

**DIRECTORATE OF SCIENCE & TECHNOLOGY  
Khadi and Village Industries Commission  
“Gramodaya” 3, IRLA ROAD, VILE-PARLE (W)  
MUMBAI-400056.**

**Proforma for submission of new R&D project proposal (Year 2024)**

**I - PART-A**

|     |   |  |
|-----|---|--|
| 1.  | Name of the Institution / Individual:<br><br>National Institute of Technology Agartala  |  |
| 2.  | Institutional Structure/Registration Details:<br><br>A centrally funded Autonomous Institute, governed by the National Institute of Technology (NIT) Act, 2007. |  |
| 2a. | Legal Status  | Institute of National Importance (INI)   |
| 2b. | Date of Registration  | NA   |
| 2c. | Registered Address  | Jirania, West Tripura<br>Pin – 799046  |
| 2d. | Office Address/Locations  | Jirania, West Tripura, Tripura, Pin - 799046<br>Phone: (0381)2546630 & Fax:(0381)2546360<br>e-mail: director@nita.ac.in, nita.director@gmail.com |
| 2e. | Affiliated to KVIC  | Yes/No<br><br>If yes, provide Certificate No. NA<br><br>Validity of Certificate NA   |

**3. Validity date of Registration (in case of NGO's): NA**

**4. Name& Designation of the head of the organization:**

Prof. Sarat Kumar Patra, Director

**5. Name, Designation & address of the Project Co-ordinator:**

| Name of the Project Coordinators | Designation         | Address  |
|----------------------------------|---------------------|--|
| Dr. Pritam Das                   | Associate Professor | Mechanical Engineering Department, NIT Agartala, |
| Dr. Arindam Majumder             | Assistant Professor | Jirania, West Tripura, Tripura, Pin - 799046     |
| Dr. Dipak Chandra Das            | Assistant Professor |  |

Bio-data of the Project Co-ordinator should be enclosed:

Dipak Chandra Das

The Bio-data of the Project Co-ordinators are attached in ANNEXURE- V, VI and VII.

**6. Background of the organization:**

(a) Past experience in R & D work in the KVI sector and micro-enterprise and entrepreneurship development need to be given separate sheets (details of work done in other areas need not be given): NA

(b) Infrastructure facilities and expertise available (give details):

**Infrastructure facilities**

| Sr. No. | Infrastructural Facility                     | Yes/No/ Not required | Full or sharing basis |
|---------|--|----------------------|-----------------------|
| 1.      | Workshop Facility                            | Yes                  | Sharing basis         |
| 2.      | Testing Laboratory Facility                  | Yes                  | Full                  |
| 3.      | Water & Electricity                          | Yes                  | Full                  |
| 4.      | Laboratory Space/ Furniture                  | Yes                  | Full                  |
| 5.      | Training Space                               | Yes                  | Full                  |
| 6.      | Power Generator                              | Yes                  | Sharing basis         |
| 7.      | Telecommunication including e-mail & fax     | Yes                  | Full                  |
| 8.      | Transportation                               | Yes                  | Sharing basis         |
| 9.      | Administrative/ Secretarial support          | Yes                  | Full                  |
| 10.     | Information facilities like Internet/Library | Yes                  | Sharing basis         |
| 11.     | Computational facilities                     | Yes                  | Full                  |

**Expertise available**

The Project Co-ordinator, Dr. Pritam Das has been awarded Ph. D. in Engineering in 2016 from Jadavpur University. His Ph.D. work is on the Analysis of Turbulent Flow in an Axisymmetric Duct with Side Injection. The Analysis was done numerically as well as experimentally. During Post Graduation, he had performed an **Experimental Determination of the size of the Recirculation Bubble behind the Baffles**. Dr. Das has carried out a lot of administrative duties of the Institute like Training and Placement Officer, Associate Dean (PG), and HOD ( Mech. Engg. Deptt.). He has carried out a numerical investigation to assess the efficacy of design innovation for rectangular microchannel heat sinks.

The Project Co-ordinator, Dr. Arindam Majumder has experience in working with existing bamboo stick making machines. He has visited various micro and small enterprises involved in bamboo stick making at Tripura. Further, he with his teammates designed a new machine for bamboo incense stick polishing. Later, an Indian Patent was granted for the same machine (**Application no. 1370/KOL/2012**). He also worked in the field of process optimization and manufacturing scheduling. During his PhD, he has worked with the problem of developing efficient metaheuristics for manufacturing scheduling. He has publications in the field of manufacturing optimization, industrial engineering and robot path planning.

Dipak Chandra Das

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The Project Co-ordinator, Dr. Dipak Chandra Das has been awarded Ph.D. in Engineering from Jadavpur University in 2017. His Ph.D. work is on film boiling heat transfer over a vertical flat plate under a mixed convection configuration. He got the prestigious "CSIR SRF Award" in 2012. During his Masters, he has performed an **experimental investigation** of film boiling over a sphere that is immersed in a vessel of water. In 2019-21, **experimental investigations** were performed to examine the impact of surface morphology and wettability on the nucleate pool boiling heat transfer using R-141b at ambient pressure. Another **experimental investigation** is carried out in 2021-22 to investigate the flow boiling heat transfer characteristics for different flow situations using low GWP and OPD refrigerants inside a smooth tube, as well as inside microfin tubes. The **drying process of rubber sheets inside a smokehouse is simulated** for perspex, steel, and ash-brick sidewall materials and reported that the ash-brick is the most efficient to reduce the heat loss and faster the drying of the sheets.

**(c) Details of completed and ongoing projects during the last 3 years:** NIL

| Sr. No. | Title of the project | Start date- Completion date | Name and full address of funding agency | Amount sanctioned* | Amount received* |
|---------|----------------------|-----------------------------|---|--------------------|------------------|
|         |                      |                             |   |                    |                  |

\*Enclose copies of the sanction

**7. District / Area to be taken up for the project:**

All the eight districts (Dhalai, Gomati, Khowai, Sipahijala, Unakoti, North Tripura, South Tripura, and West Tripura) of Tripura.

**8. Location of projects implementation and details thereon:**

The role of incense sticks is very important in the economy of Tripura. Tripura is one of the largest exporters of bamboo sticks required in the Agarbatti manufacturing industries of India. However, a drastic reduction in its exports has been observed now a days. The followings are responsible for the reduction in the exports of bamboo sticks:

- I. Low production rate
- II. Poor product quality

In order to enhance productivity along with product quality it is required to introduce semi-automatic machines in bamboo stick-making industries, especially micro-enterprises of Tripura. Therefore, the main objective of this project is to introduce redesigned semi-automatic machines for the bamboo stick-making industry. In addition to that, the machines are redesigned in such a way that the factory setup space and cost can also be reduced. This will encourage the setting up of micro-enterprises associated with bamboo stick making.

**9. If any developmental activity has been done in the proposed location prior to submission of this proposal by the Project Coordinator or the Organization, the details may be given in brief:**

Dr. Dipak Chandra Das

Two machines namely (i) a Bamboo slicing machine, and (ii) a Homestead round stick-making machine with the objectives (i) to operate in single phase connection, (ii) to reduce setup cost and space, and (iii) to reduce power consumption are redesigned and developed at Tripura in collaboration with Raado Bamboo Welfare Corporation. The fabricated prototypes of the redesigned (i) Bamboo slicing machine, and (ii) Homestead round stick-making machine are shown in figures 1 and 2 respectively.

