadu, Appanaickenpalayam,
Thudiyalur, Coimbatore-641017

Dear Sir,

Sub: "Customer Profile Analysis and Customer Relationship Management for Brand Equity in Industries"- Acknowledging the receipt of the project Grant- reg

Ref: Your Project Sanction letter date on 10.08.2023

We have received your project acceptance and sanction letter in regards to the project Proposal submitted on **"Customer Profile Analysis and Customer Relationship Management for Brand Equity in Industries"** . Our Project Team lead by Mrs. M. Ganga, MBA., Assistant Professor, Department of MBA who will be the Principal Investigator and carry out the research work as well as update you regularly about the progress of the project work. We also thank you for sanctioning the Research project grant amount of Rs. 3,00,000/- for the above-mentioned project.

Thanking You,

Yours Sincerely,

P.N. Raghunath

PRINCIPAL

PRINCIPAL
A.R.J. COLLEGE OF ENGG. & TECH.
EDAYARNATHAM, MANNARGUDI

Funding Project by the Department of MBA
ARJCET

2023-2024

Name of the Project : Customer Profile Analysis and Customer Relationship Management for Brand Equity in Industries.

Name of the Principal Investigator : Mrs. M. Ganga, MBA., Assistant Professor, Department of MBA, A.R.J College of Engineering & Technology, Mannargudi.

Name of the Principal Co-Investigator: Mr. S. Mukeshwaran, MBA., Assistant Professor, Department of MBA, A.R.J College of Engineering & Technology, Mannargudi.

It is Certified that a sum of **Rs. 3,00,000 (Rupees Three Lakhs)** Sanctioned by the **KN PACKAGE** for carrying out for the above-mentioned Project has been utilized for the purpose for which it was sanctioned and the sum of rupees **0 (Zero Rupees)** remaining unutilized is refunded.

Signature of the Managing Director

Signature of the Investigators

Signature of the HOD

S. MUKESHWARAN, M.B.A., M.Phil.,
Dept. of MBA
Hod & Placement Officer
A.R.J. College of Eng & Tech
MANNARGUDI (Tk) - 614 001
Cell: 86108 43159, 96295 53430.

Signature of the Principal

PRINC'
A.R.J. COLLEGE OF ENG... ...CH
EDAYARNATHAM, MANNARGUDI.

CERTIFICATE FOR THE PROJECT COMPLETION

This is to Certify that **Mrs. M. Ganga MBA., Assistant Professor,** Department of MBA, A.R.J College of Engineering & Technology, Mannargudi, Thiruvarur-Dt has Successfully completed the project titled **"Customer Profile Analysis and Customer Relationship Management for Brand Equity in Industries"** in the Marketing and Customer Satisfaction domain in correspondence with our organization during the Academic year 2023-2024.

19.12.2023

Date

Signature of the Authorized

CERTIFICATE FOR THE PROJECT COMPLETION

This is to Certify that **Mr.S. Mukeshwaran, Assistant Professor,** Department of MBA, A.R.J College of Engineering & Technology, Mannargudi, Thiruvarur-Dt has Successfully completed the project titled **"Customer Profile Analysis and Customer Relationship Management for Brand Equity in Industries"** in the Marketing and Customer Satisfaction domain in correspondence with our organization during the Academic year 2023-2024.

19.12.2023

Date

Signature of the Authorized

JADAYU
SOFTWARE TECHNOLOGY
POWERED BY JADAYU ENTERPRISES
An ISO 9001:2015 Certified Training, Testing and Placement Centre
Our Partners : PMKVY XSO

Phone No: 04362 – 221181
Mobile No: 8754963381, 9791812781
E-Mail ID: jdayuenterprisestnj@gmail.com

Date: 14.06.2023

To

The Principal,
A.R.J College of Engineering & Technology,
Mannargudi.

Dear sir,

Sub: Inviting a Research Proposal "Intelligent Robotics: Enhancing Autonomy and Interaction through AI"-reg

With reference to the above subject I am happy to invite a Research proposal from A.R.J College of Engineering & Technology, Mannargudi. We are offering Electrical related services and applications to customers. In this connection, we need your support in R&D work on the exploration of the **"Intelligent Robotics: Enhancing Autonomy and Interaction through AI"** .This will be required for making a New innovation of robotics enhancing and interaction through AI. Therefore, I kindly request you to submit a research proposal with all necessary details such as Proposed Project objectives, Work plan, timeline, budget and expected outcome for further development of New Robotics using interaction through AI. Am looking forward to receive your response regarding the above mentioned.

Thanking you,

14/6/23

JADAYU SOFTWARE TECHNOLOGY ★ POWERED BY JADAYU ENTERPRISES ★ THANJAVUR.

Managing Director,
JADAYU SOFTWARE TECHNOLOGY
Powered by
JADAYU ENTERPRISES

A.R.J. COLLEGE OF ENGINEERING & TECHNOLOGY ★ MANNARAGUDI ★ EDAYARNATHANKUDIKADU

E.N. Raghunath

Head Office: 42/1A, First Floor, Bishop Sundarm Complex, Pudukottai Road, Thanjavur-613007.
Branch Office: No. 1/15 Ravi Complex, palayaniyappar street, New Bus stand, Mannargudi, Opp Police Station Road, pattukkottai- 614601.

