Report On Recent Developments In Manufacturing Technology held On 16.11.2021-20.11.2021

Date of Event	16.11.2021-20.11.2021
Student Activity	**FDP on RDMT**
Conducted by	School of Engineering &IT
No. Of Participant	40

A National Level Five Days Faculty Development Program-RECENT DEVELOPMENTS IN MANUFACTURING TECHNOLOGY (RDMT)-2021 was organized by the Department of Engineering, School of Engineering &IT from 16-20th NOV.2021. The aim of conduction FDP was to highlight the recent research areas in manufacturing and material processing. Different aspects of advanced materials, composites materials, thin layer coatings, CAD-CAM, robotics in manufacturing, etc. fields were covered during the sessions. The importance of IoT and machine learning was highlighted in the inaugural session by chief guest Dr. I. Chattoraj, Director NML Jamshedpur. Advanced Composite material – a journey from science to technological development was an interesting and informative subject matter and was discussed in the second session of the first day by Dr. Subhash Singh, Assistance Professor, NIT Jamshedpur. The novel technology of joining two dissimilar metals such as steel and aluminum by friction stir welding technology was discussed by Dr. Raju Pd. Mahto during the third session of the first day in the FDP. Machining challenges during machining of hardened steel by conventional machining was delivered by Dr. Sudhanshu r. Das during day 2 session 1 of the FDP similarly many more sessions were delivered by eminent speakers around the country on topics such as Micromachining, Finite Element analysis, mathematical Modelling of Manufacturing Process, Smart Material and future scope during the different sessions of FDP.

Inaugural Function On November 16, 2021, the FDP began with tremendous zeal. Dr.Indranil Chattoraj, Director-NML, Jamshedpur, was the Chief Guest and the speaker of the first session of the Faculty Development Program. All the participants joined the same through Google Meet. We inaugural with lightning candles followed by Saraswati Vandana. Dr. Anupam Kumari was Session Chair, she welcomed the Chief Guest with an introductory speech of Dr. Chattoraj, who had shared his vast experience and knowledge in the field of Manufacturing Industries. He highlighted the vital role of the Internet of Things (IoT), Artificial Intelligence, and Machine learning in research and Industrial applications. Mr. Kuldip kumar sahu, coordinator, RDMT-2021 had summarized the schedule of five days different sessions. Prof. Ashwini Kumar, convener, RDMT-2021 concluded the first session with a vote of thanks.

Day 1 Session 2: Dr. Subash Singh, Assistant Professor Department of Production and Industrial Engineering, NIT Jamshedpur was the resource person. His topic was Advanced Composite Materials. Advanced composite materials (ACMs) are generally characterized or determined by unusually high strength fibers with unusually high stiffness, or modulus of elasticity characteristics, compared to other materials, while bound together by weaker matrices. These are termed advanced composite materials (ACM) in comparison to the composite materials commonly in use such as reinforced concrete, or even concrete itself. The high-strength fibers are also low density while occupying a large fraction of the volume. Dr. Chandraprabha Sahu was the session chair.

Day 1 Session 3: Dr. Raju PrasadMahto, Assistant Professor Department of Mechanical Engineering, SVNIT SURAT was the resource person. His topic was Introduction to Material Processing. Materials processing involves a complex series of chemical, thermal, and physical processes that prepare a starting material, create a shape, retain that shape, and refine the structure and shape. The goal of materials processing is to develop the structural features (e.g., crystal structure, microstructure, size, and shape) needed for the product to perform well in its intended application. Materials processing is central to the field of materials science and engineering, and is a vital step in manufacturing. The conversion of the starting material to the final product occurs in three steps: preparation of the starting material, processing operation, and post-processing operation(s). The processing operations can be divided into five categories based on the state of matter most important to the process: melt, solid, powder, dispersion or solution, and vapor. Metals, ceramics, and polymers are formed by operations in each of the categories so that common scientific and engineering principles can be understood and applied to various types of materials.