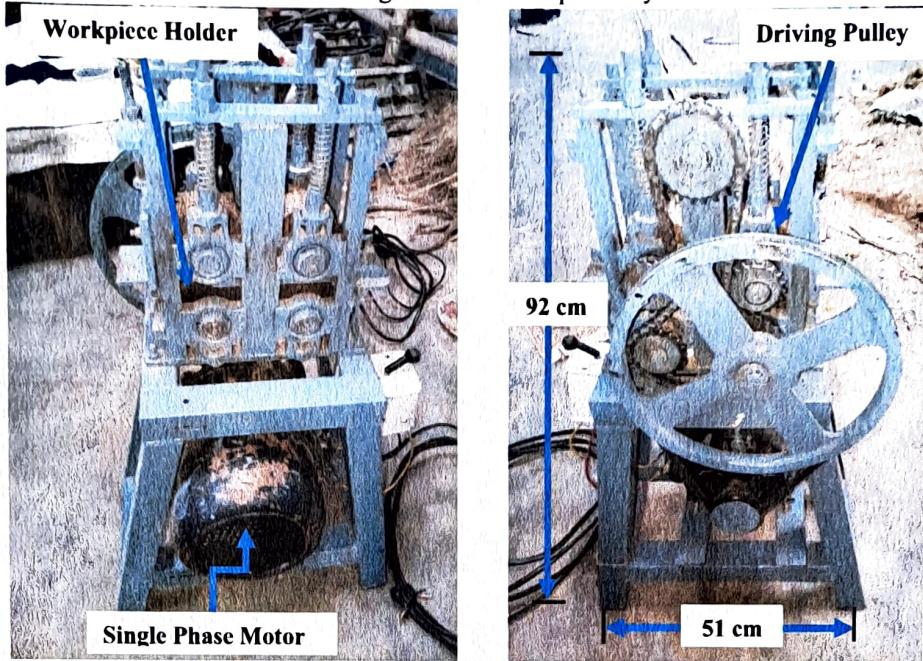
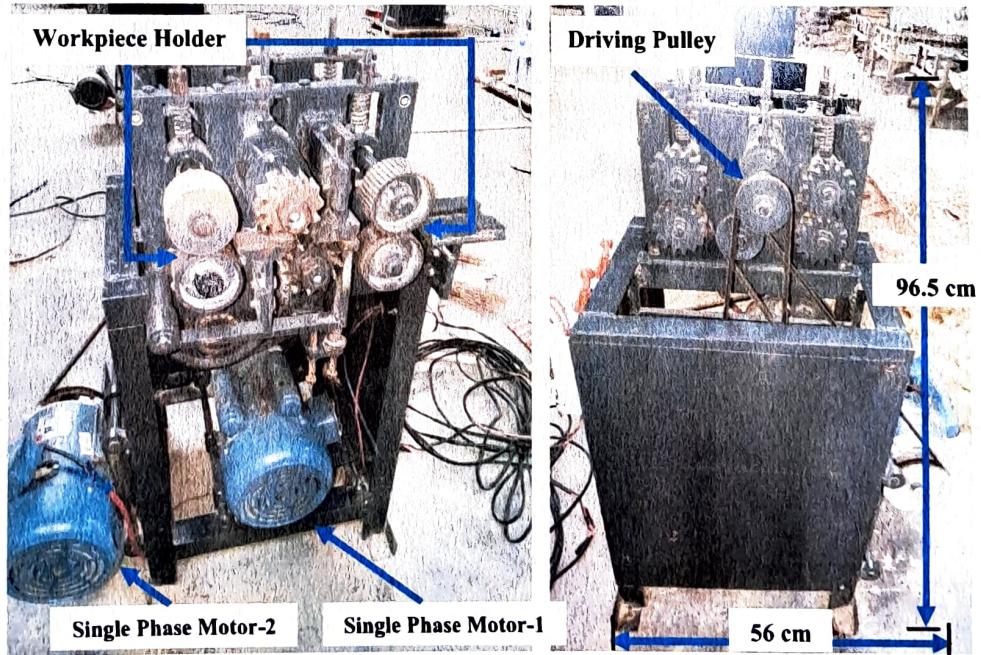


Figure 1. Prototype of Redesigned Bamboo Slicing Machine



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Figure 2. Prototype Redesigned Homestead Round Stick-Making Machine

**10. Details of the infrastructure of the organization in the proposed location**

| Sr. No. | Infrastructural Facility                     | Yes/No/ Not required | Full or sharing basis |
|---------|--|----------------------|-----------------------|
| 1.      | Workshop Facility                            | Yes                  | Sharing basis         |
| 2.      | Testing Laboratory Facility                  | Yes                  | Full                  |
| 3.      | Water & Electricity                          | Yes                  | Full                  |
| 4.      | Laboratory Space/ Furniture                  | Yes                  | Full                  |
| 5.      | Training Space                               | Yes                  | Full                  |
| 6.      | Power Generator                              | Yes                  | Sharing basis         |
| 7.      | Telecommunication including e-mail & fax     | Yes                  | Full                  |
| 8.      | Transportation                               | Yes                  | Sharing basis         |
| 9.      | Administrative/ Secretarial support          | Yes                  | Full                  |
| 10.     | Information facilities like Internet/Library | Yes                  | Sharing basis         |
| 11.     | Computational facilities                     | Yes                  | Full                  |

**II - PART-B**

**1) Title of the R & D proposed:**

“Introduction to redesigned Bamboo Slicing Machine and Homestead Round Stick-making Machine for Sustainable Agarbatti Production in Micro and small enterprises”

**2) Objectives of the proposed study:**

The proposed study aims to introduce two low-cost machines namely (i) a Bamboo slicing machine, and (ii) a Homestead round stick-making machine, redesigned in collaboration with Raado Bamboo Welfare Corporation. The key objectives of this work include:

- i) Providing a cost-effective solution to micro and small entrepreneurs by reducing the machine cost up to 20%.
- ii) Reduction of space requirement by introducing machines with a minimum of 45 % compactness and 40 % lighter in weight.
- iii) Reduction of setup cost by introducing single-phase machines in place of existing three-phase machines.
- iv) Reduction of operational cost by introducing machines which require 20 % less energy as compared to existing machines.
- v) Capacity building by conducting training sessions and workshops for local entrepreneurs and technicians.
- vi) Encourage micro-enterprises to use automation in bamboo stick making.
- vii) Encourage local people to become entrepreneurs.
- viii) To ensure the proficiency of the local entrepreneurs in operating and maintaining the machine, fostering knowledge transfer for sustainable technology utilization in the agarbatti industry.

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### **3) Justification for the project based on the assessment of the existing resources and infrastructure.**

In micro-enterprises of Tripura, the slivering of bamboo pieces into thick slices and bamboo stick making are carried out manually. Figure 3 shows the bamboo slicing and stick-making process performed by the workers in small-scale industries of Tripura. These manual processes cause (a) Low Productivity, (b) Poor product quality, and (c) an increase in wastage. However, the existing automatic or semi-automatic machines are not introduced in those micro enterprises due to their higher cost, high energy consumption, and space requirement.

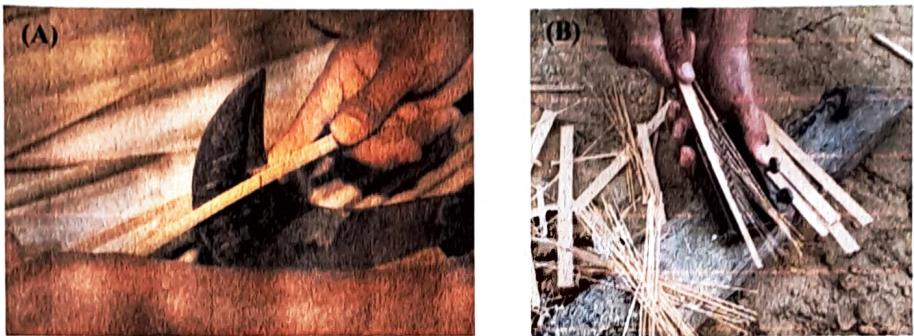


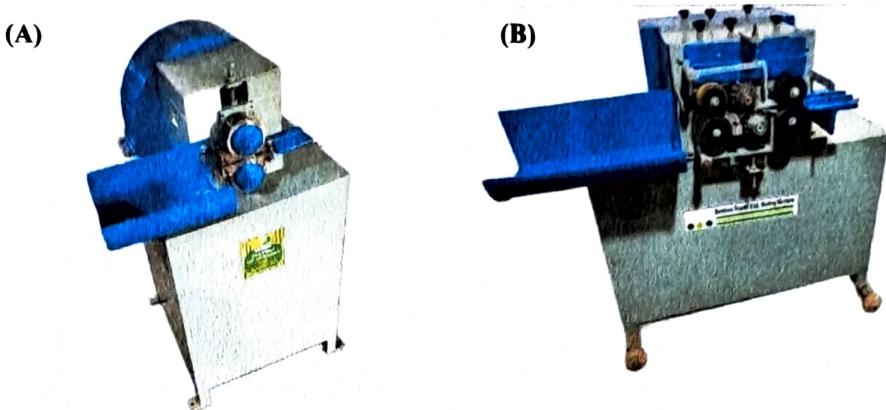
Figure 3. (A) Bamboo slicing and (B) Stick-making process performed by the workers in small-scale industries of Tripura.

In small-scale industries of Tripura, the semi-automatic machines shown in figure 4 are used for bamboo slicing, and stick making. As most of these machines are larger in size, heavy in weight and having high energy requirements therefore setup and operational cost of the small-scale bamboo stick-making industry in Tripura is very high. These indirectly increase the production cost of the final bamboo stick product.

The developed machines have the following advantages:

| <b>Existing Homestead Round Stick and Slicing Machine</b> | <b>Proposed Homestead Round Stick and Slicing Machine</b>      |
|---|--|
| Requires a three-phase power connection                   | Requires a single-phase power connection.                      |
| Heavier in weight   | Lighter in weight  |
| Larger in size  | Relatively compact   |
| Running cost is very high                                 | Running costs are 30 % lower compared to the existing machine. |
| Costlier  | Cost-effective solution  |

Dipak Chandra Baruah



**Figure 4.** Semi-Automatic (A) Bamboo Slicing Machine and (B) Homestead Round Stick-Making Machine used in small-scale industries of Tripura.

#### **4) The availability of proposed technology/intervention in the field/market etc.:**

In the market, several machines are available for bamboo slicing and stick making. However, the major drawbacks of such available machines are:

- Existing machines require a three-phase connection. The requirement of a three-phase connection increases their operational cost by increasing the power consumption and also increases the setup cost.
- Existing machines are heavier in weight and larger in size.
- Existing machines are costlier and hence cannot be used in micro-enterprises/cottage industries associated with bamboo stick making.

