Republic of the Philippines
# Department of Education
REGION III
SCHOOLS DIVISION OFFICE OF BATAAN

**DIVISION LETTER**
**No. 066 ,s. 2025**

MAY 15 2025

## ONLINE AND F2F 3D PRINTING AWARENESS TRAINING PROJECT FOR SECONDARY EDUCATION

To: Assistant Schools Division Superintendent
Chief Education Supervisors
Education Program Supervisors
Public Schools District Supervisors
Elementary/Secondary School Heads
All Others Concerned

This Office invites all secondary ICT teachers to attend the Online and Face-to-Face (F2F) 3D Printing Awareness Training Project for Secondary Education on May 19–23, 2025, via Google Classroom (https://bit.ly/43uz2Ya).

Attached is the list of ICT teachers who are expected to attend the said online and F2F orientation, followed by the program of activities, for your reference.

Immediate dissemination of this letter is desired.

**CAROLINA S. VIOLETA, EdD, CESO V**
Schools Division Superintendent

CI4
May 15, 2025

**PARTICIPANTS TO THE ONLINE AND F2F 3D PRINTING AWARENESS TRAINING PROJECT FOR SECONDARY EDUCATION**
**May 19-23, 2025**

| No. | District | School | Name of ICT Teacher | Position |
|---|---|---|---|---|
| 1 | Abucay | Abucay HS | Lady Isabel V. Malit | T-II |
| 2 | Abucay | B. Camacho NHS | Gey M. Gregorio | T-II |
| 3 | Abucay | Bangkal High School | Jolina A. Borbe | T-I |
| 4 | Abucay | Mabatang NHS | Rhoda L. Dajano | T-I |
| 5 | Hermosa | Balsik NHS | Alvin A. De Leon | T-II |
| 6 | Hermosa | Mabiga IS | Irene Jasun M. Duran | PSB T-1 |
| 7 | Hermosa | Maite IS | Micole Q. Natanauan | PSB T-1 |
| 8 | Hermosa | Pastolan IS | Nierisa D Bilbao | T-I |
| 9 | Hermosa | St. Ma. Virginia P. Leonzon MIS | Justine Jude R. Reyes | PSB T-1 |
| 10 | Hermosa | Pulo IS | Monica M. Serrano | T-I |
| 11 | Hermosa | Saba IS | Darlin M. Lingad | T-I |
| 12 | Hermosa | Sumalo IS | Karen Kate S. Cabalteja | T-II |
| 13 | Hermosa | Hermosa NHS | Jose Enrico I. Atanacio | T-II |
| 14 | Hermosa | Hermosa NHS-Annex | Jhervin Paguio | T-II |
| 15 | Orani | Doña IS | Lysette Leine D. Aquino | T-I |
| 16 | Orani | Legua IS | Darwin James R. Singca | T-II |
| 17 | Orani | Pulo IS | Jermaine Caira L. Payao | Teacher I |
| 18 | Orani | Orani NHS | Maybel B. Cerezo | Teacher II |
| 19 | Orani | Orani NHS (Pag-asa) | AIMEE A. BAGTAS | T-III |
| 20 | Orani | Orani NHS (Parang Parang) | Llanel Victoria | Teacher II |
| 21 | Samal | Samal NHS Main | Jowell H. Isidro | Teacher II |
| 22 | Samal | Samal NHS - Annex | Jamaica M. Cortez | Teacher II |
| 23 | Samal | F.C. Del Rosario IS | Camille Rose F. Magat | Teacher I |
| 24 | Samal | Palili IS | ANA MARGARITA G. CAPULE | TEACHER I |