Session1-Day2: Dr. Sudhanshu Ranjan Das, Associate Professor Department of Mechanical Engineering, VSSUT BURLA ODISHA was the resource person. His topic was Machining of Hardened steel and its challenges. The researchers have worked on many facets of machining hardened steel using different tool materials and came up with their recommendations. Researchers have tried to investigate the effects of cutting parameters, tool materials, different coatings, and tool geometry on different machinability aspects like the tool life, surface roughness, cutting forces, chip morphology, residual stresses, and the tool-chip interface temperature under dry and/or semi-dry and/or flood cooling environment during machining of 12 SCHOOL OF ENGINEERING AND IT ARKA JAIN UNIVERSITY, JHARKHAND RDMT- 2021 hardened steels while many of them have ventured to characterize the wear phenomenon. A good amount of research has been performed on an analytical and/or numerical and/or empirical modeling of the cutting forces, tool-chip interface temperature, and tool wear under orthogonal/oblique cutting conditions during machining of hardened steels. This paper presents a comprehensive literature review on machining of hardened steels using coated tools, studies related to hard turning, different cooling methods, and attempts made so far to model machining performance(s) so as to give proper attention to the various researcher works.

Session:2-Day2: Dr. Amitesh Kumar, Associate Professor Department of Foundry Engineering NIFFT RANCHI, was the resource person. His topic was Metal Matrix Composite. A metal matrix composite (MMC) is a composite material with at least two constituent parts, one being a metal necessarily, the other material may be a different metal or another material, such as a ceramic or organic compound. When at least three materials are present, it is called a hybrid composite. There is some overlap between MMCs and cermets, with the latter typically consisting of less than 20% metal by volume. MMCs are made by dispersing a reinforcing material into a metal matrix. The reinforcement surface can be coated to prevent a chemical reaction with the matrix. For example, carbon fibers are commonly used in the aluminum matrix to synthesize composites showing low density and high strength. However, carbon reacts with aluminum to generate a brittle and watersoluble compound Al4C3 on the surface of the fiber. To prevent this reaction, the carbon fibers are coated with nickel or titanium boride.

Session:3- Day2: Dr.S.Karthikeyen, Professor, Department of Mechanical Engineering, Arunei Engineering College Tamil Nadu, was the resource person. His topic was Developing Mathematical Models for Manufacturing Processes. The development of computational models for a manufacturing process relies on the mathematical expression of the governing mechanism. It helps to design relevant experiments and drives to find the data to be obtained. Mutual understanding between analytical/numerical and experimental results leads to a better insight into the basic manufacturing processes that impact the improvement of existing processes and direct the development of the new process. However, this course is completely different from the statistical or data-driven modeling approach. This course emphasized the understanding of the most general to advanced manufacturing processes based on scientific principles. The complex mechanism is presented in a simplified way to understand the subject at the elementary level. The broad impact is that the students will be able to develop a physics-based computational model of the manufacturing process using a standard commercial package (However, this course does not intend to cover the learning of the commercial software).

Session1:-Day3: Dr.Tushar Banerjee, Asst. Professor Department of Mechanical Engineering, NIT JAMSHEDPUR, was the resource person. His topic was Coating of cutting tools

Session 2:-Day3: Dr.Binod Kumar Choudhary, Asst. Professor Department of Engineering, AJU JAMSHEDPUR, was the resource person. His topic was Industrial Robotics:Opportunities for Manufacturers of End Effectors. An industrial robot is a robot system used for manufacturing. Industrial robots are automated, programmable, and capable of movement on three or more axes. Typical applications of robots include welding, painting, assembly, disassembly, pick and place for printed circuit boards, packaging and labeling, palletizing, product inspection, and testing; all accomplished with high endurance, speed, and precision. They can assist in material handling.

