



DEPARTMENT OF MECHANICAL ENGINEERING

One Week Faculty Development Programme on

“Advancements in Phase change material based Thermal and Renewable Energy Technologies”

1st June to 5th June 2020, Time 10.00 AM to 12.30 PM.

One week online Faculty program was conducted through Microsoft Teams Platform. The registrations for the online FDP was opened on 27-5-2020 at 5.00PM and closed on 30-5-2020 at 5.00 PM. There was a huge response from the faculty and research scholars and a total 1057 registrations were received from across the country and overseas. About 9 faculty members and research scholars were registered for FDP from U.K, Saudi Arabia, Malaysia, Indonesia and Ethiopia. Based on the first cum first serve, a total of 250 members were selected and given an opportunity to attend the FDP.

Registration link: <https://tinyurl.com/lbrcemechfdp>

Registration Fee: Free

Registration Deadline: 29-05-2020

Details of Resource Persons:

DEPARTMENT OF MECHANICAL ENGINEERING

One Week Faculty Development Programme on

“Advancements in Phase change material based Thermal and Renewable Energy Technologies”

From 1st June to 5th June 2020, Time 10.00 AM to 12.30 PM.



Prof. R. Velraj, Anna University, Chennai
Topic: PCM based thermal storage for solar and building applications.



Dr. S. Kalaiselvam, Anna University, Chennai.
Topic: Sustainable thermal energy storage for zero energy buildings.



Dr. D. Jayakrishna, NIT Warangal
Topic: Characterization of PCMs and their compatibility with metals.



Dr. R. Senthil, SRMIST, Chennai.
Topic: Utilization of PCMs for solar thermal collectors.



Dr. V.Sajith, NIT Calicut
Topic: Application of Phase change material based Nano fluids in Thermal Power plants.




Dr. R.Parameshwaran, BITS-Pilani, Hyderabad Campus
Topic: Nanomaterials embedded phase change materials for thermal energy storage for HVAC systems.



Dr.P.Thirumal, Govt.College of Engineering, Bargur
Topic: PCMs for HVAC and Medical applications.



Dr. P. Karthik, Concordia University, Canada.
Topic: Recent advances in building energy systems.

	<p>Dr. Rajesh Baby, St.Joseph's College of Engineering and Technology, Palai. Topic: Thermal optimization of phase change material based heat sinks: An ANN-GA approach</p>
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Inauguration Function: The inauguration function of the FDP started on 1-06-2020 at 10.00AM, with the welcome address by the Convener, Dr.S.Pichi Reddy, Professor &HoD, Department of Mechanical Engineering, followed by address from the Principal, Dr.K.Appa Rao and the key note address by the distinguished guest and resource person, Dr.R.Velraj, Professor,Department of Mechanical Engineering, Anna University, Chennai.The inaugural function concluded at 10.20AM. The day-1 first session of FDP started withDr.R.Velraj on PCM based thermal Storage for Solar and Building Applications.The one week FDP has total 9 sessions and the details are as given below.

Table 1: Details of Resource Persons and topic delivered

Dates	Name of the Resource Person	Topic Delivered
1.6.2020	Prof.R.Velraj, Anna University, Chennai.	PCM based thermal Storage for Solar and Building Applications.
	Dr.S.Kalaiselvam, Anna University, Chennai.	Sustainable thermal energy storage for zero energy buildings
2.6.2020	Dr.D.Jayakrishna, NIT Warangal	Characterization of PCMs and their compatibility with metals
	Dr.R.Senthil, SRMIST, Chennai.	Utilization of PCMs for solar thermal collectors
3.6.2020	Dr. V.Sajith, NIT Calicut	Application of Phase change material based Nano fluids in Thermal Power plants
	Dr. R.Parameshwaran, BITS-Pilani Hyderabad.	Nanomaterials embedded phase change materials for thermal energy storage for HVAC systems
4.6.2020	Dr.P.Thirumal, Govt.College of Engineering, Bargur	PCMs for HVAC and Medical applications.
	Dr.P.Karthik, Concordia University, Canada.	Recent advancements in building energy systems.
5.6.2020	Dr.Rajesh Baby, St.Joseph's College of Engineering and Technology, Palai, Kerala.	Thermal optimization of phase change material based heat sinks: An ANN-GA approach.