#### **5) Level of work done so far (Review of Literature of the proposed R & D):**

A few significant works done by the researchers at both national and international level are given below:

K. G. Ahuja et. al. [1] developed specially designed dies for the slicing of split bamboo and compared their effectiveness in bamboo slicing.

G Keshav and M Damodaran [2] have designed and developed a manually operated machine for incense-stick making. The machine was designed to reduce human involvement in bamboo-cored incense stick-making. Later the performance of the developed machine was tested and found to be better.

Ulhass N. Sonkusre et. al. [3] designed and fabricated an improved bamboo processing machine which incorporated all the operations involved in the bamboo incense stick-making process.

Tushar N. Khilosia and L. M. Rola [4] proposed to develop a pneumatically controlled bamboo stick-cutting machine with reduced weight.

Mohd Usman Shrkhni [5] developed a manually operated device which can make round sticks from bamboo slices.

Lalbiakzuala Ralte and Lalpiangliana Sailo [6] introduced a manually operated machine for making of incense sticks from pre-commminuted bamboo.

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Tian-Hu Liu et. al. [7] designed a bamboo splitting machine having intelligent tool changing and automatic charging capability. In their study, they used a genetic algorithm to optimize the size of the charging manipulator. The investigation was then extended to find the performance of the designed manipulator. The results showed an enhancement of both centering and capture rates.

Thus, it has been seen from the previous literature that most of the research was carried out either to make manually operated machines efficient or to redesign cutters of automatic machines. However, no such effort has been given to design bamboo slicing and stick-making machines, operated by single-phase connection. Therefore, an attempt has been made to redesign two machines namely (i) a Bamboo slicing machine, and (ii) a Homestead round stick-making machine which can be operated by single phase connection. The other advantages of the developed machines are: (i) low cost, (ii) more compact (iii) lightweight, and (iv) low electricity consumption. The redesign of the machines has been done in collaboration with Raado Bamboo Welfare Corporation. Figures 1 and 2 show the prototype of the redesigned Bamboo slicing machine, and Homestead round stick-making machine respectively.

#### Reference:

1. K.G. Ahuja, P.G. Mehar, Dr. A. V. Vanalkar, Dr. S. S. Khandare, Experimentation on various dies for slicing on improved hydraulic Bamboo Processing Machine, "International Journal of Engineering Research and Applications", ISSN: 2248-9622, Vol-2, Issue-6, Nov-Dec 2012, PP. 162-166.
2. G. Keshav, M. Damodaran, Design and prototyping of a low cost Manually Operated Bamboo-Cored Incense stick making machine, "Proceedings of the 1<sup>st</sup> International and 16<sup>th</sup> National conference on machines and mechanisms, IIT Roorkee, India, 2013.
3. Ulhas N. Sonkusre, P. G. Mehar, A.V. Vanalkar, S.S. Khandare, Design and fabrication of Improved Bamboo Processing machine, " International Journal of Application or Innovation in Engineering and Management", ISSN: 2319-4847, 2013.
4. Tushar N. Khilosia, Prof. L.M. Rola, Development and implementation of Mechanism by using pneumatic drive for a bamboo stick (Agarbatti stick) cutting machine, "International Journal of Advance Engineering and Research Development", ISSN: 2348-6406, Vol.- 1, Issue- 3, April 2014.
5. Mohd Usman Shrkhni. A Stick Making Device, Indian Patent 73/MUM/2005, 2015.
6. LalbiakzualaRalte and LalpianglianaSailo. Device for Making Bamboo Splint, Strip & Incense Stick. Indian Patent 955/KOL/2009, 2017.
7. Liu, T. H., Wen, Y. L., Li, G. Q., & Nie, X. N. (2020). Optimization and Experimental Study of an Intelligent Bamboo-Splitting Machine Charging Manipulator. Journal of Robotics.

#### 6) Relevance, usefulness and justifications of the proposed work to KVI sector terms of economy, efficiency, productivity, quality, raw material utilization, etc.:

The proposed project work is highly relevant in the KVI sector as it is going to provide an affordable solution to the micro and small enterprises by (i) reducing the cost of machines by up to 30%, (ii) introducing machines with single phase connection in

place of machines with three phase connection, (iii) reducing 20 % power consumption of machines (iv) increasing the productivity up to 30 % as compared to manual process.

**7) Time schedule (month wise Action Plan) for implementing the project.**

| Activity No. | Activity  | Time required (months) |
|--------------|---|------------------------|
| 1.           | Conducting comprehensive testing of developed prototypes of the Bamboo Slicing Machine and Homestead Round-making Machine at Raado Bamboo Welfare Corporation and incorporating modifications in the machines based on test results | 2                      |
| 2.           | Manpower recruitment.   | 2                      |
| 3.           | Conducting Workshops/Training Programs for the demonstration of prototypes  | 9                      |
| 4.           | Project Report Preparation  | 1                      |

| Activity | Mnth 1 to 2 | Mnth 3 to 4 | Mnth 5 to 6 | Mnth 7 to 8 | Mnth 9 to 11 | Mnth 12 |
|----------|-------------|-------------|-------------|-------------|--------------|---------|
| 1        |             |             |             |             |              |         |
| 2        |             |             |             |             |              |         |
| 3        |             |             |             |             |              |         |
| 4        |             |             |             |             |              |         |

| Year        | Milestones   |
|-------------|--|
| <b>Yr I</b> | <ul style="list-style-type: none"> <li>• Conducting comprehensive testing of developed prototypes of the Bamboo Slicing Machine and Homestead Round Stick-Making Machine at Raado Bamboo Welfare Corporation.</li> <li>• Modification of the developed Bamboo Slicing Machine and Homestead Round Stick-making Machine based on test results.</li> <li>• Manpower recruitment.</li> <li>• Conducting Workshops/Training Programs for the demonstration of prototypes.</li> <li>• Project Report Preparation</li> </ul> |

**8) Implementation methodology in brief (step wise)**

- i. *Testing of developed Bamboo Slicing Machine and Homestead Round Stick-Making Machine in real-life conditions:*

The fabricated prototypes of the bamboo-slicing machine and the stick-making machine will be tested in real life at this stage. The testing of prototypes will be done comprehensively

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with the help of Raado Bamboo Welfare Corporation. This will help to understand the drawbacks of the redesigned machines and to improve their performance.

*ii. Modification of the developed Bamboo Slicing Machine and Homestead Round Stick-Making Machine:*

The test results obtained in the earlier step will be analyzed thoroughly to identify the drawbacks of the redesigned machines. Based on the analysis, the developed (i) Bamboo Slicing Machine and (ii) Homestead Round Stick-Making Machine will be modified to improve the performance.

iii. *Organizing Workshops/Training Programs for the demonstration of prototypes:*

The step deals with organizing Workshops/Training Programs for local artisans to introduce and demonstrate the developed machines. A total of eight 1-Day Workshops/Training Programs will be conducted at this stage. 50% of the total trainees will be targeted from the women fraternity to enhance their skills in bamboo processing. These Workshops/Training Programs will not only help to introduce the redesigned machines to the local artisans but also encourage women-centric micro-enterprises within the agarbatti production ecosystem.

#### **9) Potential areas identified for promotion of micro-enterprises:**

The project will help to promote micro-enterprises related to bamboo stick making. The project will also promote such micro-enterprises in an indirect way where bamboo sticks are used as raw material such as agarbatti industries and handicrafts industries.

#### **10) Scientific and Technical interventions envisaged.**

- In the developed machines, single-phase motors are used to provide power for bamboo slicing and stick making because of that the machines can be run by single-phase connection. Therefore, the earlier requirement additional three-phase connection for operating such machines will be avoided. In other words, one can operate a single unit of each developed machines using his/her single-phase household electricity connection without upgrading it to a three-phase connection. Hence, the project will promote to establish cottage industry by reducing its setup cost.
  - In the developed Homestead Round Stick-Making Machine the requirement of the number of 2 hp motors has been reduced from 3 to 2. The reduction of motor requirement makes the developed machine energy efficient compared to similar existing machines.
  - In the developed Bamboo Slicing Machine, most of the belt drives are replaced by chain drives. The use of chain drives reduces the loss due to slippage and hence increases the machine's work efficiency.

## **11) Training programme envisaged:**

During the project, eight workshops/ training programs will be conducted to demonstrate the developed machines and to encourage the locals to become entrepreneurs in the field of bamboo stick making, in which 50% of the total trainees will be targeted from the women fraternity promoting the women empowerment.

## **12) Linkages envisaged:**

The project will help to build a strong partnership between NIT Agartala, Raado Bamboo Welfare Corporation (A registered green technology startup in Tripura), and Khadi and Village Industries Commission (KVIC) through which the developed affordable machines will be introduced to the local artisans/ micro enterprises/ small enterprises of Tripura. Further, it is expected to have a partnership with the Tripura Bamboo Mission Board (A Public Sector Board under the Government of Tripura) through this project. The partnership will help to make Tripura as the hub of agarbatti-based micro, small, and medium enterprises.