Session1:-Day 4: Dr.Sushanta Kumar Sahu, Asst. Professor Department of Mechanical Engineering, NIST BERHAMPUR, was the resource person. His topic was Introduction to Micro-machining. Micromachining is the process of machining very small parts with tools smaller than 0.015 inches in diameter and tolerances of just a few tenths. Micromachining can create very small and intricate parts that are required for certain applications, particularly in the semiconductor and medical industry. It takes machinery with both sufficient spindle speed and durable cutting tools to produce the repeatability and strength to run at high speeds. Micromachining tools may be as small as 0.001 inches in diameter (1/3 diameter of a human hair) to achieve the precision and detail needed.

Session2:-Day4: Dr. K. Murugan, Asst. Professor Department of Mechanical Engineering, Annamalai University Chennai, was the resource person. His topic was Advancement in Finite Element Analysis. The Finite Element Analysis (FEA) is the simulation of any given physical phenomenon using the numerical technique called the Finite Element Method (FEM). Engineers use FEA software to reduce the number of physical prototypes and experiments and optimize components in their design phase to develop better products, faster while saving on expenses. It is necessary to use mathematics to comprehensively understand and quantify any physical phenomena such as structural or fluid behavior, thermal transport, wave propagation, the growth of biological cells, etc. Most of these processes are described using Partial Differential Equations (PDEs). However, for a computer to solve these PDEs, numerical techniques have been developed over the last few decades and one of the prominent ones, today, is the Finite Element Analysis.

Session 3:-Day4: Mr.Kuldip Kumar Sahu, Asst. Professor Department of Engineering, Arka Jain University, was the resource person. His topic was FSP as Fabrication techniques for surface composites. The addition of reinforcement into the surface instead of bulk improves mechanical properties and boosts the surface properties of the composite. Friction stir processing (FSP) is a solid-state processing route for the fabrication of surface composite. Compared to the conventional liquid state processing route, the FSP is a compatible and energy-efficient process for fabricating surface composites. The FSP is a variant of the friction stir welding (FSW) process, carried out at a lower temperature than the base metal's melting temperature. The surface composite preparation through FSP imparts minimal thermal effect on the processed material. Aluminum surface composites by FSP exhibit improved surface properties of the Al-base alloy. Our research work is on the preparation and characterization of Al-metal matrix surface composites through friction stir processing. The correlation between the process parameters and surface properties enhancement is the primary objective of this research.

Session1:-Day5: Dr. Ashutosh Pattanaik, Asst. Professor Department of Mechanical Engineering, Jain University Bengaluru, was the resource person. His topic was Smart Materials: A brief introduction and its future scope. Smart materials, also called intelligent or responsive materials, are designed materials that have one or more properties that can be significantly changed in a controlled fashion by external stimuli, such as stress, moisture,

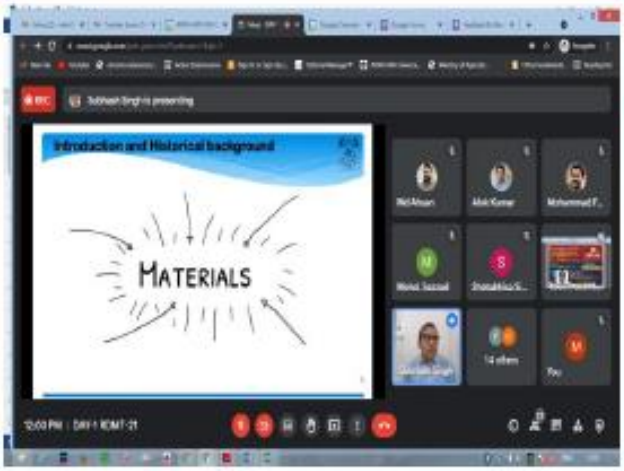
electric or magnetic fields, light, temperature, pH, or chemical compounds. Smart materials are the basis of many applications, including sensors and actuators, or artificial muscles, particularly electroactive polymers (EAPs). Terms used to describe smart materials include shape memory material (SMM) and shape memory technology (SMT).