A.R.J COLLEGE OF ENGINEERING AND TECHNOLOGY
Edayarnatham - Mannargudi
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai-25
(An ISO 9001:2015 Certified Institution)

16.06.2023

From

Dr. P.N. Raghunath M.E., Ph.D.,
Principal

TO

Jadayu Software Technology
Powered by JADAYU Enterprises
42/A, 1st Floor Bishop Sundaram Complex,
Pudukkottai Road, Thanjavur-613007

Dear Sir,

Ref: 1. your invitation letter dated 14.06.2023

We have received your project invitation letter to work on a research project entitled **"Intelligent Robotics: Enhancing Autonomy and Interaction through AI"**, and we are happy to accept your invitation and proceed further with the project. And we wholeheartedly thank the management of **Jadayu Software technology, Thanjavur .** We will submit the research proposal to you as per your requirements very soon. We look forward to procced further, and once again, we thank you for considering the Proposal.

Thanking You,

Yours Sincerely,
P.N. Raghunath
Principal.

A.R.J. COLLEGE OF ENGINEERING & TECHNOLOGY * EDAYARNATHAM * MANNARAGUDI

PRINCIPAL
A.R.J. COLLEGE OF ENGG. & TECH
EDAYARNATHAM

P.N. Raghunath

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(An ISO 9001:2015 Certified Institution)

17.07.2023

From

Dr. P.N. Raghunath M.E., Ph.D.,

Principal

TO

Jadayu Software Technology

Powered by JADAYU Enterprises

42/A, 1st Floor Bishop Sundaram Complex,

Pudukkottai Road, Thanjavur-613007

Dear Sir,

Sub: Submission of Project Proposal –Exploration of the "Intelligent Robotics: Enhancing Autonomy and Interaction through AI" Budget & assigning the project Team- Reg.

Ref: your research invitation letter dated 14.7.2023

With reference to the above subject, herewith we are submitting a project proposal titled **"Intelligent Robotics: Enhancing Autonomy and Interaction through AI"** with the necessary budget, and we have also assigned the team from Master of Computer Application to the proposed budget. Kindly receive it and do the needful for further development.

Thanking You,

Yours Sincerely,

P.N. Raghunath

Principal.

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(An ISO 9001:2015 Certified Institution)

17.07.2023

Dr. P.N. Raghunath M.E., M.B.A., Ph. D., Mobile No : 9750988221

Principal Email ID : principal@arjcet.edu.in

Ref: ARJCET/R&D

The following faculty members are assigned for conducting the research work submitted to (**Funding agency**) titled Exploration of the **"Intelligent Robotics: Enhancing Autonomy and Interaction through AI"**

List of Faculty Members

S.No	Name of PI & Co-PI	Designation & Specialization	Contact Information
1.	Ms. K.Praveena M.C.A.,	Assistant Professor, Master of Computer Application, ARJCET, Mannargudi.	8925055020 praveenakamal23@gmail.com
2.	Ms, K.Meenatchi M.C.A.,	Assistant Professor, Master of Computer Application, ARJCET, Mannargudi.	9940368568 minakshikrishna968@gmail.com

P.N. Raghunath
PRINCIPAL

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(An ISO 9001:2015 Certified Institution)

17.07.2023

Dr. P.N. Raghunath M.E., Mp.B.A., Ph. D., Mobile No : 9750988221

Principal Email ID : principal@arjcet.edu.in

Ref: ARJCET/R&D

Proposed Budget for the Research Project Work

S.No	Nature of the Work	Time Line for the work
1.	Preliminary Studies	1,00,000
2.	Budget for the Proposed Main Work	3,00,000
3.	Travel expenses for the Project work Progress Meeting	50,000
4.	Miscellaneous	50,000

P.N. Raghunath
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EDAYARNATHAM, MANNARGUDI.

"Intelligent Robotics: Enhancing Autonomy and Interaction through AI"

Project proposal

Abstract

Intelligent robotics represents a crucial frontier in technology, where advancements in artificial intelligence (AI) are revolutionizing autonomy and interaction capabilities. This paper explores how AI techniques such as machine learning, computer vision, and natural language processing are integrated into robotic systems to enhance their autonomy and interaction with humans and the environment.

Firstly, the concept of autonomy in intelligent robotics is discussed, emphasizing the ability of robots to perceive, decide, and act independently based on sensory data and predefined algorithms. AI plays a pivotal role here by enabling robots to learn from data, adapt to changing environments, and make decisions in real-time, thereby increasing their operational efficiency and safety. Secondly, the interaction aspect delves into how AI facilitates seamless communication between robots and humans.

The concept of autonomy is discussed, focusing on how AI enables robots to learn from data, adapt to unforeseen circumstances, and execute tasks efficiently and safely

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without constant human intervention. Machine learning algorithms allow robots to improve their decision-making processes over time, while computer vision provides them with the ability to interpret and respond to visual cues in their surroundings. Natural language processing allows robots to understand and respond to verbal commands, while computer vision enables them to perceive gestures and facial expressions, enhancing their ability to collaborate and assist in various tasks.

Additionally, AI-driven interaction capabilities are examined, highlighting advancements in natural language processing that enable robots to understand and generate human speech, facilitating intuitive communication and collaboration. Computer vision techniques further enhance interaction by enabling robots to recognize and interpret gestures, expressions, and other non-verbal cues, thereby improving their ability to assist and work alongside humans effectively.