| | | | | |
|---|---|---|---|---|
| ***Second Congressional District*** | | | | |
| 25 | Orion | Bataan School of Fisheries | Aileen P. Navarro | Master Teacher I |
| 26 | Orion | JEAG | Elaine E. Mallari | Teacher I |
| 27 | Orion | Udyong NHS | Emie Rose A. Gatdula | PSB / Teacher I |
| 28 | Limay | BLISS IS | Rose Ann A. Manalansan | LSB/ Teacher I |
| 29 | Limay | Kinaragan IS | Bisly T. Osiones | Teacher I |
| 30 | Limay | Lamao NHS | Mark Joseph S. Francisco | Teacher II |
| 31 | Limay | Limay NHS | Ody V. Lavarias | Teacher III |
| 32 | Limay | St. Francis NHS | Erickson R. Esteban | Teacher I |
| 33 | Pilar | Pablo Roman NHS | Altharuja D. Givens | Teacher II |
| 34 | Pilar | Dr. Victoria B. Roman Mem. HS | Ruel C. Quindoy | Teacher III |
| ***Third Congressional District*** | | | | |
| 35 | Bagac | Quinawan IS | John Bernard M. Bisalo | Teacher I |
| 36 | Bagac | Bagac Nat'l HS, Parang | Jesy Laurence D. Navarro | Teacher II |
| 37 | Bagac | Bataan High School for the Arts | Pepito B. Hernandez | Master Teacher I |
| 38 | Bagac | E. C. Bernabe NHS | Marieta C. Holgado | Teacher III |
| 39 | Bagac | Saysain High School | Alaine R. Cañete | Teacher I |
| 40 | Din. East | Layac IS | Gemma Lyn DJ. Lalic | Teacher III |
| 41 | Din. East | Tucop IS | John Cristian D. Timpug | Teacher I |
| 42 | Din. East | Pagalanggang HS | Jacie N. Ronquillo | Teacher I |
| 43 | Din. East | Sta. Lucia HS | Rellian Malit | Teacher I |
| 44 | Din. West | Payangan IS | Arjay L. Inocencio | Teacher-I |
| 45 | Din. West | Tubo-Tubo IS | Sharmaine B. Baque | Teacher I |

| | | | | |
|---|---|---|---|---|
| 46 | Din. West | Jose C. Payumo MHS | Jaycee B. Barcelona | Master Teacher I |
| 47 | Din. West | Luakan NHS | Eden A. Javier | Teacher III |
| 48 | Din. West | Luakan NHS - Annex | Lloyd L. Dizon | Teacher I |
| 49 | Din. West | Magsaysay NHS | Raymond C. Black | Master Teacher I |
| 50 | Din. West | Roosevelt NHS | John Christian I. Natanauan | Teacher I |
| 51 | Mariveles | Lucanin IS | Ashley B. Frondoza | Teacher I |
| 52 | Mariveles | Biaan Aeta IS | Merlyn D. Morna | Teacher II |
| 53 | Mariveles | Mariveles NHS, Cabcaben | Bhen Jay D. Meriño | Master Teacher I |
| 54 | Mariveles | Mariveles NHS, Alasasin | Sheena Rose Raya | Teacher I |
| 55 | Mariveles | Mar. NHS, Cab.-Batangas II | Mariane Faith C. Reyes | Teacher III |
| 56 | Mariveles | Mar. NHS, Cab.-New Alion | Jarven T. Saguin | Teacher II |
| 57 | Mariveles | Mariveles NHS - Malaya | LOUELA A. ALQUIZA | Teacher III |
| 58 | Mariveles | Mariveles NHS, Poblacion | Jeffrey M. Tapac | Teacher III |
| 59 | Mariveles | Mar. NHS Pob.-Annex -Sisiman | Bryan Dave Penoliar | Teacher I |
| 60 | Mariveles | Baseco NHS | ROGELIO B. TARROZA | Teacher I |
| 61 | Mariveles | Ipag National High School | Hershey Jaymee M. Francisco | Teacher II |
| 62 | Morong | Kanawan IS | Jayvee A. Diwa | Teacher I |
| 63 | Morong | Sampaloc IS | Aldea H. Zuñiga | Teacher I |
| 64 | Morong | Morong NHS | Mark Oliver C. Dimalanta | Teacher I |
| 65 | Morong | Mabayo NHS | Arjay M. Famularcano | Teacher I |
| 66 | Morong | Nagbalayong NHS | Lindsy M. Castro | Teacher I |

