

# 5-day GIAN Course on Advanced Low-dimensional Nanomaterials for Green energy, optoelectronic, and Healthcare applications

(Course ID: 2412205)

**06-10 January 2025**

Department of Mechanical Engineering, NIT WARANGAL

Warangal-506004, Telangana, India.

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## Overview

Nanomaterials have grabbed significant attention due to their unique properties and potential applications in various fields, and contributing to the development of efficient and sustainable energy sources. The tuning of light absorption characteristics and electronic transport by nanomaterials like quantum dots, perovskite nanoparticles, and nanowires can be utilized to fabricate more efficient solar cell devices and LEDs. Graphene-based materials, metal oxides, and nanocomposites offer improved performance in the case of energy storage devices such as batteries and supercapacitors. The synergetic phonon mobility effects are attained through nano structural semiconducting materials offering heat recovery for thermoelectric applications. Similarly, they also enhance the sensitivity and response time of photodetectors, making them suitable for applications in communication, sensing, imaging, and laser devices. Nanoparticles can be functionalized to deliver drugs with enhanced specificity and controlled release, improving therapeutic outcomes and reducing side effects. Nanomaterial-based biosensors enable rapid and sensitive detection of biomolecules, aiding in disease diagnosis and monitoring.

This course provides a comprehensive overview of these nanomaterials that exhibit remarkable characteristics at the nanoscale, enabling them to address some of the most pressing challenges in these various sectors. Ongoing research studies on energy harvesting and electronic transportation will focus on efficient optoelectronic devices, energy storage, and conversion appliances. Additionally, the course covers synthesis and manufacturing techniques for material miniaturization and nano-device fabrications. The course uniquely presents both the physics and engineering aspects, including a brief overview of the state-of-the-art research in nanostructured materials for sustainable applications. The lectures are complemented by tutorials and different sessions that provide the participant with experiences to unlock the full potential of these materials for various applications.

## Course outcomes

At the end of the course, the participants will get insights into the following:

- Basic introduction to Nanomaterials and their characterizations
- Synthesis and processing of nanomaterials
- Nanomaterials used for energy harvesting and energy storage applications
- Nanomaterials used in the Biomedical field and other medical appliances
- Fabrication techniques for micro/nanodevices



<b>Modules</b>	<p><b>Day 1:</b></p> <ul style="list-style-type: none"><li>• The world of nanomaterials: Requirement of nanomaterials, how they differ from bulk material, what is special about nanomaterials</li><li>• Type of nanomaterials: different types of nanomaterials, properties of nanomaterials, Synthesis methods for advanced nanomaterials</li><li>• Controlling the size of nanomaterials: How to control the size and shape of nanomaterials, how size and shape can affect the properties of nanomaterials; Interactive session.</li></ul> <p><b>Day 2:</b></p> <ul style="list-style-type: none"><li>• Nanomaterials used for Green Energy application: Need of Green energy, what types of nanomaterials are used for energy harvesting</li><li>• Nanomaterials for Photo catalysis and Hydrogen Production Concept of Energy conversion, what is Photo catalysis and hydrogen production, which nanomaterials are helpful for energy harvesting</li></ul> <p><b>Day 3:</b></p> <ul style="list-style-type: none"><li>• Nanomaterials used for Optoelectronic application: How nanomaterials used for Light-emitting Diode, Photo reactor, Energy saving display application</li><li>• Light emitting behavior of nanomaterials: Understanding the light emitting behavior of nanomaterials, what are the factors that play important roles in light emission?</li></ul> <p><b>Day 4:</b></p> <ul style="list-style-type: none"><li>• The perspective of nanomaterials for Healthcare: What are the different types of nanomaterials used for biomedical applications? Concept of phototherapy using nanomaterials.</li><li>• Nanomaterials used for biomedical applications: Case study</li></ul> <p><b>Day 5</b></p> <ul style="list-style-type: none"><li>• Future scope and application of Nanomaterials What are the future applications of nanomaterials, and which nanomaterials can be helpful for future application</li></ul>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>• Executives, engineers and researchers from, physical sciences, manufacturing, service and government organizations including R&amp;D laboratories and industry.</li><li>• Students at all levels (BTech/MSc/MTech/PhD) or Faculty from academic institutions and technical institutions.</li></ul>
<b>Fees</b>	<p><b>Number of participants for the course will be limited to fifty.</b></p> <p>The participation fees for taking the course is as follows:</p> <p><b>Students: INR 1,000</b></p> <p><b>Academic Institutions (Faculty): INR 2,000</b></p> <p><b>Industry/ Research Organizations: INR 5000</b></p> <p><b>Participants from abroad: US \$500</b></p> <p><b>Details for NEFT</b></p> <p><b>Account Name : DIRECTOR RESEARCH ACCOUNT</b></p> <p><b>Account No. 62266262236</b></p> <p><b>Bank : State Bank of India</b></p> <p><b>Branch : REC Warangal (NIT Campus)</b></p> <p><b>Branch Code 20149</b></p> <p><b>IFSC : SBIN0020149</b></p> <p><b>MICR Code 506002030</b></p> <p><b>SWIFT Code :SBININBB</b></p> <p>The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr. free internet facility. The participants will be provided with accommodation on payment basis.</p>



