**ALVA'S INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**Shobhavan Campus, Mijar, Moodbidri - 574225**
(Affiliated to Visvesvaraya Technological University, Belagavi
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A Report on

# "CENTRE FOR BIO-BASED PRODUCT DEVELOPMENT" (Composite Lab)

## Department of Chemistry

# CONTENTS

## 1. Mission, Vision, Objectives

**Vision**

To become a Centre of Excellence in the field of polymer composite material processing and product development

**Mission**

To train faculty and students in establishing a world class innovative product development with state of art facilities to meet the critical challenges and pursue excellence in research in the area of Natural fiber reinforced polymer composites.

**Objectives**

To engage in the design, fabrication and experimental evaluation of polymer matrix composite materials developed by reinforcing agricultural residue/by- products suitable for automobile, aerospace, marine and structural applications.

## 2. Area of Research

The centre is focused on the development of new eco-friendly composite materials by using variety of natural fibres derived from plant origin such as areca, abaca, pineapple, sisal, jute etc.

## 3. Establishment Details

The centre for Bio-based Product Development, Composite Lab was established under the Department of Chemistry, AIET in the year 2016. The centre was established to advance knowledge and nurture technically-grounded leaders and innovators to serve societal needs, with a focus on sustainable manufacturing, through an integrated multi-disciplinary research, collaboration between different industries, competitors, vendors and customers at solving tough commercial problems. The primary focus of the centre is to train the faculty and students in developing and making systemically-complex, technologically-intensive, and socially-impactful solutions that are functional, aesthetic, usable and sustainable. It is also focused to strengthen the research at AIET by adding value, effecting knowledge transfer, generating intellectual property, and raising new technologies through the innovative manufacturing research. The centre pursues excellence in research and industry interaction and lead the successful amalgamation of research in the area of natural fibre reinforced composite materials

## 4. Equipments

Universal Testing Machine (Mecmesin, 2.5kN)

Compression moulding unit (Santek, 10 Ton)

Wear & Friction Monitor (DUCOM)

## 5. Composition

**Lab coordinator:**

Dr. Basavaraju Bennehalli

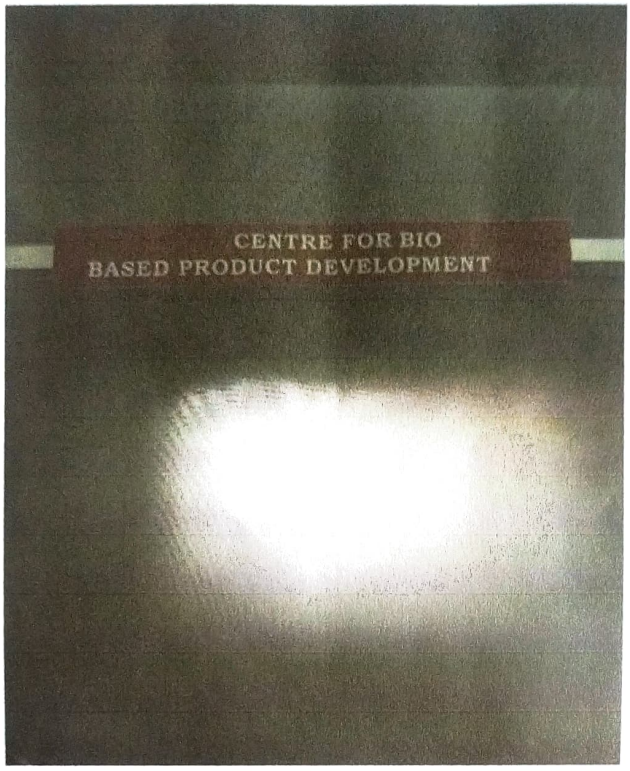
M.Sc., M.Tech., Ph.D.