The paper also addresses current challenges in the field, such as ethical considerations surrounding AI decision-making in robotic autonomy and the societal integration of intelligent robots. It concludes by discussing future directions, emphasizing the potential for continued innovation in AI to further enhance the autonomy and interaction capabilities of intelligent robotics, ultimately reshaping industries and daily life.

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Furthermore, the paper examines current challenges and future directions in the field of intelligent robotics. Issues such as ethical considerations in AI-driven decision-making and the integration of robots into society are highlighted, alongside potential solutions and research avenues. In conclusion, intelligent robotics empowered by AI represents a transformative paradigm in technology, offering unprecedented opportunities for enhancing autonomy and interaction capabilities. As research and development continue to progress, the synergy between AI and robotics promises to redefine industries, improve quality of life, and pave the way towards a future where human-robot collaboration is seamless and beneficial to society.

P.N. Rashunath

PRINCIPAL INVESTIGATOR

PRINCIPAL

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JADAYU
SOFTWARE TECHNOLOGY
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An ISO 9001:2015 Certified Training, Testing and Placement Centre
Our Partners : PMKVY

Phone No: 04362 – 221181
Mobile No: 8754963381, 9791812781
E-Mail ID: jdayuenterprisestnj@gmail.com

Date:10.08.2023

To

The Principal,
A.R.J College of Engineering & Technology,
Mannargudi.

Dear sir,

Sub: Jadayu Software Technology powered by Jadayu Enterprises, Thanjavur - Project Completion by the Department of MCA (2023-2024)- Approval Intimation- Grant Release-Reg.

With respect to the Project proposal by the Department of MCA has been approved by the **Jadayu Software Technology Powered by Jadayu Enterprises, Thanjavur** is enclosed along with the terms and conditions. You are requested to adhere to terms and conditions including the submission of the Project in time.

S.No	Name of the Investigators	Title of the Project	Amount
1.	Ms. K.Praveena, M.C.A., Assistant Professor, Department of MCA, A.R.J College of Engineering & Technology, Mannargudi. (Principal Investigator)	Intelligent Robotics: Enhancing Autonomy and Interaction through AI	5,00,000
2.	Ms. K.Meenatchi, M.C.A.,M.Phil., Assistant Professor, Department of MCA, A.R.J College of Engineering & Technology, Mannargudi. (Principal Co-Investigator)		

P.N. Raghunath
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Head Office: 42/1A, First Floor, Bishop Sundarm Complex, Pudukottai Road, Thanjavur-613007.
Branch Office: No.1/5 Ravi Complex, palayaniyappar street, New Bus stand Adjacent Road, Opp Police Station Road, pattukkottai- 61460

Funding Project by the Department of MCA
ARJCET
2023-2024

Name of the Project : Intelligent Robotics: Enhancing Autonomy and Interaction through AI.

Name of the Principal Investigator : **Ms. K.Praveena, M.C.A.,**
Assistant Professor,
Department of MCA,
ARJCET,
Mannargudi.

Name of the principal Co-Investigator : **Ms. K.Meenatchi, M.C.A.,M.Phil.,**
Assistant Professor,
Department of MCA,
ARJCET,
Mannargudi.

It is Certified that a sum of **Rs. 5,00,000 (Five Lakh Rupees)** Sanctioned by the **Jadayu Software Technology powered by Jadayu Enterprises, Thanjavur** for carrying out for the above mentioned Project has been utilized for the purpose for which it was sanctioned and the sum of rupees **0 (Zero Rupees)** remaining unutilized is refunded.

29/9/23

Signature of the Managing Director

V.GOKULRAJ B.E.
MANAGING DIRECTOR
JADAYU SOFTWARE TECHNOLOGY
POWERED BY
JADAYU ENTERPRISES

Signature of the Investigators

Signature of the HOD

HEAD OF THE DEPARTMENT
DEPARTMENT OF MCA
A.R.J. COLLEGE OF ENGG. & TECH.
EDAYARNATHAM, MANNARGUDI.

R.N. Raghunath

Signature of the Principal

A.R.J. COLLEGE OF ENGINEERING & TECHNOLOGY
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EDAYARNATHAM

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R.N. Raghunath
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Phone No: 04362 – 221181
Mobile No: 8754963381, 9791812781
E-Mail ID: jdayuenterprisestnj@gmail.com

CERTIFICATE FOR THE PROJECT COMPLETION

This is to Certify that **Ms. K.Meenatchi, M.C.A.,M.Phil., Assistant Professor,** Department of MCA, A.R.J College of Engineering & Technology, Mannargudi, Thiruvarur-Dt has Successfully completed the project titled **"Intelligent Robotics: Enhancing Autonomy and Interaction through AI"** in the Power systems domain in correspondence with our organization during the Academic year 2023-2024.

30/1/24

Date

30/1/24

S.GOKULRAJ B.E.,
MANAGING DIRECTOR
JADAYU SOFTWARE TECHNOLOGY
POWERED BY
JADAYU ENTERPRISES

Signature of the Authorized

A.R.J. COLLEGE OF ENGINEERING & TECHNOLOGY
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MANNARGUDI
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P.N. Raghunath
PRINCIPAL
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Head Office: 42/1A, 1st Floor, Bishop Sundarm Complex, Pudukottai Road, Thanjavur-613007.
Branch Office: No. 115, Ravi Complex, palayaniyappan street, New Bus stand Adjacent Road, Opp Police Station Road, pattukkottai- 614601.