**Program of Activities**

| DAY 1 | |
|---|---|
| **Date** | **Topic** |
| **Morning Session (Online, Synchronous)** | |
| 9:00 am – 9:30 am | Registration and Log-in via Google Meet |
| 9:30 am – 10:00 am | Opening Program |
| | Invocation |
| | National Anthem |
| | BPSU Hymn |
| | Welcome Remarks<br>-Dr. John Ryan C. Dizon (Program Leader) |
| | Messages<br>-Jerome C. Matic, MAEd (ETSO Chairperson, BPSU Main Campus)<br>-Dr. Bernadeth B. Gabor (ETSO Director)<br>-Prof. Monica T. Hipolito (Vice President, Research, Extension and Technology Transfer)<br>-Dr. Ruby Santos-Matibag (University President) |
| 10:00 am – 10:15 am | DR3AM Center's AVP (Features, Projects, Operations, Engagements)<br>Layout of DR3AM Center and Safety Guidelines |
| 10:15 am – 11:00 am | Introduction to the Training and Overview of Additive Manufacturing<br>-Dr. John Ryan C. Dizon |
| 11:00 am – 11:15 am | Various Materials for 3D Printing<br>-Dr. Arman Ray Nisay |
| 11:15 am – 11:45 am | 3D Printing Technologies<br>-Engr. Gerald S. Robles |
| 11:45 am – 12:00 pm | Closing Reminders<br>-Engr. Madelene V. Villablanca<br>Photo Opportunity |
| 12:00 pm – 1:00 pm | Lunch Break |
| **Afternoon Session (Online, Asynchronous)** | |
| 1:00 pm – 1:30 pm | Applications of 3D printing<br>-Dr. John Ryan C. Dizon |

| | |
|---|---|
| 1:30 pm – 2:00 pm | Achieving the SDGs through 3D Printing<br>-Dr. John Ryan C. Dizon |
| 2:00 pm – 5:00 pm | Special Topics:<br><br>Evaluation of Tensile Behavior of 3D-Printed Fiberglass-Reinforced Nylon Composites<br>-Engr. Madelene V. Villablanca<br><br>Discussion: Dimensional Accuracy of 3D-printed parts<br>-Engr. Gerald S. Robles<br><br>Effects of Thermal Cycling on Mechanical Strength of TPU 3D-Printed Material<br>-Dr. Arman Ray Nisay<br><br>Discussion of Additive Manufacturing Application in Maritime Education<br>-Engr. Brian J. Tuazon |

| DAY 2 | |
|---|---|
| **Date** | **Topic** |
| **Morning Session (Online, Asynchronous)** | |
| 8:00 am – 9:00 am | Investigation on the Effects of Acetone Vapor-Polishing to Fracture Behavior of ABS Printed Materials at Different Operating Temperature |
| 9:00 am – 10:00 am | Mechanical Properties of 3D Printed Polymers |
| 10:00 am – 11:00 am | Post-Processing of 3D-Printed Parts |
| 11:00 am – 12:00 pm | Intellectual Property (IP) Standards, Regulations, etc. |
| 12:00 pm – 1:00 pm | Lunch Break |
| **Afternoon Session (Online, Asynchronous)** | |
| 1:00 pm – 2:00 pm | Awareness level on 3D Printing Technology in Bataan |
| 2:00 pm – 3:00 pm | Exploring Challenges in Developing Technical Competencies in Advanced Manufacturing |
| 3:00 pm – 4:00 pm | 3D Printing Applications in Agriculture, Food Processing, and Environmental Protection and Monitoring |
| 4:00 pm – 5:00 pm | Fabrication and testing of a vapor polishing device for ABS 3D-printed parts |



BPSU | DR3A
Capitol Compound, Tenejero, City of Balanga 2100 PH
Email: dr3am@bpsu.edu.ph

| DAY 3 | |
|---|---|
| **Date** | **Topic** |
| **Morning Session (Online, Asynchronous)** | |
| 8:00 am – 9:00 am | Application of Taguchi Methodology in Evaluating the Rockwell Hardness of SLA 3D Printed Polymers |
| 9:00 am – 10:00 am | 3D Printed Connection System for Bamboo Structure Construction |
| 10:00 am – 11:00 am | 3D Printing for the Production of Architectural Scale |
| 11:00 am – 12:00 pm | Discussion of 3D Printed Polymeric Spare Parts for Industrial Applications |
| 12:00 pm – 1:00 pm | Lunch Break |
| **Afternoon Session (Online, Asynchronous)** | |
| 1:00 pm – 5:00 pm | 3D Modelling using Google Sketchup |