Outline of the topics covered in FDP

- PCM based thermal Storage for Solar and Building applications covering many examples of sensible and latent heat storage systems using organic, inorganic type of PCMs.
- Sustainable thermal energy storage for zero energy buildings with special emphasis on the sustainability aspects and significance of energy conservation in buildings.
- Characterization of Phase change materials and their compatibility with metals in heat exchangers with examples of corrosion in pipes, stability tests.
- Utilization of Phase change materials for solar thermal collectors in solar concentrating collectors for process heating and power generation applications.
- Application of Phase change material based Nano fluids in Thermal Power plant in condensate cooling of a thermal power plant by adding PCM for nanoparticles and used as a coolant.
- Nano-materials embedded phase change materials for thermal energy storage for HVAC systems covering the preparation, containment and characterization of nanomaterial embedded PCMs.
- Phase change materials for HVAC and Medical applications includes army personnel, new born babies protection kits, orthopedic device with PCM, solar driven car cabin with PCM etc.
- Recent advancements in building energy systems with a special emphasis on thermal energy storage systems of sensible and latent heat type. Use of machine learning, data science and Building energy management system, Data mining process etc.
- Thermal optimization of phase change material based heat sinks: An ANN-GA approach with an experimental data validation using the ANN approach, use of nntool in MATLAB.

Thermal energy storage sensible heat storage type

THERMAL ENERGY STORAGE

SENSIBLE HEAT STORAGE(SHS)

- Thermal energy is stored by raising the temperature of a solid or liquid. SHS system utilizes the heat capacity and the change in temperature of the material during the process of charging and discharging.
- The amount of stored thermal energy depends on the specific heat of the medium, the temperature change and the amount of storage material

Solar thermal cooker plant at Germany

Experimental setup - Solar Cooker based on thermal storage system for cooking during night/ early morning

(a) Parabolic Trough Collector (b) Thermal storage tank with cooking unit

Energy patterns, consumption scenario in buildings

Energy in Buildings

Growth of prosperity and energy use in buildings
Annual growth in 2017-2040, % per annum

Final energy consumption in buildings by fuel
Billion toe

1 toe = 42 GJ or 11.63 MWh

Thermal behaviour of PCMs and their attributes

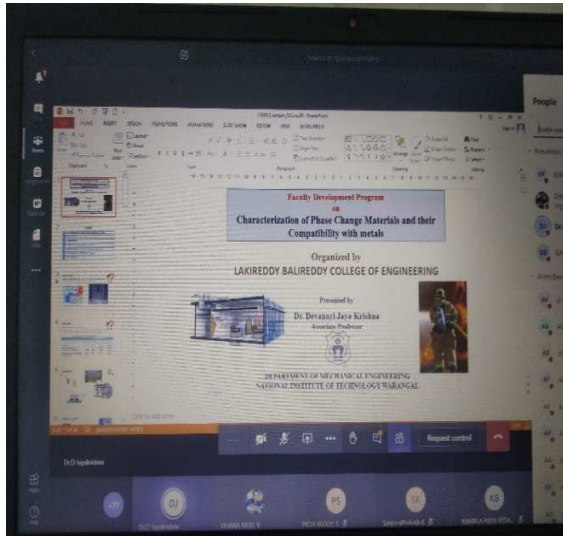
Attributes of PCM

Freezing Process

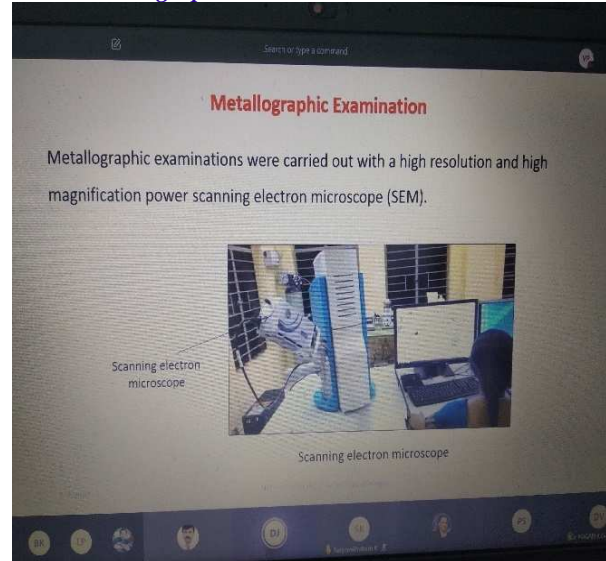
Melting Process

The principles of sensible and latent type of thermal energy storage, different PCMs and their unique characteristics, Energy in buildings, Solar thermal cooker plant, solar water heating plant using PCM embedded storage, free cooling in buildings, zero energy buildings were explained.