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Our Partners : PMKVY

Phone No: 04362 – 221181
Mobile No: 8754963381, 9791812781
E-Mail ID: jdayuenterprisestnj@gmail.com

CERTIFICATE FOR THE PROJECT COMPLETION

This is to Certify that **Ms. K.Praveena M.C.A., Assistant Professor,** Department of MCA, A.R.J College of Engineering & Technology, Mannargudi, Thiruvarur-Dt has Successfully completed the project titled **"Intelligent Robotics: Enhancing Autonomy and Interaction through AI"** in the Power systems domain in correspondence with our organization during the Academic year 2023-2024.

30/1/24

Date

S.GOKULRAJ
MANAGING DIRECTOR
JADAYU SOFTWARE TECHNOLOGY
POWERED BY
JADAYU ENTERPRISES

Signature of the Authorized

JADAYU SOFTWARE TECHNOLOGY POWERED BY JADAYU ENTERPRISES THANJAVUR

A.R.J COLLEGE OF ENGINEERING & TECHNOLOGY MANNARGUDI PERIYARNAITHAN

P.N Raghunath
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PERIYARNAITHAN MANNARGUDI.

Head Office: No.1, First Floor, Bishop Sundarm Complex, Pudukottai Road, Thanjavur-613007.
Branch Office: No. 1, Bharathi Complex, palayaniyappan Street, New Bus Stand Adjacent Road, Opp Police Station Road, pattukottai- 61460

MECK TECK RESEARCH FOUNDATION

(Registered Under Ministry of Micro, Small and Medium Enterprises UDYAM-TN-17-0015761)

16.06.2022

To

The Principal,

A.R.J College of Engineering & Technology,

Mannargudi.

Dear sir,

Sub: Inviting a Research Proposal - Prediction of Preterm Deliveries Using EMG Signal-Reg.

With reference to the above subject I am happy to invite a Research proposal from A.R.J College of Engineering & Technology, Mannargudi. We are offering Electronics related services and applications to customers. In this connection, we need your support in R&D work on the exploration of the **"Prediction of Preterm Deliveries Using EMG Signal"** This will be required for making a Prediction of Preterm Deliveries Using EMG Signal. Therefore, I kindly request you to submit a research proposal with all necessary details such as Proposed Project objectives, Work plan, timeline, budget and expected outcome for further development of our approach shows an improvement on existing studies with 96% sensitivity, 90% specificity, and a 95% area under the curve value with 8% global error using the polynomial classifier. I am looking forward to receive your response regarding the above mentioned.

Thanking you,

With Regards,

Dr. M. MEIGNANAMOORTHY, M.E., Ph.D.,
FOUNDER & CEO
Meck Teck Research Foundation
6/9, Kamarajapuram 17-th Street,
1-st Cross, PUDUKKOTTAI - 622 001,
Tamil Nadu, India.
meckteckresfoundation@gmail.com

MECK TECK RESEARCH FOUNDATION ★ EDUCATION INTO INNOVATION

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P.N. Ruzhunath

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EDAYARNATHAM, MANNARGUDI.

No : 6/9, Kamarajapuram 17th Street
1st Cross, Pudukkottai - 622 001,
Tamil Nadu, India. ★ +91 94880 58361

A.R.J COLLEGE OF ENGINEERING AND TECHNOLOGY

Edayarnatham - Mannargudi

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai-25
(An ISO 9001:2015 Certified Institution)

29.06.2022

From

Dr. P.N. Raghunath M.E., Ph.D.,

Principal

To

Meck Teck Research Foundation,

6/9, Kamarajapuram 17-th Street,

1-st Cross, Pudukkottai-922001,

Tamilnadu, India.

Dear Sir,

Ref: Your invitation letter dated 16.06.2022

We have received your project invitation letter to work on a research project entitled "**Prediction of Preterm Deliveries Using EMG Signal**", and we are happy to accept your invitation and proceed further with the project. And we wholeheartedly thank the management of **Meck Teck Research Foundation, Pudukkottai**. We will submit the research proposal to you as per your requirements very soon. We look forward to proceed further, and once again, we thank you for considering the Proposal.

Thanking You,

Yours Sincerely,

P.N. Raghunath

Principal.

PRINCIPAL
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(An ISO 9001:2015 Certified Institution)

29.06.2022

Dr. P.N. Raghunath M.E., Ph. D., Mobile No : 9750988221
Principal Email ID : principal@arjcet.edu.in

Proposed Budget for the Research Project Work

S.No	Nature of the Work	Time Line for the work
1.	Preliminary Studies	2,00,000
2.	Budget for the Proposed Main Work	3,00,000
3.	Travel expenses for the Project work Progress Meeting	50,000
4.	Miscellaneous	50,000

P.N. Raghunath
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(An ISO 9001:2015 Certified Institution)

29.06.2022

Dr. P.N. Raghunath M.E., Ph. D., Mobile No :9750988221
Principal Email ID :principal@arjcet.edu.in

The following faculty members are assigned for conducting the research work submitted to **Meck Teck Research Foundation,Pudukkottai** titled "**Prediction of Preterm Deliveries Using EMG Signal**"

List of Faculty Members

S.No	Name of PI & Co-PI	Designation & Specialization	Contact Information
1.	Mr. B.Karthick M.E.,	Assistant Professor, Department of ECE, ARJCET, Mannargudi.	9003409587 basskarthikkt@gmail.com
2.	Mrs. V. Sathiyavathi M.E.,	Assistant Professor, Department of ECE, ARJCET, Mannargudi.	8072357647 y.sathiyavathi81@gmail.com