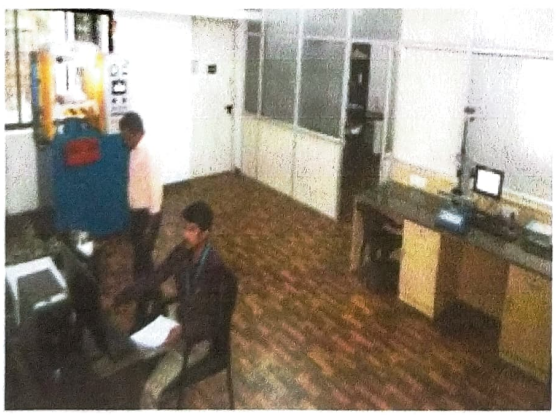
Professor, Department of Chemistry

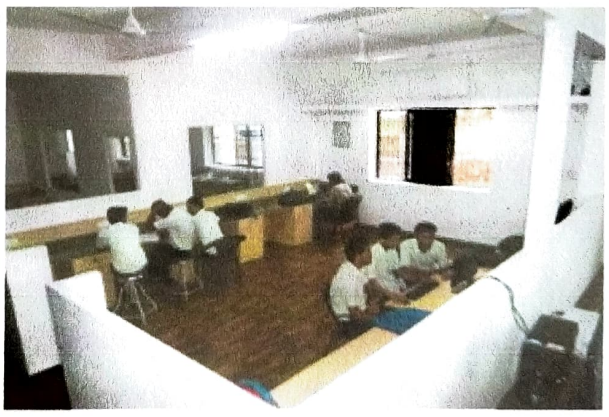
## 6. Research Scholars

| Research Scholar | Research Title | University | Status |
|---|---|---|---|
| Dhanalaksmi S | Study of effect of chemical treatments on characterization of areca fibre Reinforced polymer composites | JNTU, Hyderabad | Ph. D degree awarded |
| Ramadevi P | Chemical treatment of natural abaca fiber for surface modification and its impact on properties of abaca fiber reinforced polymer composite | JNTU, Hyderabad | Ph. D degree awarded |
| Raghu Patel GR | Influence of Surface Modification on Physico-Chemical Characteristics of Single Areca Fiber" | VTU, Belagavi, Karnataka | Ph. D degree awarded |
| Sakshi S. Kamath | The study of effect of surface modifications and fiber loading on areca fiber reinforced polymer composites | VTU, Belagavi, Karnataka | Ph. D degree awarded |
| Manuel Radrigus | Synthesis & Pharmacological Investigation of Heterocycle Encompassed Benzoxazole Nucleus" | VTU, Belagavi, Karnataka | Thesis submitted |

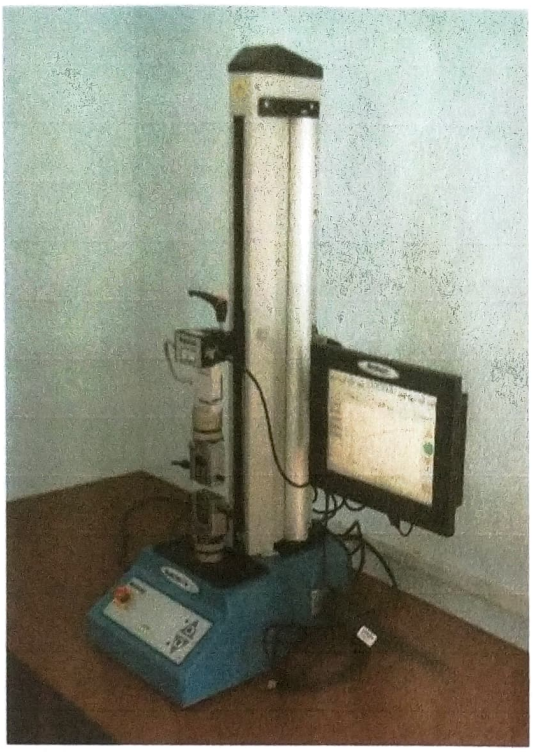
7. **Lab view**





LAB VIEW



Universal Testing Machine

Compression Moulding Unit

Wear & Friction Monitor


Moisture Analyser

## 8. Products Developed

Industry ready composite materials based on natural areca, banana, jute, sisal, & pineapple fibres are designed and developed.

## 9. Research grants

| Principal Investigator | Project Title | Funding Agency | Research Grants | Status |
|---|---|---|---|---|
| Dr. Basavaraju Bennehalli | Physicochemical & mechanical characterisation of natural areca fiber reinforced polymer composite materials | VGST, Department of IT, BT and S&T, Government of Karnatka | 30,00,000.00 | Completed |

Dr. Basavaraju Bennehalli
**Lab coordinator**

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## Academic Year 2016 - 2017

## Outcome of the lab

***List of Publications (2016-17):***

1. "Influence of Surface Modification on the Thermal Stability and Percentage of Crystallinity of Natural Abaca Fiber", Handbook of Composite from Renewable Materials, published by Wiley-Scrivener, Volume 6, Chapter 13, Page: 353-373. ISBN: 978-1-119-22380-1 . https://doi.org/10.1002/9781119441632.ch117

2. "Mechanical properties of abaca fiber reinforced polypropylene composites: Effect of chemical treatment by benzenediazoniumchloride",*Journal of King Saud University-Engineering Science*, 29, 289-294. ISSN: 1018-3639.https://doi.org/10.1016/j.jksues.2015.10.004

3. "A study of effect of chemical treatments on areca fiber reinforced polypropylene composite properties", Science and Engineering of Composite Materials, 24 (4), 501-520. Online ISSN: 2191-0359 (July 2017)https://doi.org/10.1515/secm-2015-0292

4. "Physical characterization of natural lignocellulosic single areca fiber",*Ciência & Tecnologia dos Materiais*, 27(2), 121-135. ISSN: 0870-8312.https://doi.org/10.1016/j.ctmat.2015.10.001

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# (Composite Lab)

## Academic Year

## 2017 - 2018

## Outcome of the lab

***List of Publications (2017-18):***

1. Spectral studies on chemically modified areca fibre", Materials Today: Proceedings, Volume 5, Issue 14, Part 2, 2018, Pages 28018-28025, https://doi.org/10.1016/j.matpr.2018.10.042, ISSN: 2214-7853.