| DAY 4 | |
|---|---|
| **Date** | **Topic** |
| **Morning Session (Online, Asynchronous)** | |
| 8:00 am – 12:00 pm | 3D Modelling using Autodesk Inventor |
| **Afternoon Session (Online, Asynchronous)** | |
| 1:00 pm – 5:00 pm | Various Slicing Software<br>- Cura<br>- Creality<br>- Simplify3D<br>- Bambu Studio<br>- Flashprint |

| DAY 5 | |
|---|---|
| **Date** | **Topic** |
| **Morning Session (Hands-on Training)** | |
| 8:00 am – 8:15 am | Lecture: Introduction to Parts of a 3D Printer<br>-Mr. Matthew Lumibao |
| 8:15 am – 9:30 am | 3D Modelling using Fusion – Key chain<br>-Mr. Matthew Lumibao |
| 9:30 am – 10:30 am | Fusion Exercise 1<br>-Mr. John Desir Gruela |
| 10:30 am – 11:00 am | Slicing 3D models using Cura and Creality<br>Operation of Ender and Creality 3D Printers<br>- Mr. John Desir Gruela |
| 11:00 pm – 12:00 pm | Fusion Exercise 2 -Mr. Matthew Lumibao |
| **Afternoon Session (Hands-on Training)** | |
| 1:00 pm – 1:30 pm | How to slice 3D models using Flashprint<br>Operation of Flashforge Printers -Mr. Matthew Lumibao |
| 2:30 pm – 3:00 pm | Fusion Exercise 3 – Mr. John Desir Gruela |
| 3:00 pm – 3:30 pm | Fusion Exercise 4 – Mr. John Desir Gruela |
| 3:30 pm – 4:00 pm | How to slice 3D models using Bambu Studio<br>Operation of BambuLab 3D Printers -Mr. Matthew Lumibao |
| 4:00 pm – 4:30 pm | Fusion Exercise 5 -Mr. Matthew Lumibao<br>Final Assessment and Feedback -Ms. Reinne Anne Cruz |
| 4:30 pm – 5:00 pm | Closing and Awarding of Certificates |

Note: The one-day hands-on training will be delivered in multiple batches over a five-day period, with each session lasting half a day to ensure all participants are accommodated.

# EXTENSION PROGRAM/PROJECT PROPOSAL

## I. IDENTIFYING INFORMATION

| | | |
|---|---|---|
| Title | : | **3D Printing Awareness Training Project for Secondary Education** |
| Proponents | : | Dr. Arman Ray N. Nisay<br>Engr. Madelene V. Villablanca<br>Engr. Michaela T. Espino<br>Engr. Aida T. Solomon<br>Engr. Roland S. Manalang |
| Mandated Program | : | Enhanced 3D Printing Awareness Training Program: Preparing the Workforce of Tomorrow |
| Extension Agenda | : | Lakbay Kalinga sa Teknolohiya at Inhenyeriya |
| Project Team Leader | : | Dr. Arman Ray N. Nisay |
| Co-Team Leader | : | Engr. Madelene V. Villablanca |
| Members/Trainers | : | Engr. Michaela T. Espino<br>Engr. Aida T. Solomon<br>Engr. Roland S. Manalang |
| Implementing College / Department | : | BPSU DR3AM Center, College of Engineering and Architecture, BS Mechanical Engineering, BS Industrial Engineering, College of Graduate School |
| Collaborating Organizations | : | DepEd - Bataan |
| Beneficiaries | : | 36 |
| *Number of Male Beneficiaries:* | | *18* |
| *Number of Female Beneficiaries:* | | *18* |
| Duration / Inclusive Dates | : | 1 year / February 3, 2025 to February 2, 2026 |
| Location | : | Bataan Peninsula State University / Province of Bataan |
| Budget | : | |
| Source of Fund | : | |
| Sustainable Development Goals | : | SDG 1 (No poverty);<br>SDG 2 (Decent work and economic growth;<br>SDG 9 Industry innovation and infrastructure;<br>SDG 12 (Responsible consumption and production) |
| Research Utilized Furniture | : | Development of 3D Printed Connectors and Handicrafts Joints to Enhance the Competitive Advantage of Local Industries |

## II. RATIONALE

Additive manufacturing (AM), commonly known as three-dimensional (3D) printing, represents a transformative approach to production, where objects are built layer by layer from digital models. This technology is revolutionizing a wide array of industries, including construction, agriculture, automotive, aerospace, food production, and healthcare (Dizon et al., 2018). Despite its growing significance, a considerable gap remains in comprehensive understanding and practical applications of 3D printing technology in other regions aside from Bataan.