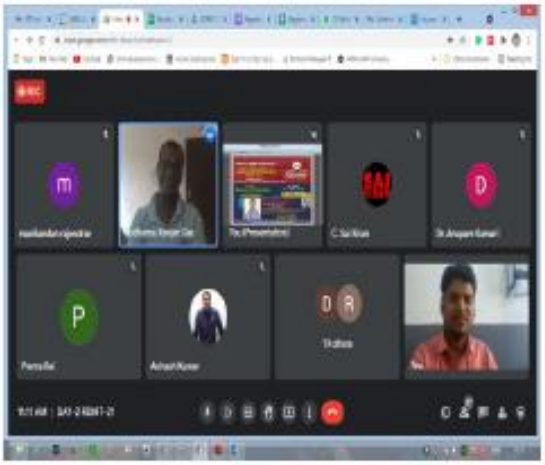
Session2:-Day5: Dr.P.C.Jena, Associate Professor Department of Mechanical Engineering, VSSUT BURLA ODISHA, was the resource person. His topic was Composite: Modelling, fabrication, testing, and analysis. The main highlight was to determine experimentally the flexural behavior of composite sandwich beams and compare the results with predictions of theoretical models. Sandwich beams were fabricated by bonding unidirectional carbon/epoxy face sheets (laminates) to aluminum honeycomb cores with an adhesive film. All constituent materials (composite laminates, adhesive, and core) were characterized 18 SCHOOL OF ENGINEERING AND IT ARKA JAIN UNIVERSITY, JHARKHAND RDMT- 2021 independently. Special techniques were developed to prevent premature failures under the loading pins and to ensure failure in the test section. Sandwich beams were tested under four-point and three-point bending. Strains to failure in the face sheets were recorded with strain gauges, and beam deflections and strains in the honeycomb core were recorded by using moire techniques. The beam face sheets exhibited a softening nonlinearity on the compression side and a stiffening non-linearity on the tension side. Experimental results were in good agreement with predictions from simple models which assume the face sheets to behave like membranes, neglecting the contribution of the honeycomb core, and accounting for the non-linear behavior of the face sheets

Session3:-Day5: Valedictory Session Dr.Amaresh Kumar, Academic Dean&Professor Department of Mechanical Engineering, NIT JAMSHEDPUR, was the Guest of Honour. He graced the Valedictory ceremony. Mr.Mukesh Kumar Sharma, Coordinator RDMT-2021 expressed sincere gratitude towards University Managements, Invited speakers, participants from different states, and the members of the Organising Committee. Finally, the FDP was concluded with National Anthem.

Poster of the Event

Events Glimpse





Participants Feedback

Feedback forms were made available for each session and final feedback along with the final quize was organized. The feedback form consisted of feedback about the session, the rating of the session out of five points, five-point was assigned for the excellent session and point one was assigned to just a good session.