## **13) Follow-up Mechanism envisaged to tap fullest benefit of R&D:**

A feedback mechanism will be developed to understand the drawbacks of the redesigned machines. The feedbacks will be collected in the following three phases:

- **First Phase:** In this phase, feedback will be collected from the workers during the comprehensive testing of prototypes at Raado Bamboo Welfare Corporation. This will help to improve the operational drawbacks of the machines before commercialization.
- **Second Phase:** The second phase deals with collecting feedback from the artisans/ technicians, who participated in the organized workshops/ Training Programs. Like the 1<sup>st</sup> phase, the feedback from the participating artisans/ technicians will also help to improve the machines before commercialization.
- **Third Phase:** The third phase will start after the commercialization of the developed machines. In this phase, the feedback will be collected from those artisans/ micro enterprises/ small enterprises to whom the developed machines will be supplied by Raado Bamboo Welfare Corporation. The feedback will not only assist in improving their operational drawbacks but also help to solve problems related to maintenance.

## **14) Expected outcome of the project:**

The outcomes of the project are as follows:

- A cost-effective solution to the micro and small entrepreneurs related to bamboo stick making.
- A reduced space requirement for setting up of bamboo stick manufacturing unit.
- Reduced factory setup cost for bamboo stick making.
- Skilled worker in the bamboo stick manufacturing industry.
- Increased productivity and profitability of micro-enterprises associated with bamboo stick making.
- Improved rural livelihood of Tripura.

## **15) Exit Strategy (Plan after completion of the project.):**

After completion of the project, the developed technologies will be handed over to Raado Bamboo Welfare Corporation for commercialization. The corporation will then manufacture the machines and supply them to the local artisans/micro enterprises/ small enterprises. The corporation will also emphasize on sustainable financing by offering handholding support for artisans to secure loans under various financing schemes.

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16) Any other information/remarks: NIL

17) Budget: (Amount in INR)

| Sr. No. | Item of Expenditure                     | 1 <sup>st</sup> Year | Total            |
|---------|---|----------------------|------------------|
| 1       | Manpower*                               | 3,00,000             | 3,00,000         |
| 2       | Travel                                  | 28,000               | 28,000           |
| 3       | Training Programmes*                    | 4,24,400             | 4,24,400         |
| 4       | Contingencies*                          | 2,95,000             | 2,95,000         |
|         | <b>Total</b>                            | 10,47,400            | 10,47,400        |
|         | Overhead (10% of the total expenditure) | 1,04,740             | 1,04,740         |
|         | <b>Total</b>                            | <b>11,52,140</b>     | <b>11,52,140</b> |

\* Budget break-up of manpower, training programmes and contingencies along with budget justification is provided in ANNEXURE- VIII, IX, and X

18) Certificate of Endorsement from the head of the institution should be in the prescribed format. (Annexure III).

Provided in ANNEXURE- III

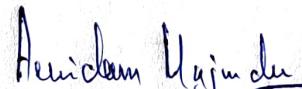
19) Submission of Progress Report: A write up on various activities carried out under this project is required to be submitted quarterly and also annually along with the data, summary etc... in the prescribed formats (Annexure-IV).

NA



26/02/2024  
(Dr. Pritam Das)

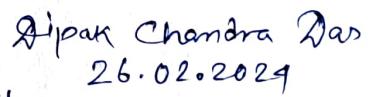
Name & Signature of the Project Coordinator



Arindam Majumder  
26/02/2024

(Dr. Arindam Majumder)

Name & Signature of the Project Coordinator



Dipak Chandra Das  
26.02.2024

26.02.2024

(Dr. Dipak Chandra Das)  
Name & Signature of the Project Coordinator

  
Name & Signature of the Head of the Institution/Agency  
Dean Research & Consultancy  
NIT, Agartala.

Date:

Place:

Recommendation of

State Director/Divisional Director:

Signature  
State Director/Divisional Director

ANNEXURE- III  
(Ref : S.O. No. 1739, Dt:29.06.2015)

**CERTIFICATE**

**ENDORSEMENT FROM THE HEAD OF THE INSTITUTION**

1. We have gone through the terms and conditions of the S&T grant agreed to abide by and enter into an Agreement/MOU with KVIC for implementing the S&T scheme.
2. We have neither obtained nor intended to obtain financial assistance from any other agencies, amounting to double funding.
3. We undertake to submit progress reports, statement(s) of accounts, utilization certificates, etc. as required.
4. Certified that **Dr. Pritam Das, Dr. Arindam Majumder and Dr. Dipak Chandra Das** are the Project Coordinators of the proposed S&T Project. The Project Coordinators will assume the responsibility of completion of the project.
  - Certified that the hardware, other basic facilities and such other administrative support required as per terms and conditions of the grant, will be extended to the Coordinator(s) throughout the duration of the project.
  - Our agency assumes to undertake the complete financial and other management responsibilities of the project, and will ensure compliance with the terms and conditions laid down.
5. Certified that the Society/Organization will extend benefits of the said S&T projects to the targeted beneficiaries of KVI activities only.
6. If any of the above statements found to be incorrect by the KVIC at any point of time, the organization takes the responsibility to refund the entire amount released by KVIC along with 10% interest as per GFR norms.

Date :

Place :

  
Name & Signature of the  
Head of Agency  
Dean Research & Consultancy  
NIT, Agartala.

**Dr. Pritam Das**

**Annexure V**

**Associate Professor**

bhargav\_2006@yahoo.co.in  
Ph: +91-9612089371  
DOB: 03.12.1974

Department of Mechanical Engineering  
National Institute of Technology, Agartala  
Barjala, Jirania, Tripura West, Pin: 799046, India

**EDUCATION**

- Ph.D in Mechanical Engineering, Jadavpur University, 2016
- M.M.E. in Mechanical Engineering (Fluid Mechanics and Hydraulics): Jadavpur University, 2007
- B.E in Mechanical Engineering: N I T Agartala(Erstwhile Tripura Engineering College) in 1997

**RESEARCH INTEREST**

- Flow in Microchannel
- Turbo machinery

**WORK EXPERIENCE**

- Associate Professor, (February 2019–continuing), Department of Mechanical Engineering, NIT Agartala, India.
- Assistant Professor, (March 2002–February 2019), Department of Mechanical Engineering, NIT Agartala, India.

**ADMINISTRATIVE RESPONSIBILITY**

**Institute Level**

- Associate Dean (Academic Affairs) (August 2015-August 2019)
- Training and Placement Officer (January 2008 – May 2010)

**Department Level**

- Lab In-Charge of Fluid Mechanics and Hydraulics Laboratory (2008 – till date)
- Head of the Department, Department of Mechanical Engineering (May 2019 – January 2023)
- Head of the Department, Department of Mechanical Engineering (October 2023 – Till date)

**RESEARCH GUIDANCE**

- Guidance of Ph.Ds (1 – completed 03 - under progress at NIT Agartala )
- Guidance of post graduate (M. Tech) projects (8 – Completed)
- Guidance of undergraduate projects (22 – Completed)

**CONSULTANCY**

- Consultancy work worth of Rs. 10,25,922/- titled ‘Inspection of 54453 Nos. of Girl Bicycle for the state of Tripura’, Department of School Education, Govt. of Tripura, 2016-2020. (Co-investigator)



## **LIST OF PUBLICATIONS**

The author has 10 number of publications in SCI journals and other reputed journals.

A handwritten signature in blue ink, appearing to read "S. K. Jaiswal".

**Dr. Arindam Majumder**

**Assistant Professor**

arindam2012@gmail.com  
Ph: +91-9612089371  
DOB: 25.02.1985

Department of Mechanical Engineering  
National Institute of Technology, Agartala  
Barjala, Jirania, Tripura West, Pin: 799046, India

**EDUCATION**

- Ph.D in Mechanical Engineering (Industrial Engineering): Jadavpur University, 2020
- M.E in Mechanical Engineering (Machine Design): Indian Institute of Engineering Science and Technology, Shibpur (Formerly Bengal Engineering and Science University), 2009
- B.E in Mechanical Engineering: North Maharashtra University, Jalgaon, 2007

**RESEARCH INTEREST**

- Smart manufacturing
- Robotics
- Soft Computing Techniques

**WORK EXPERIENCE**

- Assistant Professor Gr.-I, (August 2022–continuing), Department of Mechanical Engineering, NIT Agartala, India.
- Assistant Professor, (April 2010–August 2022), Department of Mechanical Engineering, NIT Agartala, India.
- Contractual Lecturer, (August 2009–April 2010), Department of Mechanical Engineering, NIT Agartala, India.