Research conducted by Dizon et al. on the awareness of 3D printing in Bataan revealed that while many residents are familiar with the concept of 3D printing, there is a widespread lack of in-depth knowledge regarding its functionality and potential applications. To address this gap, a 3D printing awareness training program is continuously conducted in Bataan at the Design, Research and Extension in Additive Manufacturing (DR3AM) Center, formerly Additive Manufacturing Research Laboratory (AMReL), of Bataan Peninsula State University since 2022.

With the success in training hundreds of professionals – including, engineers, architects, educators, technicians, and technologists – this proposal seeks to extend the 3D printing training program to high schools and senior high schools in the province of Bataan.

This proposed extension project aims to address these needs by empowering educators and students in secondary education through comprehensive training and research initiatives. Moreover, it is essential to build a strong foundation in the basic principles of AM to fully grasp its wide-ranging applications. Key topics that must be covered include:

- 3D printing technologies and materials – to understand the different types of 3D printing methods, and explore the various materials used in 3D printing suitable for different applications.
- Familiarization of different components of a 3D printer and each function to create a final product.
- Post-processing techniques of 3D-printed parts in refining the 3D-printed objects for practical use.

By covering these topics, the program aims to equip participants with the knowledge and skills necessary to explore the full capability of additive manufacturing, from basic principles to advanced applications and material characterization.

## III. OBJECTIVES

### A. General objective:

The general objective of this extension project is to continuously provide training to educators and students of secondary education, including high schools and senior high schools in Bataan, to mainstream 3D Printing as a key tool in research, prototyping, design, and in providing solutions to problems in the community.

B. **Specific objectives:**

Instill in the minds of the secondary-level educators and students the following:

- To impart a solid understanding of the basic principles of 3D printing, such as different technologies and diverse materials utilized in wide-ranging applications
- To provide hands-on training on 3D modelling and 3D printing, enabling participants to gain practical experience
- To demonstrate the use of 3D printing technologies in conducting innovative research
- To offer comprehensive training workshops that cover essential aspects of 3D printing, including design software, printer operation, and routine maintenance
- To promote potential research collaboration between institutions, facilitating the exchange of ideas in applying 3D printing to solve community-based challenges

## IV. EXPECTED OUTPUTS:

**Secondary-level educators and students who are:**

- knowledgeable on the principles of 3D printing technology, materials, and its diverse range of applications
- basic knowledge in creating a 3D model and operate a 3D printer to produce the desired output through a hands-on experience on 3D modelling software and 3D printing process
- capable of developing practical solutions through 3D printing to address specific challenges in the community, such as educational tools.

## V. PROJECT COMPONENTS/DESCRIPTIONS:

### A. Community Analysis:

A survey of 2,900 Bataeños revealed that while most residents are aware of the existence of 3D printing technology, many lack an understanding of its working principles or potential applications. With this proposed extension and training project, the local community challenges could be also addressed through 3D printing, such as the need for custom solutions in education and small-scale manufacturing.

### B. Problem Analysis:

There is a substantial knowledge gap regarding the principles, technologies, and applications of 3D printing within the community. Some of the secondary-level educators and students are aware of the technology but do not understand its full potential or how to apply it effectively in their fields. There is a lack of hands-on experience necessary to fully integrate 3D printing technology in advanced research or large-scale projects. The lack of expertise and practical

knowledge in 3D printing can result in missed opportunities in innovation and efficiency improvements in manufacturing and prototyping.

C. **Description of the Target Group:**

The extension program will be exclusively for secondary-level educators and students. All activities will be facilitated by a team of highly skilled and knowledgeable faculty, researchers, and staff from the DR3AM Center of BPSU.