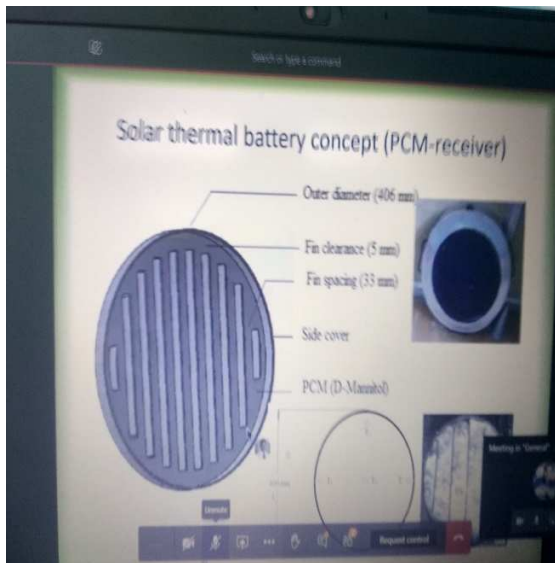
Characterization of PCMs and their compatibility with metals



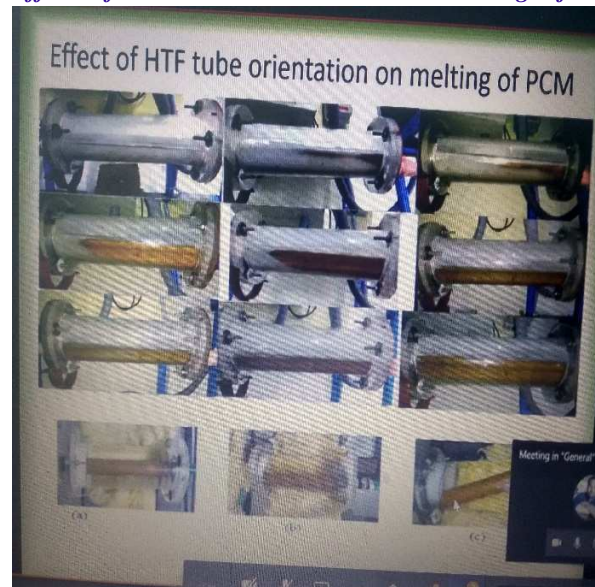
PCM Metallographic examination device



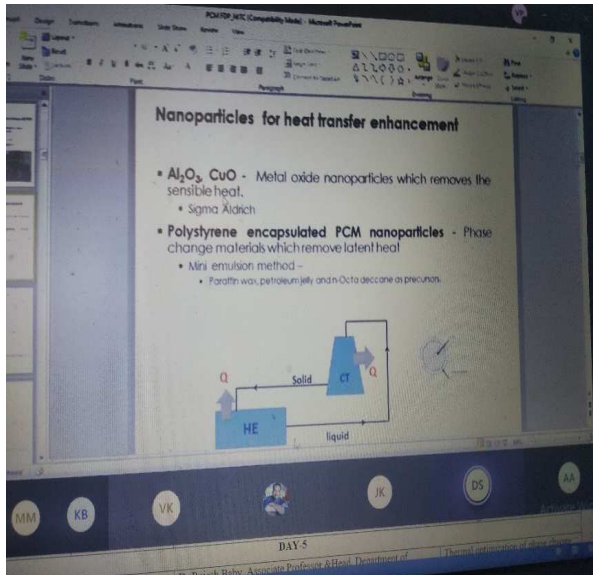
Solar thermal battery concept using PCM