P.N. Raghunath

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"Prediction of Preterm Deliveries Using EMG Signal"

Project proposal

Abstract

There has been some improvement in the treatment of preterm infants, which has helped to increase their chance of survival. However, the rate of premature births is still globally increasing. As a result, this group of infants are most at risk of developing severe medical conditions that can affect the respiratory, gastrointestinal, immune, central nervous, auditory and visual systems. In extreme cases, this can also lead to long-term conditions, such as cerebral palsy, mental retardation, learning difficulties, including poor health and growth. In the US alone, the societal and economic cost of preterm births, in 2005, was estimated to be $26.2 billion, per annum. In the UK, this value was close to £2.95 billion, in 2009. Many believe that a better understanding of why preterm births occur, and a strategic focus on prevention, will help to improve the health of children and reduce healthcare costs. At present, most methods of preterm birth prediction are subjective. However, a strong body of evidence suggests the analysis of uterine electrical signals (Electrohysterography), could provide a viable way of diagnosing true labour and predict preterm deliveries. Most Electrohysterography studies focus on true labour detection during the final seven days, before labour. The challenge is to utilise Electrohysterography techniques to predict preterm delivery earlier in the pregnancy. This paper explores this idea further and presents a supervised machine learning approach that classifies term and preterm records, using an open source dataset containing 300 records (38 preterm and 262 term). The synthetic minority oversampling technique is used to oversample the

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minority preterm class, and cross validation techniques, are used to evaluate the dataset against other similar studies. Our approach shows an improvement on existing studies with 96% sensitivity, 90% specificity, and a 95% area under the curve value with 8% global error using the polynomial classifier.

B.

PRINCIPAL INVESTIGATOR

P.N.Rajkumath

PRINCIPAL

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EDAYARNATHAM, MANNARGUDI.

A.R.J. COLLEGE OF ENGINEERING & TECHNOLOGY * MANNARAGUDI * EDAYARNATHAM

P.N.Rajkumath

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EDAYARNATHAM, MANNARGUDI.

MECK TECK RESEARCH FOUNDATION

(Registered Under Ministry of Micro, Small and Medium Enterprises UDYAM-TN-17-0015761)

Date: 06.07.2022

To

The Principal,

A.R.J College of Engineering & Technology,

Mannargudi.

Dear sir,

Sub: Acceptance of Research Project with Sanction of Grant-Reg.

Ref: ARJCET/R&D/29.06.2022.

With reference to the above subject we are happy to accept the Project Proposal titled **"Prediction of Preterm Deliveries Using EMG Signal"**. We are also happy to sanction an amount of Rs. 6,00,000 (Rupees Six Lakhs only) for the proposed submitted by the team of **Mr.B.Karthick and Mrs. V.Sathiyavathi, Assistant Professors, Department of Electronics & Communication Engineering.** We hope that this project will provide us a monetary benefit towards our Business and its development. Please contact us for getting more information needed.

Thanking You,

With Regards,

Dr. M. MEIGNANAMOORTHY, M.E., Ph.D.,
FOUNDER & CEO
Meck Teck Research Foundation
6/9, Kamarajapuram 17-th Street,
1-st Cross, PUDUKKOTTAI - 622 001,
Tamil Nadu, India.

R-N. Rajhu

PRINCIPAL
A.R.J. COLLEGE OF ENGG. & TECH
EDAYARNATHAM, MANNARGUDI.

No : 6/9, Kamarajapuram 17th Street
1st Cross, Pudukkottai - 622 001,
Tamil Nadu, India.
+91 94880 58361
mecktecksresfoundation@gmail.com

MECK TECK RESEARCH FOUNDATION

(Registered Under Ministry of Micro, Small and Medium Enterprises UDYAM-TN-17-0915761)

03.08.2022

To

The Principal,

A.R.J College of Engineering & Technology,

Mannargudi.

Dear Sir,

Sub: MECK TECK RESEARCH FOUNDATION, PUDUKKOTTAI -- On-going Project by the Department of ECE (2022-2023)- Approval Intimation- Grant Release-Reg.

With respect to the Project proposal by the Department of ECE has been approved by the **MECK TECK RESEARCH FOUNDATION, PUDUKKOTTAI** enclosed along with the terms and conditions. You are requested to adhere to terms and conditions including the submission of the Project in time.

S.No	Name of the Investigators	Title of the Project	Amount
1.	Mr. B.Karthick M.E., Assistant Professor, Department of ECE, A.R.J College of Engineering & Technology, Mannargudi. (Principal Investigator)	Prediction of Preterm Deliveries Using EMG Signal	6,00,000
2.	Mrs. V. Sathiyavathi M.E., Assistant Professor, Department of Mechanical Engineering, A.R.J College of Engineering & Technology, Mannargudi. (Principal Co-Investigator)		

Here with enclosed the cheque for the approved grant and disburse the grants to the concern Faculties from Department of ECE, ARJCET from your side at the earliest. Kindly send the Utilization Certificate (format enclosed) on completion of the project.

Thanking You,

Yours Truly,

(Founder & CEO)

Dr. M. MEIGNANAMOORTHY, M.E., Ph.D.,
FOUNDER & CEO
Meck Teck Research Foundation
6/9, Kamarajapuram 17-th Street,
1st Cross, PUDUKKOTTAI - 622 001,
Tamil Nadu, India.