D. **Partnership:**

**BPSU Extensionists** - the implementers are responsible for the following:

- Preparation of materials and equipment
- Trainers and resource speakers
- Meals for the trainers
- Venue of the Training

**Partners** - the collaborative partners are responsible for the following:

- Recruitment of participants
- ****if there are others, please specify****

## VI. TECHNICAL ASPECTS

### A. Theoretical Framework:

3D printing technology is a transformative process to convert digital designs into tangible objects, meeting significant need across various sectors, such as economics, environmental sustainability, health and social studies, geography, and geopolitics. To effectively adapt this technology, it is essential to acquire a solid understanding of the principles and processes of 3D printing. This proposal is designed to equip the secondary-level educators and students with the essential knowledge and skills in 3D printing, preparing them for future contributions in education, research, and community-related initiatives.

The paradigm of the project is depicted in Figure 1, which illustrates the systematic approach to executing the training plan effectively for comprehensive learning outcomes. The success of the training program relies on key inputs, including the expert trainers and facilitators equipped with extensive workshop materials, the participants who will engage in the 3D printing proficiency development, and other 3D printing equipment to facilitate practical learning experiences. The project's process is structured around a series of theoretical and practical training activities to ensure a thorough understanding of 3D printing technology, from 3D modelling to printing of desired objects and post-processing techniques. Throughout the training, the participants will be continuously assessed to ensure they are meeting the learning objectives. Feedback will be gathered to improve future training programs, and proper documentation of the progress will be conducted for future reference. Upon completion of the project, trained secondary-level educators and students will emerge from the program with enhanced knowledge and practical skills in 3D

printing, ready to contribute to educational advancements and potential research collaborations.

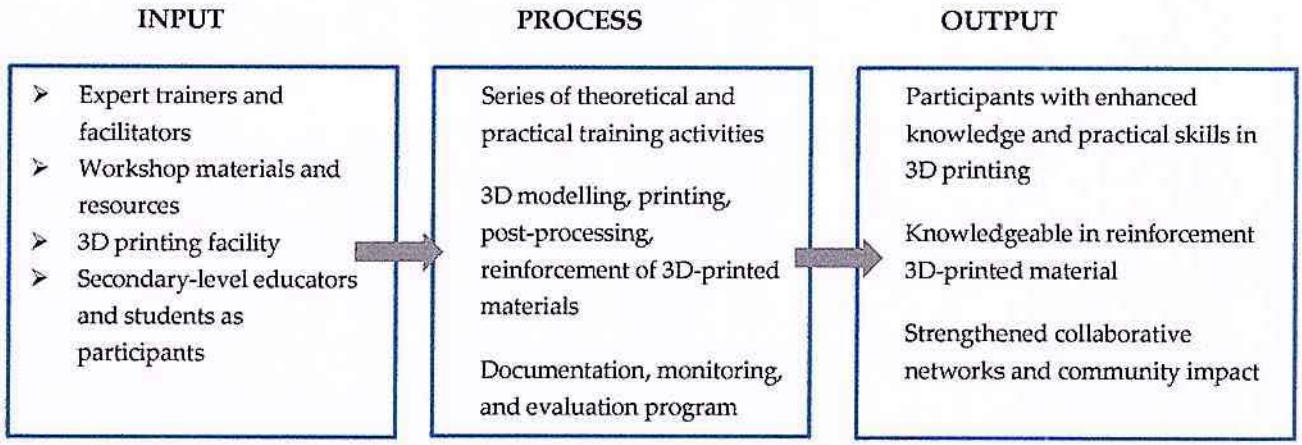


**Figure 1. Paradigm of the Project**

**B. Methodology:**

The participants will receive lecture materials and instructional videos online to provide an overview of AM technology before the actual training session begins. The proponents will conduct a series of lectures, followed by practical sessions covering 3D modelling, slicing, printing, and post-processing. All activities will be closely monitored by the internal monitoring team of the project and the Office of Training and Extension Services. The lecture and training sessions will be distributed as follows:

*Lectures:*
**Engr. Madelene V. Villablanca** – discussion on overview of Additive Manufacturing
**Dr. Arman Ray N. Nisay** – discussion on 3D printing materials
**Engr. Michaela T. Espino** – discussion on differences among 3D printing technologies
**Engr. Aida T. Solomon** – post-processing techniques for 3D printed parts
**Engr. Roland S. Manalang** – demonstration of parts of a 3D printer

*Hands-on Training:*
**Engr. Madelene V. Villablanca** – set-up of 3D printers
**Dr. Arman Ray N. Nisay** and **Engr. Aida T. Solomon** – CAD modeling hands-on training and 3D printing process
**Mr. Carlo D. San Pedro** and **Mr. Matthew Benjamin S. Lumibao** – support technical staff from DR3AM Center

*Documentation and Monitoring:*
**Engr. Roland S. Manalang** – monitoring and evaluation
**Engr. Michaela T. Espino** – documentation during lecture and training sessions

**Assigned Tasks:**

- Facilitators – Dr. Arman Ray N. Nisay, Engr. Madelene V. Villablanca, Engr. Michaela T.