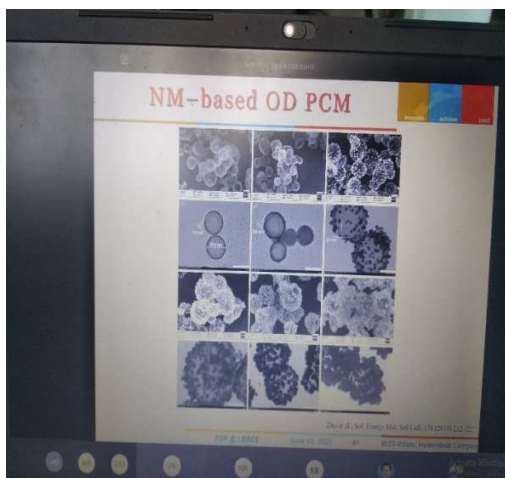
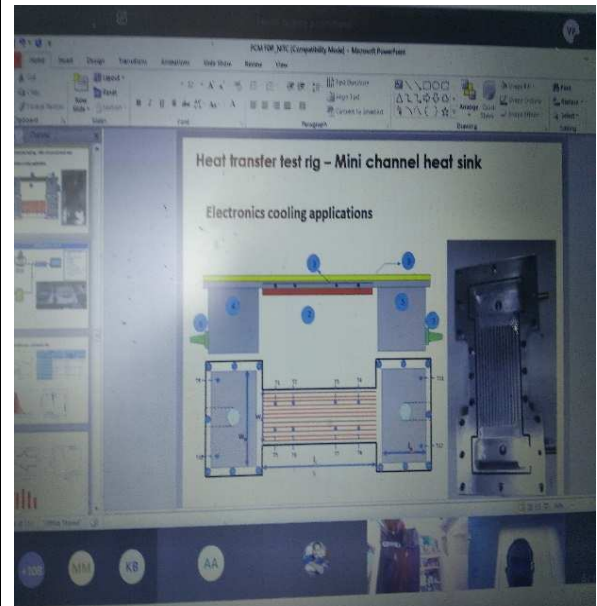
Effect of HTF tube orientation on melting of PCM



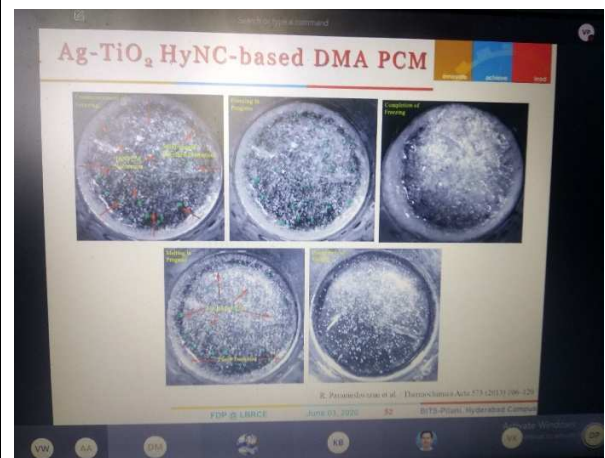
Nanoparticle based PCM for heat transfer enhancement