2. Tensile & flexural properties of areca sheath fibres, Materials Today: Proceedings, Volume 5, Issue 14, Part 2, 2018, Pages 28080-28088, ISSN: 2214-7853, https://doi.org/10.1016/j.matpr.2018.10.049.

3. "A review on the mechanical properties of areca fiber reinforced composites", *Science & Tecnology of Materials, 30(2), Pages 120-130* https://doi.org/10.1016/j.stmat.2018.05.004 . *ISSN: 2603-6363.*

4. "A Review on natural areca fiber reinforced polymer composite materials",*Ciência & Tecnologia dos Materiais,*29(3), Pages 106–128. https://doi.org/10.1016/j.ctmat.2017.10.001 .ISSN: 0870-8312

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## Academic Year 2018 - 2019

## Outcome of the lab

***List of Publications (2018-19):***

1. Dynamic mechanical properties of natural fiber composites—a review", *Advanced Composites and Hybrid Materials*, 2(4), Pages:586–607, https://doi.org/10.1007/s42114-019-00121-8,ISSN 2522-0128.

2. "A Review on Various Synthetic Methods of Benzoxazole Moiety" *International Journal of Pharmacy and Biological Sciences*, 9(2), Pages 748-764, DOI: https://doi.org/10.21276/ijpbs.2019.9.2.90, Online ISSN: 2230-7605, Print ISSN: 2321-3272

3. "Influence of Surface Modification on Physical, Mechanical, and Morphological Properties of Natural Single Areca catechu Fiber", *Oriental Journal of Chemistry, 35(2), Pages 605-610, DOI : http://dx.doi.org/10.13005/ojc/350214, ISSN : 0970 - 020X, ONLINE ISSN: 2231-5039.*

4. "Extraction and Characterization of Cellulose from Natural Areca Fiber", Materials Science Research India, Volume 16 (1), Pages 86-93, DOI: http://dx.doi.org/10.13005/msri/160112, ISSN: 0973-3469

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## Academic Year 2019 - 2020

## Outcome of the lab

***List of Publications (2019-20):***

1. "Tensile and Flexural Behaviour of Areca Husk Fibre Reinforced Epoxy Composite", *Advances in Metrology and Measurement of Engineering Surfaces, Lecture Notes in Mechanical Engineering*, Pages 35-43, ISSN 2195-4356 ISSN 2195-4364 (electronic), Lecture Notes in Mechanical Engineering, ISBN 978-981-15-5150-5 ISBN 978-981-15-5151-2 (eBook), https://doi.org/10.1007/978-981-15-5151-2.

2. "Study on morphology and mechanical behavior of areca leaf sheath reinforced epoxy composites". *Advanced Composites and Hybrid Materials*, 3(2), https://doi.org/10.1007/s42114-020-00169-x, ISSN 2522-0128.

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**Academic Year**
**2020 - 2021**

## Outcome of the lab

***List of Publications (2020-21):***

1. Studies on physical and mechanical properties of untreated (raw) and treated areca leaf sheaths, Materials *Research Innovations*, 25 (7), 404-411.
2. Synthesis, In-vitro Antioxidant, Anti-diabetic Evaluation and Docking Studies of Newly Synthesized Benzoxazole Derivatives, *Trends in Sciences*, 18 (21), 35-35.
3. Experimental and Finite Element Studies on Free Vibration of Areca Leaf Sheath Reinforced Polymer Composites, *Mechanics of Advanced Composite Structures*, 8 (2), 367-388.
4. Surface Modification of Areca Fibre by Benzoyl Peroxide and Mechanical Behaviour of Areca-Epoxy Composites, *Material Science Research India*, 18 (1), 48-55.
5. Physical, chemical and surface morphological characterization of single areca sheath fiber, IOP Conference Series*: Materials Science and Engineering* 1065 (1), 012020.
6. Effect of fiber fraction on the physical and mechanical properties of short areca sheath fiber reinforced polymer composite, *Materials Today: Proceedings* 44, 4972-4975, 2021.
7. Tribological studies of epoxy composites using surface modified areca sheath fibres, *Materials Today: Proceedings* 45, 4763-4767, 2021.
8. Tribological properties of areca sheath fiber composites, *Materials Today: Proceedings* 46, 7955-7961, 2021.
9. Potential of using areca fibres in composite fabrication, *Materials Today: Proceedings* 44, 4143-4149, 2021.
10. Tensile and flexural behaviour of areca husk fibre reinforced epoxy composite, *Advances in Metrology and Measurement of Engineering Surfaces*, 35-43, 2021

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