Espino, Engr. Aida T. Solomon, Engr. Roland S. Manalang, support technical staff from DR3AM Center

- Communication with potential partners – Dr. Arman Ray N. Nisay, Engr. Madelene V. Villablanca, Engr. Michaela T. Espino, Engr. Aida T. Solomon, Engr. Roland S. Manalang
- Meeting with partners - Dr. Arman Ray N. Nisay, Engr. Madelene V. Villablanca, Engr. Michaela T. Espino, Engr. Aida T. Solomon, Engr. Roland S. Manalang
- Preparation of Memorandum of Agreement (MOA) – Engr. Michaela T. Espino
- MOA signing – Dr. Arman Ray N. Nisay
- Preparation of materials for training (attendance sheet, machines, filaments, meals for trainors, etc) – Engr. Madelene V. Villablanca
- Preparation and submission of PR for supplies and materials – Engr. Roland S. Manalang
- Preparation of training program and invitation for university officials – Engr. Aida T. Solomon
- Request for University Memo - Dr. Arman Ray N. Nisay
- Registration – Engr. Madelene V. Villablanca
- Training assessment of participants – Engr. Roland S. Manalang
- Preparation and submission of accomplishment report - Engr. Aida T. Solomon
- Preparation of PPT for in-house review and conference presentation – Engr. Michaela T. Espino, Engr. Madelene V. Villablanca
- Preparation of manuscript for publication – Dr. Arman Ray N. Nisay, Engr. Madelene V. Villablanca
- Documentation of all activities – Engr. Aida T. Solomon, Engr. Roland S. Manalang
- Conduct of monthly meetings – Dr. Arman Ray N. Nisay, Engr. Madelene V. Villablanca, Engr. Michaela T. Espino, Engr. Aida T. Solomon, Engr. Roland S. Manalang
- Technical writer – Engr. Michaela T. Espino, Engr. Roland S. Manalang

## VII. MONITORING AND EVALUATION PLAN

Regular submission of accomplishment reports will be strictly observed throughout the project. The extensionist will be responsible for preparing periodic progress reports, final technical reports, and accounting for all project expenditures. Upon project completion, a comprehensive evaluation will be conducted to assess outcomes, impact, and overall success.

## VIII. ACTIVITIES /EXPECTED OUTPUT

| INPUTS | ACTIVITIES | OUTPUTS | OUTCOMES | IMPACT | SOCIETAL GOALS |
|---|---|---|---|---|---|
| Lecture materials on 3D printing technology | Series of lectures on the concepts and applications of 3D printing | Participants with foundational knowledge and skills in 3D printing | Participants able to apply 3D printing in practical contexts | Participants initiating 3D printing-related projects in the communities | This will address the following SDGs:<br>(1) No poverty;<br>(2) Decent work and economic growth;<br>(9) Industry innovation and infrastructure;<br>(12) Responsible consumption and production |
| Training manuals for practical sessions on 3D printing | Hands-on training on 3D modelling, slicing, printing, and post-processing | Completed 3D-printed objects during training sessions | Trained participants able to conduct projects relating to reinforcement 3D printing, addressing local challenges | Growth of local innovation to enhance problem-solving capacity within communities | This will address the following SDGs:<br>(1) No poverty;<br>(2) Decent work and economic growth;<br>(9) Industry innovation and infrastructure;<br>(12) Responsible consumption and production |

## X. REFERENCES

1) John Ryan C. Dizon, Qiyi Chen, Alejandro H. Espera, Jr., Rigoberto C. Advincula, "Mechanical Characterization of 3D-Printed Polymers", 2018, Additive Manufacturing, Vol. 20, pp. 44-67.