**ADMINISTRATIVE RESPONSIBILITY**

**Institute Level**

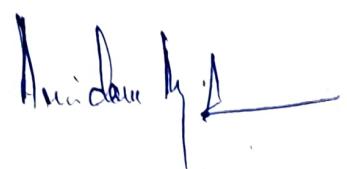
- Deputy Registrar (Academic Affairs) (August 2019-Till date)
- Chairperson, Departmental Purchase Committee, Academic Section (May 2023- Till date)

**Department Level**

- Lab In-Charge of CFD Lab I and II (May 2019- Till date)
- Lab In-Charge of NITA Laboratory of Optimization (NITALO) (September 2023-Till date)
- Lab In-Charge of Metrology Lab (2011-2015)
- Departmental Faculty-In-Charge of Consultancy and Testing Works (June 2022 – Till date)
- PG Coordinator (August 2011- August 2012)

**RESEARCH GUIDANCE**

- Guidance of Ph.Ds (03 - under progress out of which 02 at NIT Agartala and 01 at Jadavpur University)
- Guidance of post graduate (M. Tech) projects (13 – Completed)
- Guidance of undergraduate projects (13 – Completed)



## **CONSULTANCY**

- Consultancy work worth of Rs. 10,25,922/- titled 'Inspection of 54453 Nos. of Girl Bicycle for the state of Tripura', Department of School Education, Govt. of Tripura, 2016-2020. (Co-investigator)

## **PATENT (GRANTED)**

- Shubhendu Debbarma, John Deb Barma, **Arindam Majumder**: 'A Polishing System for Polishing of Surface of Subjects such as the Incense Sticks Application.' Application.No.1370/KOL/2012, Applied To: Indian Patent Office.

## **EDITED BOOK**

- Abhishek Majumder, Joy Lal Sarkar, and **Arindam Majumder**, eds. Artificial Intelligence and Data Science in Recommendation System: Current Trends, Technologies and Applications. Bentham Science Publishers, 2023.

## **LIST OF PUBLICATIONS**

### **International Journals (SCIE/ESCI/Scopus)**

1. Anit Kumar, Shubham Tiwari, and **Arindam Majumder**. A\*-VG algorithm: a hybrid algorithm for the path planning of inspection robots. Journal of the Brazilian Society of Mechanical Sciences and Engineering, 45(7), 386 (2023). <https://doi.org/10.1007/s40430-023-04249-z>
2. **Arindam Majumder**, Abhishek Majumder, and Rahul Bhattacharya. Teaching-Learning-Based Optimization Algorithm for Path Planning and Task Allocation in Multi-robot Plant Inspection System. Arabian Journal for Science and Engineering 46, pp. 8999-9021 (2021). <https://doi.org/10.1007/s13369-021-05710-8>.
3. Arindam Sinha, **Arindam Majumder**, and Krishanu Gupta. A RSM based MOGOA for process optimization during WEDM of Inconel 625. Proceedings of the Institution of Mechanical Engineers, Part E: Journal of Process Mechanical Engineering, 236, pp. 1824-1832 (2022). <https://doi.org/10.1177/09544089221074837>.
4. Md Piyar Uddin, John Deb Barma, and Arindam Majumder. Effect of Process Parameters on the Performance of Powder Mixed EDM of Ni-BASED Superalloys: a Review. Surface Review and Letters (SRL), 30(11), pp. 1-17 (2023). <https://doi.org/10.1142/S0218625X23300113>
5. Jatinder ND Gupta, **Arindam Majumder**, Dipak Laha. Flowshop scheduling with artificial neural networks. Journal of the Operational Research Society. 71(10), pp. 1619-1637, 2020. <https://doi.org/10.1080/01605682.2019.1621220>.
6. **Arindam Majumder**, Ponnuthurai N Suganthan, Dipak Laha. Bacterial foraging optimization algorithm in robotic cells with sequence-dependent setup times. Knowledge-Based Systems, 172, pp. 104–122, 2019. <https://doi.org/10.1016/j.knosys.2019.02.016>
7. **Arindam Majumder**, Dipak Laha, and P. N. Suganthan. A hybrid cuckoo search algorithm in parallel batch processing machines with unequal job ready times. Computers & Industrial Engineering, 124, pp. 65-76 (2018). <https://doi.org/10.1016/j.cie.2018.07.001>



8. **Arindam Majumder**, Argha Das, and Pankaj Kr Das. A standard deviation based firefly algorithm for multi-objective optimization of WEDM process during machining of Indian RAFM steel. *Neural Computing and Applications*. 29(3), pp 665–677 (2018).
9. **Arindam Majumder**, and Dipak Laha. A New Cuckoo Search Algorithm for 2-Machine Robotic Cell Scheduling Problem with Sequence-Dependent Setup Times. *Swarm and Evolutionary Computation*, 28, pp 131-143 (2016): Doi:10.1016/j.swevo.2016.02.001
10. **Arindam Majumder**: Comparative Study of Evolutionary Algorithms Coupled with Neural Network Model for Optimization of EDM Process Parameters, *Proceedings of IMechE, Part B: Journal of Engineering Manufacture*. 229(9), pp. 1504-1516 (2015). Doi: 10.1177/0954405414538960
11. Alok Ranjan, Ranjan Das, Debabrata Barik, Sagnik Pal, **Arindam Majumder**, Madhujit Deb, and Milon Selvam Dennison. Heat Transfer and Performance Enhancement of Porous Split Elliptical Fins. *International Journal of Energy Research*, 2023 (2023). <https://doi.org/10.1155/2023/9206017>
12. **Arindam Majumder**. Termite alate optimization algorithm: a swarm-based nature inspired algorithm for optimization problems. *Evolutionary Intelligence* 16(3), 997-1017 (2023). <https://doi.org/10.1007/s12065-022-00714-1>
13. Alok Ranjan, Ranjan Das, Sagnik Pal, **Arindam Majumder**, and Madhujit Deb. Performance analysis of porous-based taper-shaped fin for enhanced heat transfer rate using cuckoo search algorithm. *Proceedings of the Institution of Mechanical Engineers, Part E: Journal of Process Mechanical Engineering* (2023): 09544089231157151. <https://doi.org/10.1177/09544089231157151>
14. Alok Ranjan, Ranjan Das, Sameer S. Gajghate, Debabrata Barik, Himadri Majumder, Elaine M. Cardoso, **Arindam Majumder**, Sagnik Pal, and Madhujit Deb. Numerical and Optimization-Based Study on Split Hemispherical Shaped Fins for Augmenting Heat Transfer Rate. *International Journal of Energy Research* 2023 (2023). <https://doi.org/10.1155/2023/8300877>
15. Aparesh Datta, Santosh Sah, **Arindam Majumder**, Nirmalendu Biswas, and Dipankar Sanyal. Designing Interrupted Microchannel Heat Sink with Ribbed Microchambers by Single and Bi-objective Optimizations of Numerical Results. *Journal of Thermal Analysis and Calorimetry*, 146, pp 2681–2697, (2021). <https://doi.org/10.1007/s10973-020-10510-7>
16. **Arindam Majumder**. Optimization of Modern Manufacturing Processes Using Three Multi-Objective Evolutionary Algorithms: A Step Towards Selecting Efficient Algorithms. *International Journal of Swarm Intelligence Research (IJSIR)*, 12(3), pp 96-124 (2021). DOI: 10.4018/IJSIR.2021070105
17. Alok Ranjan, Ranjan Das, Sagnik Pal, **Arindam Majumder**, and Madhujit Deb. Use of Cuckoo Search Algorithm for Performance Evaluation of Split Elliptic Shaped Fins for Enhanced Rate of Heat Transfer. *Journal of Heat Transfer*, 143(6), 063301 (8 pages) (2021). <https://doi.org/10.1115/1.4050715>
18. Sushmita Sharma, Apu Kumar Saha, **Arindam Majumder**, and Sukanta Nama. MPBOA-A novel hybrid butterfly optimization algorithm with symbiosis organisms search for global optimization and image segmentation. *Multimedia Tools and*