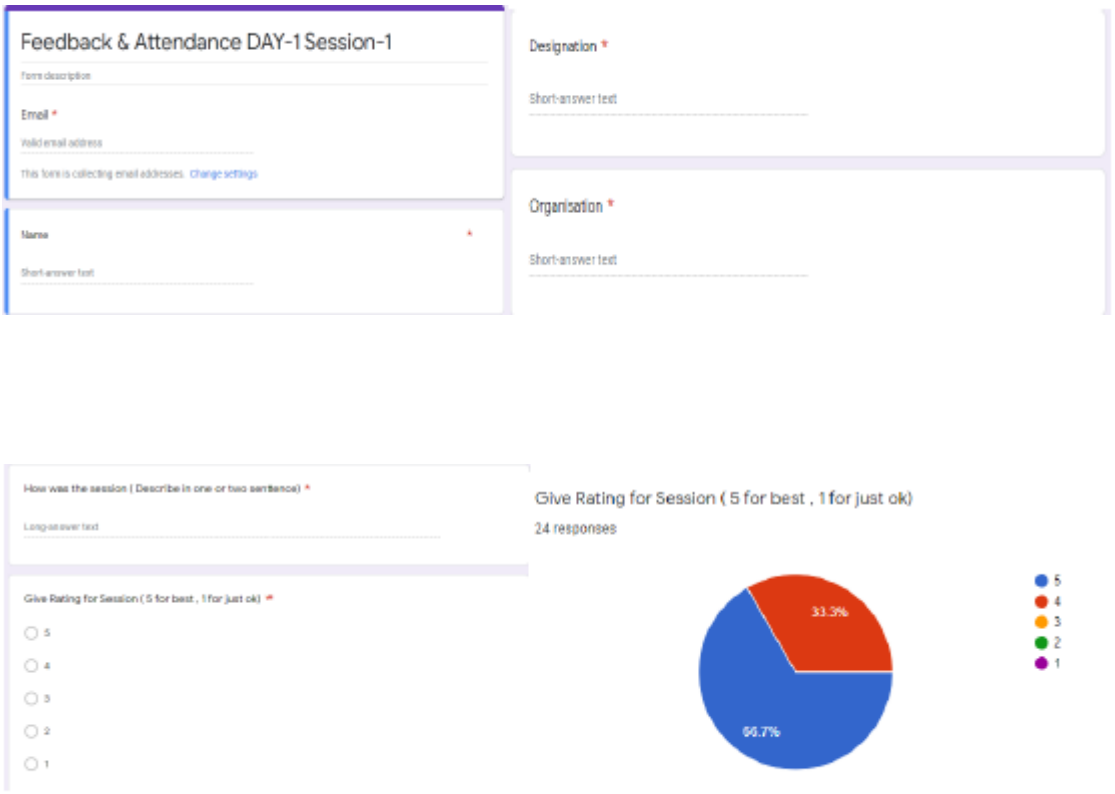


Figure 16: Sample Feedback form and feedback rating of one session.

Final Quiz and Feedback :

Link for the final quiz and Feedback is given below.
https://docs.google.com/spreadsheets/d/1W9gj8-QjYY6Wze2Xj7nBTguPy5_rR8PDxs7-

C4z08Yk/edit?resourcekey#gid=1927985038

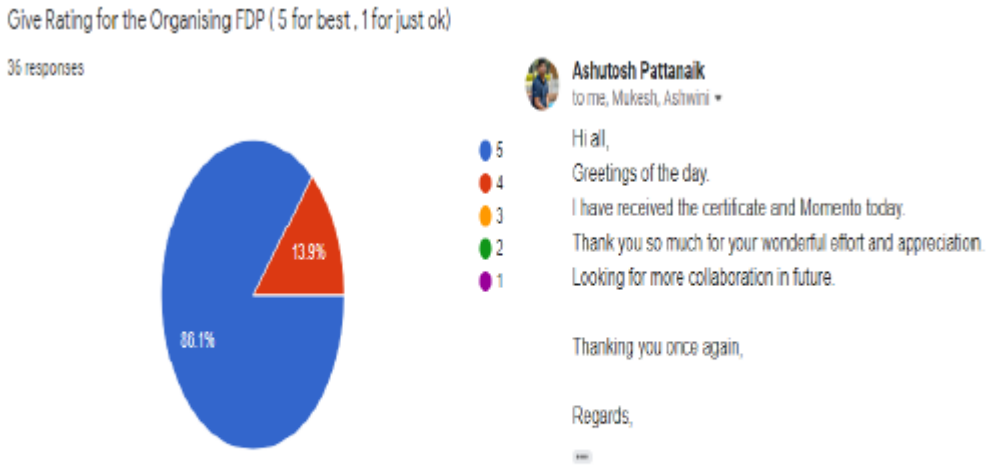


Figure 17: Overall feedback rating of the FDP