## International Faculty



**Pankaj M. Koinkar** is a young academician and researcher who was born in Jalgaon, Maharashtra, India. After getting a doctoral degree from North Maharashtra University, he moved to the Department of Physics, University of Pune, India, to work as a Research Associate from April 2005 to Sept. 2005. Then, he went to Korea University, Seoul, South Korea for Postdoctoral study from October 2005 to September 2006. After Postdoctoral study in South Korea, he joined Centre for International Cooperation in Engineering Education (CICEE), The **University of Tokushima**, Tokushima, Japan, in March 2007. His research interests include nanostructures (2D nanomaterials, carbon related materials and oxides), conducting polymer, field emission microscopy, and engineering education. He has published more than 120 papers in peer-reviewed international journals and got awards for oral presentation at the conference. He has been working as a Reviewer for more than 100 SCI journals from Elsevier (Holland), American Society of Chemistry (US), and World Scientific Publication (Singapore).

### Indian Faculty



**Dr. Gudipadu Venkatesh** currently working as Assistant Professor in the Department of **Mechanical Engineering, National Institute of Technology Warangal**, India. He holds a Master of Technology and Ph.D in the Mechanical and Industrial Engineering Department at IIT Roorkee. He is having 10 years of experience in Teaching and Research. His research interests are application of microwaves in manufacturing processes, Nano finishing of advanced materials using Hybrid Abrasive Flow Machining and surface engineering. Two students were awarded Ph.D. and four are pursuing Ph.D. under his guidance. He guided 18 PG and 7 UG projects. He Completed one funded projects and one is ongoing. He published more than 45 research papers in reputed journals and conferences and one patent. He is editorial board member for 5 journals and delivered around 30 guest lectures.



**Dr. P. Vamsi Krishna** is currently working as Professor in the **Department of Mechanical Engineering, National Institute of Technology Warangal**, India. He is having 21 years of experience in Teaching and Research. His research interests are application of solid lubricants in machining process, application of eco-friendly nano cutting fluids in machining, vibration assisted machining, modeling and simulation of manufacturing processes and composite materials. Five students were awarded Ph.D. and five are pursuing Ph.D. under his guidance. He guided 35 PG and 19 UG projects. He completed five funded projects and one is ongoing. He published one text book, three text book chapters and edited three books. He published more than 130 research papers in reputed journals and conferences and one patent. He is editorial board member for 10 journals and delivered 35 guest lectures. He is recognized as one of the top 2% most influential scientists in 2022 Stanford university list. He is awarded with outstanding reviewer award by Tribology international, Elsevier in 2017 and best reviewer award from Transactions of Indian Institute of Metals in 2020.

Last date for registration: 31/12/2024

Registration Link:

[Click here for Registration](#)

## Course Coordinator

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**Prof. P. Vamsi Krishna**

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### How to reach NIT Warangal?

**Airport:** RGIA , HYD

(3hours journey from Warangal)

**Railway station**

Kazipet (KZJ): 3 km from NITW,  
Warangal (WL) 12 km from  
NIT, Warangal

**On Road**

(3hours journey from Hyderabad)



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MINISTRY OF  
EDUCATION

सत्यमेव जयते



# National Institute of Technology Warangal

## REGISTRATION FORM

GIAN Sponsored, One Week International Workshop on  
“Course ID: 2412205 Advanced Low-dimensional Nanomaterials for Green energy,  
optoelectronic, and Healthcare applications”  
06-10 Jan 2024

Name: Mr./Ms/Dr. \_\_\_\_\_  
(In capital letters)

Designation/Department/Organization: \_\_\_\_\_

Address for Correspondence: \_\_\_\_\_

E-mail ID: \_\_\_\_\_ Mob. No. \_\_\_\_\_

Field of Specialization: \_\_\_\_\_

Experience: \_\_\_\_\_ (in years)

Details of fees \_\_\_\_\_ Cash/DD/NEFT \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

### Bank Details:

Account Name: **DIRECTOR RESEARCH ACCOUNT**

Account No. : **62266262236**

Bank : **State Bank of India**

Branch : **REC Warangal (NIT Campus)**

Branch Code : **20149**

IFSC : **SBIN0020149**

MICR Code : **506002030**

SWIFT Code **SBININBB**

Signature of Head