Five-Days National Workshop

on

3D Printing:

State-of-Art and Future Prospects (3DP-2023)

During

15th July – 19th July, 2023

(Virtual Mode)

To be Organized by

Department of Mechanical Engineering
National Institute of Technology
Rourkela, Odisha - 769008
www.nitrkl.ac.in

ELIGIBILITY

The course is open for faculty members, research scholars, UG/ PG students, personnel from R&D sectors/ research laboratories, Industry personnel (Bureaucrats/ Technical staff members) and student/ faculty/ staff members of NIT Rourkela.

REGISTRATION DETAILS

Course Fee (Including GST)

Personnel from Industry and R&D units: Rs. 1000/-
Faculties/ Research Scholars/ Students/ Technical Staff Members: Rs. 500/-

Mode of Payment

Interested participants are required to send the scan copy of the Registration Form through e-mail. Online payment **should be made in favor of**:

Account Name: **CONTINUING EDUCATION NIT ROURKELA**
Payable Bank/ Branch: SBI, NIT Campus, Rourkela-769008
Account No.: **10138951784**
IFSC Code: **SBIN0002109**
MCIR No.: 769002007/ SWIFT Code: SBININBB137

Please Note

- ✓ Incomplete registration-form (without proof/ details of online transaction) will not be considered.
- ✓ Registration fee is non-refundable.
- ✓ E-Certificate will be provided for the candidates attending all the sessions.
- ✓ There is no registration fee for the participants from the host institute.
- ✓ Online joining link(s) through *Google-meet/ MS-Team* will be shared in due course.
- ✓ **Last Date of Online Registration: July 10, 2023**

ADDRESS FOR CORRESPONDENCE

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ABOUT NIT Rourkela and ME DEPARTMENT

The erstwhile **Regional Engineering College (REC) Rourkela** was converted to a deemed university and renamed as **National Institute of Technology, Rourkela** on 26th June, 2002. It was declared as **An Institution of National Importance** through the parliament act on 15th August 2007. The institute has made a rapid stride in earning a reputation as a place of higher learning in the field of engineering as well as technology during the last decade. NIT Rourkela provides quality education in a diverse and multi-cultural environment. The mission of the institute is to meet the needs of the industry and commerce by providing human resource with the required knowledge and skill and also by promoting, dissemination, developing and transferring technology. The institute strives hard to become an internationally acclaimed institution of higher learning that will serve as a source of knowledge and expertise for the society and be a preferred destination for undergraduate as well as post graduate students along with advanced research.

The **Mechanical Engineering Department** of NIT, Rourkela is known for research in diverse fields. The main foci of research are on mechanical vibration, robotics, CAD/CAM, precision engineering, metal forming, Machining, CFD, Industrial refrigeration and Cryogenics. The academic programme of the department reflects not only the core areas of Mechanical Engineer but also the research specialization of the faculty. The department at present has over one hundred research scholars pursuing projects on diverse fields. The faculty is organized under three divisions and six groups. All the groups are working in close co-operation while retaining individual identities. Many Research and Development projects being pursued by the faculty are sponsored by Government agencies and private industries. Some of the major sponsors are BRNS, DST, DAE, CSIR, DRDO, BARC, ISRO and private industries.

OBJECTIVES of the WORKSHOP

Recently, global manufacturing paradigm has experienced a revolutionary transition towards entering a new paradigm called *Industry 4.0*. This is due to introduction of 3D printing, also called Additive Manufacturing (AM) technology which is gradually replacing traditional manufacturing methods. AM utilizes digital 3D CAD data to fabricate a part through layer-wise stacking mechanism (often, termed as 3D printing). Apart from polymers/composites, the scope of AM is extended to fabricate metallic and ceramic components as well.

AM clutches innovation in digital processes, communications, imaging, architecture and engineering to provide digital flexibility and efficiency to manufacturing operations. Recently, India has realized the need of exploring this emerging technology in all segments including defense and public sectors, especially within the nation's small, medium and large-scale industries to keep pace with the new manufacturing paradigm (Industry 4.0). In the strategy paper, documented by the Ministry of Electronics and Information Technology (MeitY), domestic manufacturers are encouraged to set up operations by exploring available resources and collaborating with foreign companies who are presently known as the leaders of AM throughout the *Globe*. It is believed that many possibilities of AM are to be unfolded in near future. This will definitely push forward the national program ***MAKE IN INDIA***.

The Workshop on ***3D Printing: State-of Art and Future Prospects (3DP-2023)*** is focused on the global knowledge transfer and networking of professionals involved in additive manufacturing technology domain. The course includes expert lectures from industry and academic from around the world, discussion on additive layer technologies and additive metal processes, latest developments in 3D printing and metal-based additive manufacturing, application potential of additively manufactured products in defense, aerospace, automotive and biomedical sectors.

Academicians from premier institutions like IITs, NITs, State/ Centrally Funded Universities, foreign universities, experts from Industries as well as R&D Organizations having expertise and experience in relevant domain knowledge are to be invited as *Resource Person* for this workshop.

PROPOSED COURSE CONTENT

The workshop will cover but is not limited to the following topics:

Introduction to Additive Manufacturing (AM)
General overview; Introduction to reverse engineering; Traditional manufacturing *versus* AM; Computer aided design (CAD) and manufacturing (CAM) and AM; Different AM processes and relevant process physics, AM process chain; Application level: Direct processes – Rapid Prototyping, Rapid Tooling; Rapid Manufacturing; Indirect Processes - Indirect Prototyping, Indirect Tooling, Indirect Manufacturing; Industry 4.0

Materials Science for AM/ Metallurgical Aspects
Discussion on different materials used; Use of multiple materials, multifunctional and graded materials in AM; Role of solidification rate; Evolution of non-equilibrium structure; Structure-property relationship; Grain structure and microstructure, recrystallization, residual stress

AM Technologies: Process Physics and Parametric Appraisal
Powder-based AM processes involving sintering and melting (selective laser sintering, and electron beam melting); Printing processes - droplet based 3D printing; Solid-based AM processes - extrusion based fused deposition modeling object; Liquid-based AM process-Stereolithography; Micro- and nano-additive manufacturing, Heat interaction phenomena

Mathematical Models for AM
Transport phenomena models: temperature, fluid flow and composition, buoyancy driven tension driven free surface flow pool); Case studies: Numerical Modeling of AM process, Powder bed melting based process, Droplet based printing process, Residual stress, part fabrication time, cost, optimal orientation and optimal Defect in AM and role of transport Simulations (choice of parameter, model validation, etc.), Free wares used for AM

Process Selection, Planning and Control for AM
Selection of AM technologies using decision methods; AM process planning; post processing; defect monitoring and control; research gap and future prospect