- Applications, 80(8), pp 12035-12076 (2021). <https://doi.org/10.1007/s11042-020-10053-x>.
- 19. Suman Dey, N. M. Reang, **Arindam Majumder**, Madhujit Deb & Pankaj Kumar Das. A hybrid ANN-Fuzzy approach for optimization of engine operating parameters of a CI engine fueled with diesel-palm biodiesel-ethanol blend. Energy, 202, p 117813(2020). <https://doi.org/10.1016/j.energy.2020.117813>
  - 20. **Arindam Majumder**. A Simple and robust Fuzzy-AHP based Taguchi Approach for multi-objective optimization of welding process parameters, International Journal of Productivity and Quality Management. 20(1), pp.116–137 (2017).
  - 21. Madhujit Deb, Pinki Majumder, **Arindam Majumder**, Sumit Roy, Rahul Banerjee, Application of artificial intelligence (AI) in characterization of the performance-emission profile of a single cylinder CI engine operating with hydrogen in dual fuel mode: An ANN approach with fuzzy-logic based topology optimization, International Journal of Hydrogen Energy, 41(32), pp 14330-14350 (2016), <http://dx.doi.org/10.1016/j.ijhydene.2016.07.016>.
  - 22. **Arindam Majumder**, Abhishek Majumder. Standard Deviation Method Based PSO- An Instigated Approach to Optimize Multi-Objective Manufacturing Process Parameters. Journal of Swarm Intelligence Research (IJSIR). 7(2), pp 15-35 (2016). Doi: 10.4018/IJSIR.2016040102
  - 23. Madhujit Deb, Bishop Debbarma, **Arindam Majumder**, Rahul Banerjee, Performance –emission optimization of a diesel-hydrogen dual fuel operation: A NSGA II coupled TOPSIS MADM approach, Energy, 117(1), pp 281-290, (2016), <http://dx.doi.org/10.1016/j.energy.2016.10.088>.
  - 24. Madhujit Deb, **Arindam Majumder**, Rahul Banerjee, G.R.K. Sastry, P.K. Bose, A Taguchi-fuzzy based multi-objective optimization study on the soot-NOx-BTHE characteristics of an existing CI engine under dual fuel operation with hydrogen, International Journal of Hydrogen Energy, 39(35), pp 20276-20293, (2014) <http://dx.doi.org/10.1016/j.ijhydene.2014.09.171>.
  - 25. Abhijit Sarkar, **Arindam Majumder**, Martand Pawar, S C Saha, and R N Rai. Optimization of Process Parameters of Submerged Arc Welding by using Grey-Fuzzy based Taguchi Method for AISI 1518 grade steel. Proceedings of IMechE, Part B: Journal of Engineering Manufacture. 228 (11), pp. 1491-1500, (2014) Doi:10.1177/0954405414521064
  - 26. Madhujit Deb, Rahul Banerjee, **Arindam Majumder**, G.R.K. Sastry. Multi objective optimization of performance parameters of a single cylinder diesel engine with hydrogen as a dual fuel using pareto-based genetic algorithm, International Journal of Hydrogen Energy, 39, pp. 8063-8077. (2014), Doi: <http://dx.doi.org/10.1016/j.ijhydene.2014.03.045>.
  - 27. A. Sarkar, J. Roy, **Arindam Majumder**, S. C. Saha. Optimization of Process Parameters of Submerged Arc Welding by using Grey-Fuzzy based Taguchi Method for AISI 1518 grade steel.” Proceedings of IMechE, Part B: Journal of Engineering Manufacture. 228 (11), pp. 1491-1500, (2014). Doi:10.1177/0954405414521064
  - 28. **Arindam Majumder**, Pankaj Kumar Das, Abhishek Majumder & Moutushee Debnath. An approach to optimize the EDM process parameters using desirability-based multi-objective PSO, Production & Manufacturing Research: An Open Access



- Journal, 2(1), 228-240, (2014). Doi: <http://dx.doi.org/10.1080/21693277.2014.902341>
29. Joydeep Roy, **Arindam Majumder**, John Deb Barma, R. N. Rai, S. C. Saha: An approach for solving multicharacteristics optimization of submerged arc welding process parameters by using grey based genetic algorithm, Journal of Scientific and Industrial Research, Vol. 72.(6), pp- 340-347,2013.
  30. **Arindam Majumder**. Process Parameter Optimization during EDM of AISI 316LN Stainless Steel by Using Fuzzy based multi objective PSO, Journal of Mechanical Science and Technology, 27(7), pp. 2143-2151,(2013). Doi: 10.1007/s12206-013-0524-x
  31. Joydeep Roy, **Arindam Majumder**, R. N. Rai, S. C. Saha: "Optimization of the effect of welding heat input on the Microstructure and mechanical properties of submerged arc welded joints by Fuzzy based Multiobjective Threshold Acceptance Algorithm" Proceedings of IMechE, Part B: Journal of Engineering Manufacture. Vol. 227.(12), pp. 1830-1840. 2013 Doi: 10.1177/0954405413494921.
  32. Probir Kumar Bose, Madhujit Deb, Rahul Banerjee, **Arindam Majumder**. A. Multi objective optimization of performance parameters of a single cylinder diesel engine running with hydrogen using a Taguchi-fuzzy based approach, Energy-The International Journal. 63, pp. 375-386, (2013). Doi: 10.1016/j.energy.2013.10.045.
  33. **Arindam Majumder**. Study of The Effect of Machining Parameters on Material Removal Rate and Electrode Wear during Electric Discharge Machining of Mild Steel, Journal Engineering Science and Technology Review, 5(1), pp-14-18, (2012).
  34. **Arindam Majumder**. Study of the effect of bevel angle and welding heat input on mechanical properties of mild steel weldments", International Journal of Mechanical and Materials Engineering (IJMME), 6(2), pp. 280-290, 2011

### Other International Journals

1. **Arindam Majumder**. Hybridized SA based BAT algorithm: an improved bat algorithm for global optimization" Journal of Computational Intelligence and Electronic Systems (JCIES). 3(4), pp. 278-284. (2014) Doi: <http://dx.doi.org/10.1166/jcies.2014.1098>.
2. **Arindam Majumder**. Parametric Optimization of electric Discharge Machining by GA-based Response Surface Methodology, Journal for Manufacturing Science and Production, Vol. 12. (1), pp. 25–30, 2012. Doi: 10.1515/jmsp-2011-0016
3. **Arindam Majumder**. A Comparative Study of the Ann with RSM for Predicting Bead Geometry of Gas Tungsten Arc Welded aa7039 aluminium Alloy Joints, International Review of Mechanical Engineering, 4 (7), pp. 833-839, (2010).

### National Journal

- Joydeep Roy, **Arindam Majumder**, R. N. Rai, S. C. Saha: Study the Influence of Heat Input on the Shape Factors and HAZ width during Submerged Arc welding Indian Welding Journal. Volume 48 No. 1 January, 2015

### International Conferences

1. Md Piyar Uddin, **Arindam Majumder**, John Deb Barma, Pravin Kumar. Study of the performance of Cu-Gr composite tool during EDM of AISI 1020 mild steel, 13th International Conference on Materials, Processing & Characterization - (ICMPC 2022), April 22–24, 2022 at Gokaraju Rangaraju Institute of Engineering &



- Technology, Hyderabad, India. (**Published in Materials Today: Proceedings. Vol. 62, 3886-3890, 2012**)
2. **Arindam Majumder**, Dipak Laha. Bacterial foraging optimization in non-identical parallel batch processing machines, International Conference on Machine Intelligence and Signal Processing (MISP-2019), September 7-10, 2019 at IIIT Allahabad, India.
  3. **Arindam Majumder**, Dipak Laha. Cuckoo Search on Parallel Batch Processing Machines, International Conference on Advanced Computing and Intelligent Engineering (ICACIE-2016), December 21-23, 2016, at C.V. Raman College of Engineering, Bhubaneswar, Odisha.
  4. **Arindam Majumder**, Dipak Laha. Bacteria Foraging Optimization Algorithm for Robotic Cell Scheduling Problems, 5th International Conference of Materials Processing and Characterization (ICMPC 2016), 13th-12th March, 2016 at Gokaraju Rangaraju Institute of Engineering & Technology (**Published in Procedia Material Today. Vol. 4(2), 2129-2136, 2017**)
  5. Sheetal Kumar Parwar, John Deb Barma, **Arindam Majumder**. Study of the Effect of Inclusion of TiO<sub>2</sub> in Active Flux on Submerged Arc Welding of Low Carbon Mild Steel Plate and Parametric Optimization of the Process by Using DEA Based Bat Algorithm". ICACE 2015: 17th International Conference on Advances in Civil Engineering, June 22-23, 2015, at Venice, Italy. (**World Academy of Science, Engineering and Technology, International Science Index, Industrial and Manufacturing Engineering (2015), 2(6), 633.**)
  6. Argha Das, **Arindam Majumder**, and Pankaj Kumar Das,: "An Approach to Optimize the Parameters of Particle Swarm Optimization by Taguchi Based Grey Relational Analysis", 3rd International Conference on Material Processing and Characterization (ICMPC 2012), 8-9 March 2014. (**Published in Procedia Material Science. 6, 2014, 597 – 604. Doi: 10.1016/j.mspro.2014.07.074.**)
  7. Dipak Laha, **Arindam Majumder**. Modeling of Flow Shop Scheduling with Effective ANN-based Training Algorithms, The 18th Online World Conference on Soft-Computing in Industrial Applications (WSC18), 1st-12th December 2014.

### National Conferences

1. Sheetal Kumar Parwar, **Arindam Majumder**, John Deb Barma. An Intelligent approach to optimize multi objective manufacturing processes using DEA based BAT algorithm, National Conference on Recent Advancements in Mechanical Engineering (NCRAME 2013), 8<sup>th</sup>-9<sup>th</sup> Nov. 2013
2. **Majumder. A**, Saha. A. "Study of the effect of Machining Parameters on electrode Wear during Electro Discharge Machining of IS:226/75 Mild Steel", National Conference on Design and Manufacturing (NaConDM2011),pp:863-870, 2011. (**Also published in the Special Issue of International Journal of Applied Engineering Research**)

### Book Chapters

1. Arindam Majumder. Robotic Cell Scheduling Problems and Their Solution Procedures: A Survey and Future Research Directions. Handbook of Research on AI and Knowledge Engineering for Real-Time Business Intelligence. IGI Global, 2023. 271-295. DOI: 10.4018/978-1-6684-6519-6.ch018
2. **Arindam Majumder** and Rajib Ghosh. Task Allocation and Path Planning of a Multi-Robot System Using Heuristic Coupled Particle Swarm Optimization Algorithm. In Handbook of Research on Developments and Trends in Industrial and Materials Engineering, pp. 194-209. IGI Global, 2020. DOI: 10.4018/978-1-7998-1831-1.ch009.