P.N. Rajkumar
PRINCIPAL
A.R.J. COLLEGE OF ENGG. & TECH.
EDAYARNATHAM, MANNARGUDI

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1st Cross, Pudukkottai - 622 001,
Tamil Nadu, India.
+91 94880 66301 meckteckresfoundation@gmail.com

A.R.J COLLEGE OF ENGINEERING AND TECHNOLOGY

Edayarnatham - Mannargudi

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai-25
(An ISO 9001:2015 Certified Institution)

12.07.2022

Dr. P.N. Raghunath M.E., Ph. D., Mobile No : 9750988221

Principal Email ID : principal@arjcet.edu.in

To

Meck Teck Research Foundation,
6/9, Kamarajapuram 17-th Street,
1-st Cross, Pudukkottai-922001,
Tamilnadu, India.

Dear Sir,

Sub: "Prediction of Preterm Deliveries Using EMG Signal"- Acknowledging the receipt of the project Grant- reg

Ref: Your Project Sanction letter date on 06.07.2022

We have received your project acceptance and sanction letter in regards to the project Proposal submitted on **"Modelling of Energy Storage Systems and Analysis of Power System Stability using Smart Grid"** . Our Project Team lead by Mr. B.Karthick, Assistant Professor of Electronics & Communication Engineering who will be the Principal Investigator and carry out the research work as well as update you regularly about the progress of the project work. We also thank you for sanctioning the Research project grant amount of Rs. 6,00,000/- for the above-mentioned project.

Thanking You,

Yours Sincerely,
P.N. Raghunath
PRINCIPAL.

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EDAYARNATHAM, M.K.

MECK TECK RESEARCH FOUNDATION

(Registered Under Ministry of Micro, Small and Medium Enterprises UDYAM-TN-17-0015761)

CERTIFICATE FOR THE PROJECT COMPLETION

This is to Certify that **Mr. B.Karthick M.E., Assistant Professor,** Department of ECE, A.R.J College of Engineering & Technology, Mannargudi, Thiruvarur-Dt has Successfully completed the project titled **"Prediction of Preterm Deliveries Using EMG Signal"** in the Signals and Systems domain in correspondence with our organization during the Academic year 2022-2023.

24.02.2023

Date

Signature of the Authorized

Dr. M. MEIGNANAMOORTHY, M.E., Ph.D.,
FOUNDER & CEO
Meck Teck Research Foundation
6/9, Kamarajapuram 17-th Street,
1-st Cross, PUDUKKOTTAI - 622 001,
Tamil Nadu, India.

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No : 6/9, Kamarajapuram 17th Street
1st Cross, Pudukkottai - 622 001,
Tamil Nadu, India.

+91 94880 58361

meckteckresfoundation@gmail.com

MECK TECK RESEARCH FOUNDATION

(Registered Under Ministry of Micro, Small and Medium Enterprises UDYAM-TN-17-0015761)

CERTIFICATE FOR THE PROJECT COMPLETION

This is to Certify that **Mrs. V. Sathiyavathi M.E.,** **Assistant Professor,** Department of ECE, A.R.J College of Engineering & Technology, Mannargudi, Thiruvarur-Dt has Successfully completed the project titled **"Prediction of Preterm Deliveries Using EMG Signal"** in the Signals and Systems domain in correspondence with our organization during the Academic year 2022-2023.

24.02.2023

Date

Signature of the Authorized

Dr. M. MEIGNANAMOORTHY, M.E., Ph.D.,
FOUNDER & CEO
Meck Teck Research Foundation
6/9, Kamarajapuram 17-th Street,
1-st Cross, PUDUKKOTTAI - 622 001,
Tamil Nadu, India.

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lu, India.

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SUNTEK automation and solutions

No.5, Sri Seethalamman Nagar, 2nd Cross, Pazavathankattalai, Kumbakonam- 612 001

suntekautomation@gmail.com / 8838645430 / 9788065145

06.09.2022

From

Suntek Automation and Solutions
No .5 Sri Seethalamman Nagar,
2nd Cross, Pazavathan Kattalai,
Kumbakonam-612001,
Tanjore-Dt, Tamil Nadu.

To

The Principal,
A.R.J College of Engineering & Technology,
Mannargudi.

Dear sir,

Sub: Inviting a Research Proposal - Modelling and analysis of IC Engine piston with Composite Material-Reg.

With reference to the above subject, I am happy to invite a Research proposal from ARJCET, Mannargudi. We are offering Mechanical related services and applications to customers. In this connection, we need your support in R&D work on the exploration of the **"Modelling and Analysis of IC Engine piston with Composite Material"**. Fatigue damage of piston such as piston side wear, piston head cracks and so on are reduced by reducing the structural weight of the IC Engine Piston using some Light weight Composite materials and carbon fibred reinforced composite materials. A parametric model of a piston is done in 3D modeling software Autodesk Inventor. Further, it is analyzed for its deformation characteristics through ANSYS Workbench software. Therefore, I kindly request you to submit a research proposal with all necessary details such as Proposed Project objectives, Work plan, timeline, budget and expected outcome for further development of Modelling of IC Engine Piston. Am looking forward to receive your response regarding the above mentioned.