2) Michaela T. Espino, Brian J. Tuazon, Alejandro Espera, Carla Joyce C. Nocheseda, Roland S. Manalang, John Ryan C. Dizon, Rigoberto C. Advincula, Statistical Methods for Design and Testing of 3D-Printed Polymers, MRS Communication, 2023, https://doi.org/10.1557/s43579-023-00332-7.

3) Elliot Gonzaga1, Brian J. Tuazon, Joseph Garcia, Marlon Bulan, Fred Liza, Rigoberto Advincula, John Ryan C. Dizon, Additive Manufacturing Applications in Maritime Education, Diffusion Foundations and Materials Applications, 2023, 32, 19-26, https://doi.org/10.4028/p-kt7n60.

4) Ciara Catherine L. Gache, Brian J. Tuazon, Michaela T. Espino, Rigoberto C. Advincula, and John Ryan C. Dizon, 3D-Printed Polymeric Spare Parts for Industrial Applications: A State-of-the-Art Review,

SciEnggJ. 2022 15 (2) 128-144.

5) Brian J. Tuazon1, Michaela T. Espino, Ciara Catherine L. Gache, John Ryan C. Dizon, Additive Manufacturing Technology in the Furniture Industry: Future Outlook for Developing Countries, Advance Sustainable Science, Engineering and Technology (ASSET), 2024, Vol. 6, No.3, pp. 02403024-01 ~ 02403024-014, https://doi.org/10.26877/asset.v6i3.908

6) Michaela T. Espino, Brian Jumaquio Tuazon, John Ryan C. Dizon, Effects of Thermal Cycling on the Mechanical Strength of TPU 3D-Printed Material, Materials Science Forum (Volume 1118), 2024, pp. 105-110, https://doi.org/10.4028/p-iRuRZ3

7) Gil Cruz, John Ryan C. Dizon, Nima Farzadnia, Hongyu Zhou, Marianito Margarito, Joseph Alfred Garcia, Fred P. Liza, Rigoberto C. Advincula, On the performance, applications, and sustainability of 3D-printed cement and other geomaterials, MRS Communications, 2023, https://doi.org/10.1557/s43579-023-00358-x.

8) Gerald Sanqui Robles, Michaela Tayag Espino, Ray Noel Medina Delda, John Ryan Cortez Dizon, Significance of Fundamental Metrology of 3D-Printed Parts for Engineering Design: Dimensional Accuracy, Advance Sustainable Science, Engineering and Technology (ASSET), Vol 4, No. 2, DOI: https://doi.org/10.26877/asset.v4i2.12950.

9) G.S. Robles, R.N.M. Delda, R.L.B. Del Rosario, M.T. Espino and J.R.C. Dizon, Dimensional Accuracy of 3D - Printed Acrylonitrile Butadiene Styrene: Effect of Size, Layer Thickness, and Infill Density, Key Engineering Materials, Vol. 913, 2022, https://doi.org/10.4028/p-nxviqm.

10) Rigoberto C. Advincula, John Ryan C. Dizon, Qiyi Chen, Ivy Niu, Jason Chung, Lucas Kilpatrick and Reagan Newman, Additive Manufacturing for COVID-19: Devices, Materials, Prospects and Challenges, MRS Communications Journal, 2020, Volume 10, Issue 3September 2020, pp. 413-427, doi:10.1557/mrc.2020.57.

11) Jan Lloyd Buenaventura Crisostomo, John Ryan Cortez Dizon, 3D Printing Applications in Agriculture, Food Processing, and Environmental Protection and Monitoring, Advance Sustainable Science, Engineering and Technology (ASSET), Vol. 3, No. 2, 2021, pp. 0210201-01 ~ 0210201-12, DOI: https://doi.org/10.26877/asset.v3i2.9627

12) John Ryan C. Dizon, Ciara Catherine L. Gache, Honelly Mae S. Cascolan, Lina T. Cancino, Rigoberto C. Advincula, Post-processing of 3D-printed Polymers, Technologies, 2021, 9(3):61. https://doi.org/10.3390/technologies9030061.

13) Delda, R.N.M.; Basuel, R.B.; Hacla, R.P.; Martinez, D.W.C.; Cabibihan, J.-J.; Dizon, J.R.C. 3D Printing Polymeric Materials for Robots with Embedded Systems. Technologies 2021, 9, 82. https://doi.org/10.3390/technologies9040082

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