3. **Arindam Majumder**, Abhishek Majumder. Application of Standard Deviation Method integrated PSO approach in optimization of manufacturing process parameters. Handbook of Research on Artificial Intelligence Techniques and Algorithms (2014): 541. DOI: 10.4018/978-1-4666-7258-1.ch017.

## WORKSHOPS / TRAINING PROGRAM/ CONFERENCES

### Organized:

1. DST-STUTI sponsored Seven Days Training Program on 'Optimization in Engineering Design and Applications', 31<sup>st</sup> July -6<sup>th</sup> August, 2023.
2. One-week self-sponsored Short Term Training Program in Hybrid mode on 'Optimum Design: Principles and Applications', November 25<sup>th</sup> -29<sup>th</sup>, 2023.
3. TEQIP-III sponsored Five Days Workshop on 'Optimization Techniques in Multi-Disciplinary Research', November 25<sup>th</sup> -29<sup>th</sup>, 2019.

### Attended

1. AICTE approved Six days FDP on 'Student Induction Programme', December 20<sup>th</sup> and 25<sup>th</sup>, 2021, at NIT Agartala.
2. International Conference on Machine Intelligence and Signal Processing (MISP-2019), September 7-10, 2019, at IIIT Allahabad, India.
3. 5th International Conference of Materials Processing and Characterization (ICMPC & 2016), 13th-12th March 2016, at Gokaraju Rangaraju Institute of Engineering & Technology, Hyderabad, India.
4. International Conference on Advanced Computing and Intelligent Engineering (ICACIE-2017), December 21-23, 2016, at C.V. Raman College of Engineering, Bhubaneswar, Odisha, India.
5. NIT Agartala Sponsored Two days National Workshop on 'Academic Environment in Technical Education: Future Perspectives', March 16<sup>th</sup> and 17<sup>th</sup>, 2017, at NIT Agartala, India.
6. TEQIP Sponsored Two days Workshop on 'Green Energy & Economy', February 6<sup>th</sup> and 7<sup>th</sup>, 2014, at NIT Agartala.
7. TEQIP Sponsored Two days National Workshop on 'Advances in multi-criteria decision making (MCDM) Techniques', February 13<sup>th</sup> and 14<sup>th</sup>, 2014, NIT Agartala.

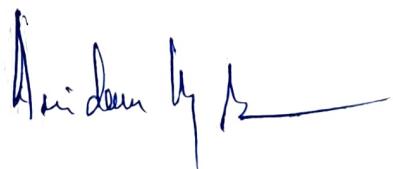
## COURSE TAUGHT

- Kinematics of Machine (Theory) (UG)
- Design of Machine Element I & II (Theory) (UG)
- Soft Computing (Theory) (UG & PG)
- Fracture Mechanics (Theory) (PG & PhD)
- Strength of Material (Theory) (UG)
- Design of Machine Element I & II (Sessional) (UG)

## MEMBER OF PROFESSIONAL BODIES

- Institute of Engineers- AMIE
- International Association of Engineers- Member
- International Association of Computer Science and Information Technology (IACSIT) – Member

## OTHER PROFESSIONAL ACTIVITIES



- Delivered a lecture on ‘Use of metaheuristic algorithm in manufacturing quality improvement’ in the webinar programme of Mechanical and Production Engineering Division, IEI, Tripura State Centre on 4<sup>th</sup> September 2021.
- Acted as Resource person on ‘Optimization Techniques and its application in the field of Manufacturing’ at five (05) days TEQIP-III sponsored workshop on “Advanced Materials, Manufacturing and Measurements” organized by Department of Mechanical Engineering, NIT Agartala from 23rd – 27th September, 2019.
- Reviewer for the following journals: (i) Neural Computing and Applications, (ii) Robotics and Autonomous Systems, (iii) Swarm and Evolutionary Computation, (iv) IMechE Part B: Journal of Engineering Manufacture (SAGE Publication), (v) Journal of the Institution of Engineers (India): Series C (Springer), (vi) Concurrent Engineering: Research and Applications (SAGE Publication), (vii) Measurement Engineering: Research and Applications (SAGE Publication), (viii) Production & Manufacturing Research (Taylor & Francis), and (ix) Soft Computing (Springer)

#### **FELLOWSHIP**

- Received GATE scholarship for Master of Engineering course from MHRD, Govt of India, Aug 2007- May 2009.

#### **TECHNICAL SKILLS**

- Language: Matlab
- Graphical Packages: Minitab, Design Expert, Origin
- Design Software: Solid Works

#### **CITATION INDEX**

|                  | <i>Google Scholar</i> | <i>Scopus</i> |
|------------------|-----------------------|---------------|
| <i>Citations</i> | 933                   | 703           |
| <i>h-index</i>   | 17                    | 15            |
| <i>i10-index</i> | 23                    | -             |

#### **REFEREES:**

Prof. (Dr.) Dipak Laha  
 Professor  
 Department of Mechanical Engineering  
 Jadavpur University  
 Kolkata, India- 700032  
 Email: [dipaklaha\\_jume@yahoo.com](mailto:dipaklaha_jume@yahoo.com)

Dr. Pritam Das  
 Associate Professor  
 Department of Mechanical Engineering  
 National Institute of technology, Agartala  
 Tripura, India-799046  
 E- mail: [bhargav\\_2006@yahoo.co.in](mailto:bhargav_2006@yahoo.co.in)



**BIO-DATA**

1. Name and full correspondence address: **Dr. DIPAK CHANDRA DAS**  
CO – Late Nakul Chandra Das,  
Vill - Joy Chand Pur, PO - Kashari, Belonia,  
South Tripura, Tripura – 799150.
2. Email(s) and contact number(s): **dehdas12@gmail.com** & **+91 9862111109.**
3. Institution: **NIT Agartala.**
4. Date of Birth: **27.02.1985.**
5. Gender (M/F/T): **Male.**
6. Category Gen/SC/ST/OBC: **SC.**
7. Whether differently abled (Yes/No): **No.**
8. Academic Qualification

|    | Degree | Year | Subject                             | University/Institution | % of marks |
|----|--------|------|-------------------------------------|------------------------|------------|
| 1. | BE     | 2008 | Mechanical Engineering              | NIT Agartala           | 72.7       |
| 2. | MME    | 2010 | Heat Power (Mechanical Engineering) | Jadavpur University    | 82         |
| 3. | Ph.D.  | 2017 | Engineering                         | Jadavpur University    | 79         |

9. Ph.D thesis title, Guide's Name, Institute/Organization/University, Year of Award:

**"A Generalized Approach to Film Boiling Heat Transfer Analysis on a Vertical Flat Plate",**  
**Prof. (Dr.) Dipankar Sanyal & Prof. (Dr.) Koushik Ghosh,**  
**Jadavpur University, 2017.**

10. Work experience

| S.No. | Positions held                    | Name of the Institute | From       | To         | Pay Scale                    |
|-------|-----------------------------------|-----------------------|------------|------------|------------------------------|
| 1.    | Assistant Professor (Grade II)    | NIT Agartala          | 24.08.2022 | Till date  | Rs. 73,000                   |
| 2.    | Assistant Professor (Contractual) | NIT Agartala          | 10.07.2015 | 22.08.2022 | Rs. 70,000<br>(Consolidated) |



**11. Professional Recognition/ Award/ Prize/ Certificate, Fellowship received by the applicant.**

| S.No | Name of Award                             | Awarding Agency | Year |
|------|---|-----------------|------|
| 1.   | <b>CSIR Direct Senior Research Fellow</b> | CSIR            | 2012 |
| 2.   | <b>GATE</b>                               | MIIRD           | 2008 |