Thanking you,

With Regards,

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09.09.2022

From

Dr. P.N. Raghunath M.E., Ph.D.,
Principal

TO

Suntek Automation and Solutions
No .5 Pazavathan Kattalai
2nd Cross ,Sri Seethalamman Nagar,
Kumbakonam-612001,
Tanjore-Dt ,Tamil Nadu

Dear Sir,

Ref: Your invitation letter dated 06.09.2022

We have received your project invitation letter to work on a research project entitled "**Modelling and analysis of IC engine piston with composite material.**", and we are happy to accept your invitation and proceed further with the project. And we wholeheartedly thank the management of **Suntek Automation and Solutions, Tanjore** We will submit the research proposal to you as per your requirements very soon. We look forward to proceed further, and once again, we thank you for considering the Proposal.

Thanking You,

Yours Sincerely,
P.N. Raghunath
Principal.

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17.10.2022

From

Dr. P.N. Raghunath M.E., Ph.D.,

Principal

TO

Suntek Automation and Solutions
No .5 Pazavathan Kattalai
2nd Cross ,Sri Seethalamman Nagar,
Kumbakonam-612001,
Tanjore-Dt ,Tamil Nadu

Dear Sir,

Sub: Submission of Project Proposal- Modelling and analysis of IC engine piston with composite material-reg

Ref: Your invitation letter dated 13.10.2022

With reference to the above subject, herewith we are submitting a project proposal titled "**Modelling and analysis of IC engine piston with composite material.**",with the necessary budget, and we have also assigned the team from Department of Mechanical Engineering,to the proposed budget. Kindly receive it and do the needful for further development.

Thanking You,

Yours Sincerely,

P.N. Raghunath

Principal.

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17.10.2022

Dr. P.N. Raghunath M.E., Ph. D.,
Principal

Mobile No :9750988221
Email ID:principal@arjcet.edu.in

The following faculty members are assigned for conducting the research work submitted to **Suntek Automation and Solutions, Tanjore** titled **"Modelling and Analysis of IC Engine piston with Composite Material"**

List of Faculty Members

S.No	Name of PI & Co-PI	Designation & Specialization	Contact Information
1.	Mr. B. Jothiramalingam, M.Tech.,	Assistant Professor, Department of Mech, ARJCET, Mannargudi.	9600841292 jothi197mech@gmail.com
2.	Mr. V. Manikandan, M.Tech., MISTE,,	Assistant Professor, Department of Mech, ARJCET, Mannargudi.	8973385893 mechrocks97@gmail.com

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17.10.2022

Dr. P.N. Raghunath M.E., Ph. D., Mobile No : 9750988221

Principal Email ID :principal@arjcet.edu.in

Proposed Budget for the Research Project Work

S.No	Nature of the Work	Time Line for the work
1.	Preliminary Studies	1,00,000
2.	Budget for the Proposed Main Work	2,00,000
3.	Travel expenses for the Project work Progress Meeting	50,000
4.	Miscellaneous	50,000

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"Modelling and Analysis of IC Engine piston with Composite Material"

Project proposal

Abstract

The Study of this research is to carry out how the Hypereutectic alloys can be used as a piston material rather than commonly used alloys of Aluminium, Cast Iron, AlSiC, Al2O3, etc. We carried out Structural and Steady Thermal Analysis on ANSYS to determine the properties of AlSi17Cu5MgNi (Hypereutectic alloy) which exhibits high performance durability, toughness and can be used in high performing engines, where the piston undergoes continuous dynamic loads and high stresses. Though this piston has not comparison in strong, but hypereutectic pistons are made as an ideal choice of selection for the engine producing power between 600HP to 700HP based on the application of use. In further technological developments, the new material of is made by the composition of aluminium i.e. the formation of meatal matrix composite on the basis of aluminium and production is done with the help of power metallurgy. Some other constituents are added to reduce the weight such as carbon and magnesium. The current research on piston material like cast and forged aluminium alloys provides better potential for optimization and plays a vital role in upcoming years.

Piston endures the cyclic gas pressure and the inertial forces at work, and this working condition may cause the fatigue damage of piston such as piston side wear, piston head cracks and so on. One of the design criteria is the endeavour to reduce the structural weight and thus to reduce fuel consumption. This has been made possible by improved engine design. These improvements include

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increased use of lightweight materials, such as advanced ultrahigh tensile strength steels, aluminium and magnesium alloys, polymers, and carbon-fiber reinforced composite materials. Here the life of the piston is improved by means of introducing a new composite matrix of aluminum with particulates of silicon carbide which has the maximum wear factor and which has the same performance except a little bit variation in properties called Al 6061 alloy in reinforcement with Silicon carbide. The piston is designed and analyzed through aluminum and silicon carbide in the ratio 2:3. A parametric model of a piston is done in 3D modeling software Autodesk Inventor. Further, it is analyzed for its deformation characteristics through ANSYS Workbench software

PRINCIPAL INVESTIGATOR

P.N. Raghunath

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No.5, Sri Seethalamman Nagar, 2nd Cross, Pazavathankattalai, Kumbakonam- 612 001

suntekautomation@gmail.com / 8838645430 / 9788065145

16.11.2022

From:

Suntek Automation and Solutions
No .5 Pazavathan Kattalai
2nd Cross ,Sri Seethalamman Nagar,
Kumbakonam-612001,
Tanjore-Dt ,Tamil Nadu

To :

The Principal,
A.R.J College of Engineering & Technology,
Mannargudi.

Dear sir,

Sub: Suntek Automation and Solutions, Project completion by the Department of Mechanical Engineering (2022-2023)- Approval Intimation- Grant Release-Reg.