PCM based micro-channel heat sink

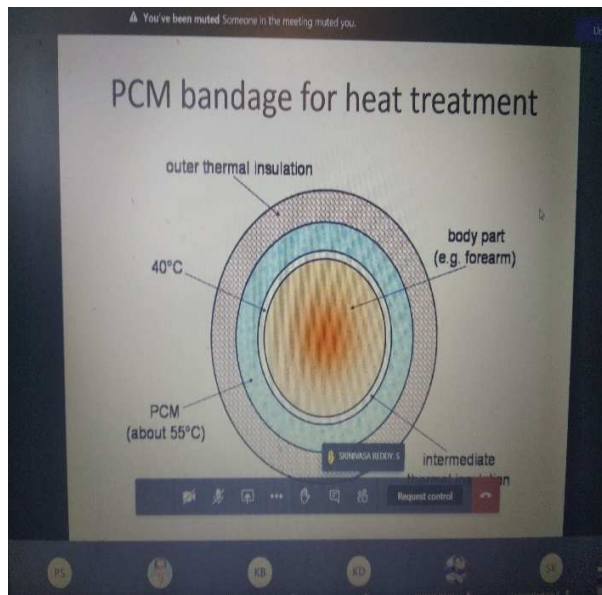


Nanomaterial based PCM characterization

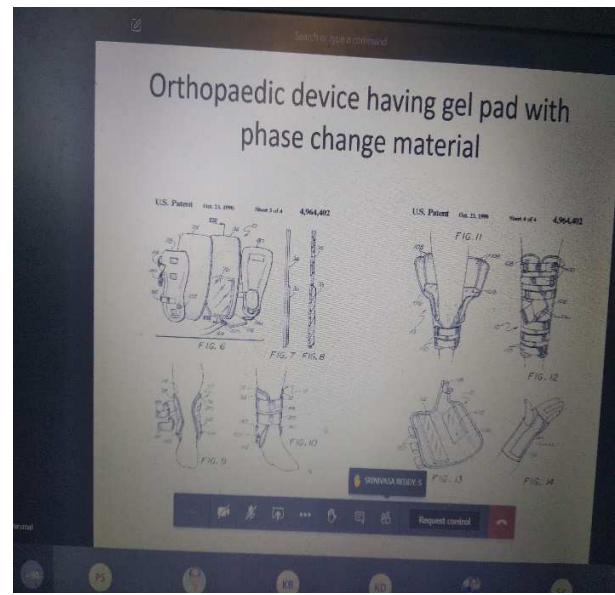


Hybrid nanocomposite based PCM characterization

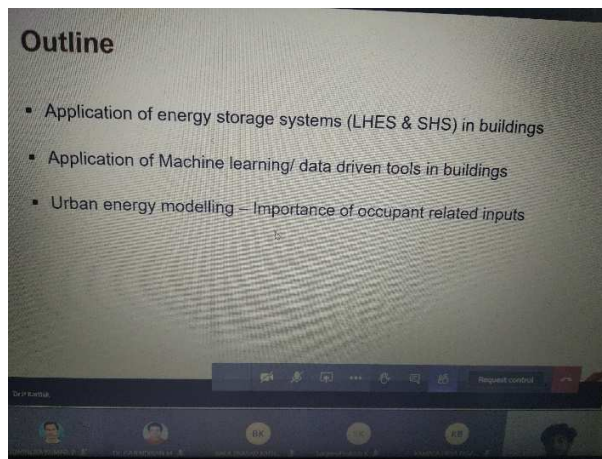
PCM based bandage for heat treatment



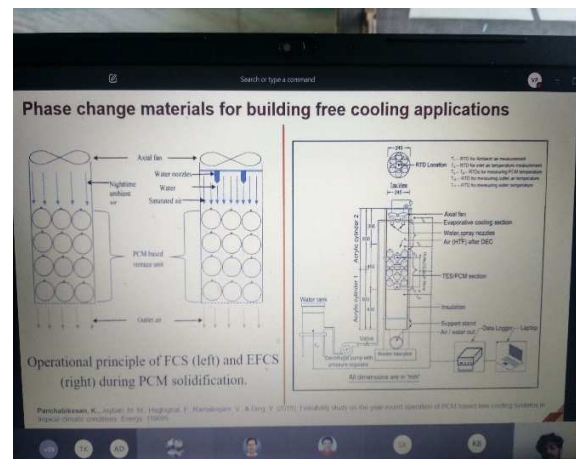
PCM for Medical application in orthopaedic device



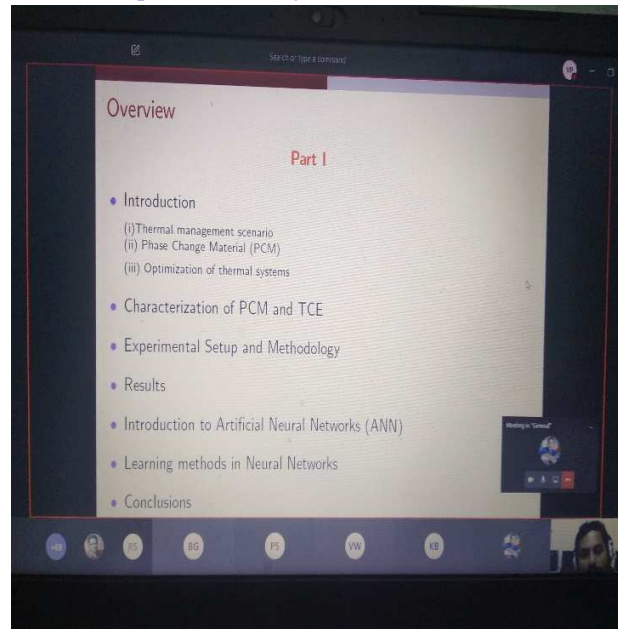
Advancements in building energy storage systems