**12. Publications (*List of papers published in SCI Journals, in year wise descending order*).**

| S. No. | Author(s)  | Title  | Name of Journal   | Volume | Page      | Year |
|--------|--|--|---|--------|-----------|------|
| 1.     | <b>Amit Kumar, Dipak Chandra Das, Pritam Das</b>   | Parametric variation studies of experimental flow boiling heat transfer phenomena using R407c inside an enhanced tube                  | Heat and Mass Transfer  | 59     |           | 2023 |
| 2.     | <b>Sandipan Deb, Paresh Mahesh Kanade, Mantu Das, Dipak Chandra Das, Sagnik Pal, Ranjan Das, Ajoy Kumar Das</b>                          | Flow Boiling Heat Transfer Characteristics over Horizontal Smooth and Microfin Tubes: An Empirical Investigation Utilizing R407c       | International Journal of Thermal Sciences (Accepted)                    |        |           | 2023 |
| 3.     | <b>Neeraj Kumar Vidhyarthi, Sandipan Deb, Sameer Sheshrao Gajghate, Sagnik Pal, Dipak Chandra Das, Ajoy Kumar Das, Bidyut Baran Saha</b> | A comprehensive assessment of two-phase flow boiling heat transfer in micro-fin tubes using pure and blended eco-friendly refrigerants | Energies  | 16     | 1951      | 2023 |
| 4.     | <b>Sandipan Deb, Mantu Das, Dipak Chandra Das, Sagnik Pal, Ajoy Kumar Das, Ranjan Das</b>  | Significance of surface modification on nucleate pool boiling heat transfer characteristics of refrigerant R-141b                      | International Journal of Heat and Mass Transfer                         | 170    | 1209-94   | 2021 |
| 5.     | <b>Dipak Chandra Das, Koushik Ghosh and Dipankar Sanyal</b>  | Scale analysis for water jet impingement over a horizontal flat plate under film boiling configuration                                 | Heat and Mass Transfer  | 57     | 1211-1221 | 2021 |
| 6.     | <b>Sandipan Deb, Mantu Das, Dipak Chandra Das, Sagnik Pal, Ajoy Kumar Das, Ranjan Das</b>  | Surface wettability change on TF nanocoated surfaces during pool boiling heat transfer of refrigerant R- 141b                          | Heat and Mass Transfer  | 56     | 3273-3287 | 2020 |
| 7.     | <b>Dipak Chandra Das, Koushik Ghosh, Dipankar Sanyal</b>   | Forced convection film boiling heat transfer model for a sphere by scaling analysis  | Journal of the Brazilian Society of Mechanical Sciences and Engineering | 40     | 1-9       | 2018 |
| 8.     | <b>Dipak Chandra Das, Koushik Ghosh, Dipankar Sanyal</b>   | A Scale Analysis Model for Film Boiling Heat Transfer on a Vertical Flat Plate with Wide Applicability                                 | International Journal of Heat and Mass Transfer                         | 90     | 40-48     | 2015 |
| 9.     | <b>Dipak Chandra Das, Koushik Ghosh, Dipankar Sanyal, Renaud Meignen</b>   | A Novel Approach for Modeling Mixed Convection Film Boiling for a Vertical Flat Plate  | Numerical Heat Transfer, Part A: Applications                           | 66     | 1112-1130 | 2014 |

Dipak chandra Das

13. Books/Reports/Chapters/General articles etc.

| S. No | Title   | Author's Name  | Publisher  | Year of Publication |
|-------|---|--|--|---------------------|
| 1.    | Simulation of temperature management inside rubber smokehouses of perspex, steel, and ash-brick materials   | Chirojyoti Chakma, Amit Kumar, Dipak Chandra Das, Pritam Das | Materials Today: Proceedings, 62, 2975-2980. (Scopus Journal)  | 2022                |
| 2.    | Significance of surface morphology of materials on flow boiling heat transfer using R-407c  | Amit Kumar, Dipak Chandra Das, Pritam Das                    | Materials Today: Proceedings, 62, 3122-3128. (Scopus Journal)  | 2022                |
| 3.    | Thermal Management of a Cubical Building using Hydrated Salt 24 Advances in Mechanical Engineering, Select Proceedings of ICTEMA2022  | Dipak Chandra Das, Kumar Gourav, Pritam Das                  | NOLEGEIN, an imprint of Consortium E-Learning Network Pvt. Ltd., ISBN: 978-81-952903-6-9.  | 2022                |
| 4.    | Simulation of microchannel heat exchangers with triangular and circular cavities, Advances in Mechanical Engineering, Select Proceedings of ICTEMA2022  | K. Mohana Rao, Amit Kumar, Dipak Chandra Das, Pritam Das,    | NOLEGEIN, an imprint of Consortium E-Learning Network Pvt. Ltd., ISBN: 978-81-952903-6-9.  | 2022                |
| 5.    | Numerical Investigation of Heat Transfer of a Thermosyphon varying the Filling Ratios, Advances in Mechanical Engineering, Select Proceedings of ICTEMA2022   | Dipak Chandra Das, Tabrez Alam, Amit Kumar, Pritam Das       | NOLEGEIN, an imprint of Consortium E-Learning Network Pvt. Ltd., ISBN: 978-81-952903-6-9.  | 2022                |
| 6.    | A Comprehensive Parametric Modelling for Mixed Convection Film Boiling Analysis on a Vertical Flat Plate", Two-Phase Flow for Automotive and Power Generation Sectors. Energy, Environment, and Sustainability, 363- 380. | Dipak Chandra Das, Koushik Ghosh and Dipankar Sanyal,        | Springer, Singapore, <a href="https://doi.org/10.1007/978-981-13-3256-2_14">https://doi.org/10.1007/978-981-13-3256-2_14</a><br>Print ISBN: 978-981-13-3255-5,<br>Online ISBN: 978-981-13-3256-2 | 2019                |
| 7.    | An experimental investigation of boiling over curved metal body electrically heated from inside', General Studies Of Nuclear Reactors (S22), Reference number 42095247, 42 (1), INIS Issue 43(1).                         | Dipak Chandra Das, Koushik Ghosh and Dipankar Sanyal,        | International Nuclear Information System   | 2011                |

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**ANNEXURE-VIII**

**Manpower Budget Detail (Amount in INR)**

| Description  | Year-1                                     | Total          |
|--|--|----------------|
| <b>Manpower Position:</b><br>Project Associate   | Rs. 25,000 ×12<br>months<br>= Rs3,00,000/- | Rs. 3,00,000/- |
| <b>Monthly Emolument:</b><br>Rs. 25,000/-  |  |                |
| <b>Duties and Responsibilities:</b><br>i) To collect data regarding productivity, Drafting the design of the machines in Computer.<br>ii) To demonstrate the developed machines before local entrepreneurs<br>iii) For helping to conduct training sessions and workshops for local entrepreneurs and technicians. |  |                |

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**ANNEXURE-IX**

**1.a. Training/ Workshop Programme Budget Detail (Amount in INR)**

| <b>Workshop/Training Program</b>                             | <b>Year-1</b>   | <b>Total</b>    |
|--|-----------------|-----------------|
| Eight (8) nos. of 1-Day Workshop at each District of Tripura | <b>4,24,400</b> | <b>4,24,400</b> |

**1.b. Head-wise Expenditure for each day Training Programme/ Workshop for 160 Artisans (Amount in INR)**

| <b>Head</b>               | <b>Purpose</b>   | <b>Amount Required</b>   |
|---------------------------|--|--|
| Food and refreshments     | For providing food and refreshments to the Artisans, Guests and organizers (Projects Coordinators and Project Associate) | (No. of Artisans, Guests and organizers) * (Amount for Lunch, Two High-Teas and water)<br>=(20 Artisans + 04 organizers +02 guests) per workshops * 8 workshops * Rs. 650<br>=(160 Artisans + 48 organizers and guests)<br>* Rs. 650 = <b>1,35,200</b> |
| Stationary/ Miscellaneous | For the procurement of uttorio for guests, registration kit and course certificates for Artisans etc.                    | <b>85,200</b>  |
| Local travel              | For reimbursement of travel tickets and local transport of the Artisans  | No. of Artisans * Amount for to and fro travel<br>= <b>160*250 = 40,000</b>  |
|                           | Transportation of two Equipments   | No. of Workshops * Amount for to and fro travel<br>= <b>8*8000 = 64,000</b>  |
| Contingency               | For other expenses   | <b>1,00,000</b>  |
| <b>Total</b>              |  | <b>4,24,400</b>  |

**1.c. District-wise Artisans Details**

| <b>District</b>       | <b>Male</b> | <b>Female</b> | <b>District</b> | <b>Male</b> | <b>Female</b> |
|-----------------------|-------------|---------------|-----------------|-------------|---------------|
| Dhalai                | 10          | 10            | Sepahijala      | 10          | 10            |
| Gomati                | 10          | 10            | South Tripura   | 10          | 10            |
| Khowai                | 10          | 10            | Unakoti         | 10          | 10            |
| North Tripura         | 10          | 10            | West Tripura    | 10          | 10            |
| Total                 | 40          | 40            | Total           | 40          | 40            |
| <b>Total Artisans</b> |             |               |                 | <b>160</b>  |               |

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**Contingencies Budget Detail (Amount in INR)**

| Description  | Year-1 | Total          |
|--|--------|----------------|
| Fabrication of final prototypes of (i) Bamboo Slicing Machine and (ii) Homestead Round Stick-Making Machine after carrying out the modifications based on test results | 200000 | Rs. 2,95,000/- |
| Transportation and Installation  | 25000  |                |
| Consumables  |        |                |
| Bamboo   | 15000  |                |
| Printing   | 10000  |                |
| Hard Disc  | 15000  |                |
| Miscellaneous  | 30000  |                |

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