With respect to the Project proposal by the Department of Mechanical Engineering has been approved by the **Suntek Automation and Solutions, Kumbakonam** is enclosed along with the terms and conditions. You are requested to adhere to terms and conditions including the submission of the Project in time.

S.No	Name of the Investigators	Title of the Project	Amount
1.	Mr. B. Jothi Ramalingam M. Tech., Assistant Professor, Department of Mechanical Engineering, A.R.J College of Engineering & Technology, Mannargudi. (Principal Investigator)	Modelling and Analysis of IC Engine piston with Composite Material	4,00,000
2.	Mr. V. Manikandan M.Tech., MISTE., Assistant Professor, Department of Mechanical Engineering, A.R.J College of Engineering & Technology, Mannargudi. (Principal Co-Investigator)		

Herewith enclosed the cheque for the approved grant and disburse the grants to the concern Faculties from Department of Mechanical Engineering, ARJCET from your side at the earliest. Kindly send the Utilisation Certificate (format enclosed) on completion of the project.

Thanking You,

Yours Truly,

(Managing Director)

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28.11.2022

Dr. P.N. Raghunath M.E., Ph. D., Mobile No : 9750988221

Principal Email ID:principal@arjcet.edu.in

To

Suntek Automation and Solutions
No .5 Pazavathan Kattalai
2nd Cross ,Sri Seethalamman Nagar,
Kumbakonam-612001,
Tanjore-Dt ,Tamil Nadu

Dear Sir,

Sub: "Modelling and Analysis of IC Engine piston with Composite Material" Acknowledging the receipt of the project Grant- reg

Ref: Your Project Sanction letter date on 16.11.2022

We have received your project acceptance and sanction letter in regards to the project Proposal submitted on **"Modelling and Analysis of IC Engine piston with Composite Material"**. Our Project Team lead by Mr. B. Jothiramalingam, , Assistant Professor of mechancial who will be the Principal Investigator and carry out the research work as well as update you regularly about the progress of the project work. We also thank you for sanctioning the Research project grant amount of Rs. 4,00,000/- for the above-mentioned project.

Thanking You,

Yours Sincerely,

P.N. Raghunath

PRINCIPAL

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EDAYARNATHAM, MANNARGUDI.

Funding Project by the Department of Mechanical Engineering
ARJCET

2022-2023

Name of the Project	: Modelling and analysis of IC engine piston with composite material.
Name of the Principal Investigator	: Mr. S. JOTHIRAMALINGAM, M. Tech., Assistant Professor, Department of Mechanical Engineering, A.R.J College of Engineering & Technology, Mannargudi.
Name of the Principal Co-Investigator	: Mr. V. MANIKANDAN, M.Tech., MISTE, Assistant Professor, Department of Mechanical Engineering, A.R.J College of Engineering & Technology, Mannargudi.

It is Certified that a sum of Rs. 4,00,000 (Rupees 4 Lakh Rupees) Sanctioned by the Suntek Automation and Solutions , Kumbakonam for carrying out for the above-mentioned Project has been utilized for the purpose for which it was sanctioned and the sum of rupees 0 (Zero Rupees) remaining unutilized is refunded.

Signature of the Managing Director

SUNTEK AUTOMATION & SOLUTIONS * SUNTEK SOLUTIONS * KUMBAKONAM - 612 001

Signature of the Investigators

Signature of the HOD

A.R.J. COLLEGE OF ENGINEERING AND TECHNOLOGY * HOD DEPT OF Mechanical * MANNARGUDI

P.N. Raghunath

Signature of the Principal

A.R.J. COLLEGE OF ENGINEERING & TECHNOLOGY * MANNARAGUDI * EDAYARNATHAM *

P.N. Raghunath

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suntekautomation@gmail.com / 8838645430 / 9788065145

CERTIFICATE FOR THE PROJECT COMPLETION

This is to Certify that **Mr. B. Jothi Ramalingam M.Tech., Assistant Professor,** Department of Mechanical Engineering, A.R.J College of Engineering & Technology, Mannargudi, Thiruvarur-Dt has Successfully completed the project titled **"Modelling and Analysis of IC Engine Piston with Composite Material"** in the Mechanical Engineering domain in correspondence with our organization during the Academic year 2022-2023.

27.02.2023

Date

SUNTEK AUTOMATION & SOLUTIONS SUNTEK SOLUTIONS KUMBAKONAM - 612 001

Signature of the Authorized

A.R.J. COLLEGE OF ENGINEERING & TECHNOLOGY MANNARAGUDI EDAYARNATHAM

P. N. Raghunath

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suntekautomation@gmail.com / 8838645430 / 9788065145

CERTIFICATE FOR THE PROJECT COMPLETION

This is to Certify that **Mr. V.Manikandan M.Tech., MISTE., Assistant Professor,** Department of Mechanical Engineering, A.R.J College of Engineering & Technology, Mannargudi, Thiruvarur-Dt has Successfully completed the project titled **"Modelling and Analysis of IC Engine Piston with Composite Material"** in the Mechanical Engineering domain in correspondence with our organization during the Academic year 2022-2023.

27.02.2023

Date

SUNTEK AUTOMATION & SOLUTIONS KUMBAKONAM - 612 001

Signature of the Authorized

A.R.J. COLLEGE OF ENGINEERING & TECHNOLOGY MANNARAGUDI EDAYARNATHAM

P.N. Rajnath

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