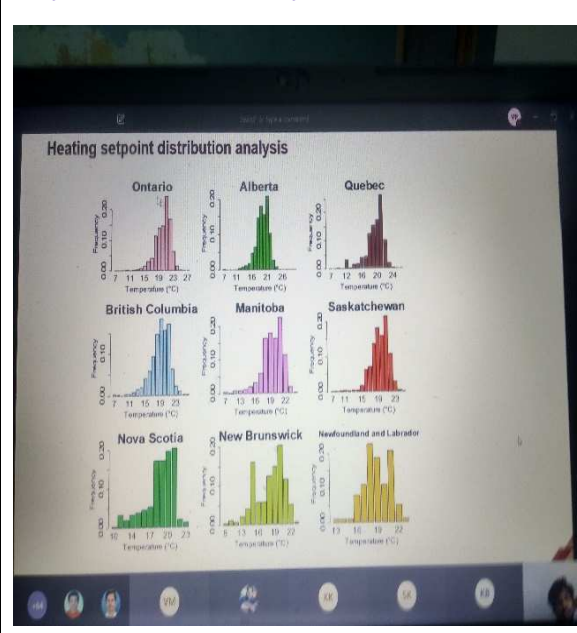
PCMs for building cooling applications



Thermal optimization of PCM based heat sinks



Artificial Neural Network for PCM based heat sinks



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L.B.Reddy Nagar, Mylavaram-521230, Krishna Dist, Andhra Pradesh, India

DEPARTMENT OF MECHNAICAL ENGINEERING

One Week Faculty Development Programme on

“Advancements in Phase change material based Thermal and Renewable energy Technologies” 1st to 5th June 2020 Timings 10.00AM to 12.30 PM.

Program Objective: To impart the knowledge of phase change material based thermal and renewable energy technologies and the recent developments happening around the globe for energy efficient thermal energy storage.

Program Outcomes:

1. Understand the importance of sensible and latent heat thermal energy storage systems in the world energy scenario and the need for efficient energy storage systems.

Advancements in Phase Change Material based Thermal and Renewable Energy Technologies

Lakireddy Bali Reddy College of Engineering- ME_Online FDP: 1-06-2020 to 5-06-2020

2. Get familiar with unique characteristics of Phase change materials, availability, and cost criterion.
3. Application of PCMs for Thermal comfort and building architecture i.e., in HVAC systems
4. Application of PCMs for renewable energy systems i.e., in solar water heaters, solar thermal power plants,
5. Application of nanomaterial based PCMs for thermal power plants and heat transfer in exchangers, heat sinks, heat pipes.
6. Awareness on the recent advancements happening in the field of thermal and renewable energy technologies across the world.
7. Application of Machine learning, Data science, Data mining process, Building energy management systems in building thermal energy storage systems.

COORDINATORS

Dr.P.VijayKumar&Dr.V.Dhanaraju

CONVENER

Dr.S.Pichi Reddy
Professor and Head

One Week online Faculty Development Program on
**ADVANCEMENTS IN PHASE CHANGE MATERIAL BASED THERMAL
AND RENEWABLE ENERGY TECHNOLOGIES**
(01st June 2020 to 05th June 2020)

**WELCOME TO
Resource Persons and Participants**

Dr. K.Appa Rao
(Principal)

Dr. S.Pichi Reddy
(Convener)

Dr. P. Vijaya Kumar
Dr. V. Dhanaraju
(Co-ordinators)

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Advancements in Phase Change Material based Thermal and Renewable Energy Technologies



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President, LBRCT

Dr. K. Appa Rao
Principal, LBRCE

CONVENER

Dr. S.Pichi Reddy
H.O.D - Mech. Dept

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Dr.V.Dhana Raju

CO-COORDINATORS

Dr.N.Sunil Naik

Mr.S.Rami Reddy

TECHNICAL ADVISOR

Dr. D.Veeraiah, HoD, CSE

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Mr. A. Dhanujaya Kumar

Mr. G. Naresh

Ms. S. Snigdha

Dear Sir/Madam,

Greetings from the Department of Mechanical Engineering.

The Department of Mechanical Engineering, Lakireddy Bali Reddy College of Engineering is organising **One Week Online Faculty Development Programme** on **"Advancements in Phase Change Material based Thermal and Renewable Energy Technologies"** from **1st to 5th June 2020** with timings from **10.00 am to 11.30 am**.

The resource persons are drawn from renowned institutions. **E-certificate will be provided for all participants who participate on all the days.**

Registration link: <https://tinurl.com/mefdp>

Registration Fee: Free

Registration Deadline: 29-05-2020

We look forward to your support and active participation in this programme and make this one week online FDP a success.

The FDP will be conducted using 'Microsoft Teams' app. The participants are requested to download Microsoft Teams in their smart phones or laptops /desktops. Login Credentials will be provided by the host.

With Regards

Convener

Dr.S.Pichi Reddy

For Further Information Contact:

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2. *Dr.V.Dhana Raju, Phone: 9848363670, E-mail: dhanaraju1984@gmail.com*

One Week online Faculty Development Program on
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(01st June 2020 to 05th June 2020)

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About the Institute & Department

The Lakireddy Bali Reddy College of Engineering (LBRCE) was established in the year 1998 by Er. Lakireddy Bali Reddy garu. The institute is established with the sole aim of providing high quality educational opportunities in the field of science, engineering, technology and management. It is approved by AICTE, affiliated to JNTUK, Kakinada and attained autonomous status in the year 2010. It attained NAAC accreditation. The institute is certified by ISO: 9001-2015. The Department of Mechanical Engineering was started in the year 1998. The Department is accredited by NBA (Tier-I). The Dept. is recognized as a Research centre by JNTUK Kakinada.

About the FDP

The present challenges for the researchers looking at the ever growing energy demand, rapid depletion of fossil fuels, pollution issues are too many. The objective of this FDP is to address the above issues and provide solutions in terms of expert deliberations by eminent speakers on the advancements in phase change material based thermal and renewable energy technologies covering all the latest research works happening in this area.

Registration and Fee Particulars:

- > There is no registration fee
- > Reg Link: <https://tinyurl.com/mefdp>

Important Dates:

- > Submission of Application : 29/05/2020
- > Confirmation : 30/05/2020
- ↓ The selected candidates will be intimated through email only.
- ↓ All the sessions are conducted online through Microsoft Teams App.
- ↓ E-certificate will be given to the participants that satisfy the criteria set by the organising committee

COMMITTEE MEMBERS

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3. Sri L.R.N.K. Prasad Reddy, Vice-Chairman

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3. Dr. K. Appa Rao, Professor & Principal
4. Dr. K. Harinadha Reddy, Prof. & Vice-Principal

Convener:

- Dr. S.Pichi Reddy, Professor & HOD, ME

Coordinators:

1. Dr. P. Vijaya Kumar, Professor, ME
2. Dr. V.DhanaRaju, Associate Professor, ME

Co-ordinators:

1. Dr. N.SunilNaik, Associate Professor, ME
2. Mr.S.Rami Reddy, Assistant Professor, ME

Resource persons:

1. Prof. R.Velraj, Anna University, Chennai
2. Dr.P.Karthik, Concordia University, Canada
3. Dr.S.Kalaiselvam, Anna University,
4. Dr.D.Jayakrishna, NIT, Warangal.
5. Dr.V.Sajith, NIT, Calicut
6. Dr.P.Thirumal, GCE, Bargur
7. Dr.Rajesh Baby, SJCE, Palai
8. Dr.R.Parameshwaran, BITS-Pilani, Hyd
9. Dr.R.Senthil, SRMIST, Chennai.

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ADVANCEMENTS IN PHASE CHANGE MATERIAL BASED THERMAL AND RENEWABLE ENERGY TECHNOLOGIES
(1-5JUNE, 2020)



Organized by

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