Report on 3-day workshop on CNC Laser Cutting and 3-D printing

Three day workshop on CNC Laser Cutting and 3-D printing was organized by the Department of Mechanical Engineering in association with ISTE student chapter of ATMECE. The participants were 5th semester and 3rd semester students of mechanical Engineering department. The workshop was conducted from 12th Dec to 14th Dec 20024.

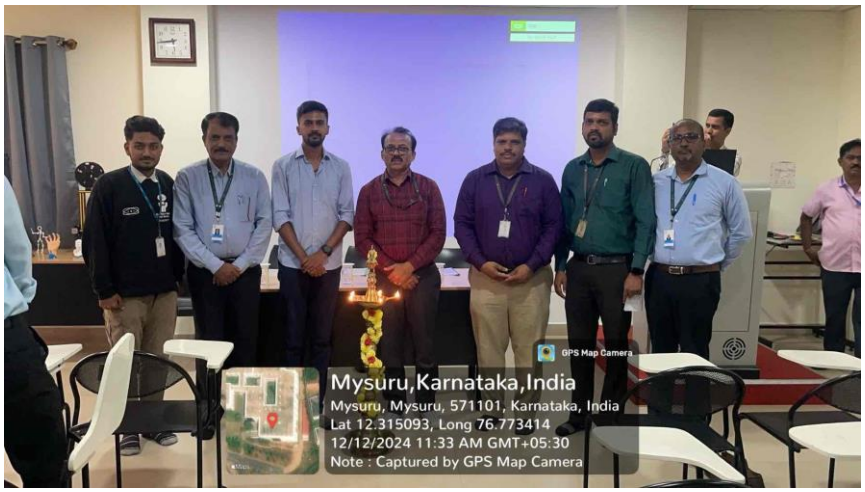
The Resource persons were Dr. Mohanakumara K C, Asst. prof. Department of Mechanical Engineering, Mr. Renuka Prasad G P, Founder & CEO, Dhatri Solutions, Mysuru, and Mrs. Bharathi, Manager (Technical) CIPET, Mysuru.

Objectives of the Workshop were

- Gain hands-on experience with laser cutting and 3D printing equipment.
- Learn to design and prepare models for both processes.
- Understand safety protocols and best practices.
- Apply these skills to create functional and aesthetic projects.

Day-1, Inauguration

Inauguration of the workshop was conducted on 12th dec 2024 at ME-seminar hall. The chief guest of the function was Mr. Renuka Prasad G P, Founder & CEO, Dhatri Solutions, Mysuru, presided by Dr. Basavaraj L, honorable Principal ATMECE. Dr. Chethan HoD Mech dept. welcome all and Dr. Mohanakumara K C briefed about the objectives of the workshop. In his inaugural address Dr. Basavaraj L stressed upon the importance of skill development and advised all participants to make use of the opportunity.

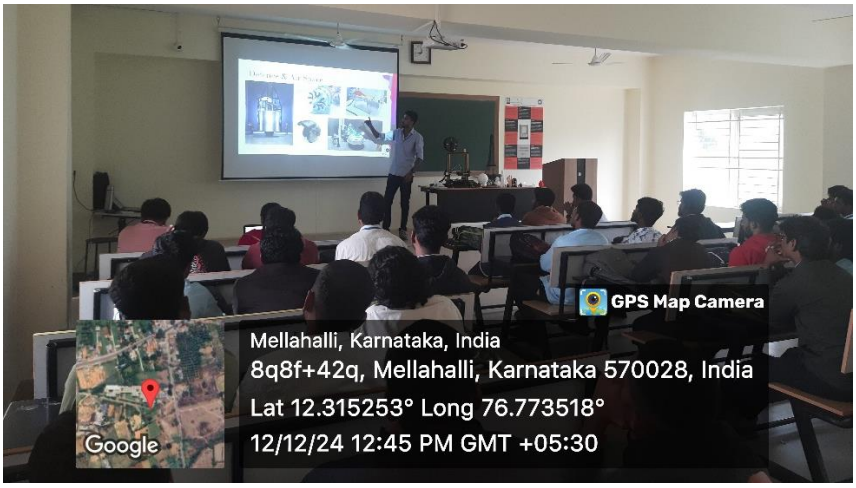


Day-1, Session-1 Technical session on 3D printing by Mr. Renuka Prasad G P

About 3D Printing

3D printing is an additive manufacturing process that builds objects layer by layer using materials such as plastics, resins, or metals. It allows for the creation of complex geometries that are often impossible with traditional manufacturing.

Key Features:
Versatility: Ideal for rapid prototyping and custom parts.
Material Options: Includes PLA, ABS, nylon, resin, and other thermo plastics.
Applications: Engineering prototypes, biomedical models, custom tools, and artistic creations.



Day-1, Session-2, Simulation of 3D Printing by Mr. Renuka Prasad G P

About Simulation of 3D Printing

Key Components of 3D Printing Simulation

1. **CAD Models**: The 3D model (usually designed in software like Blender, SolidWorks, or Fusion 360) serves as the base for simulation.
2. **Slicing Software**: Programs like Cura, PrusaSlicer, or Simplify3D generate the G-code for the printer. Advanced slicing tools may offer built-in simulation options.
3. **Simulation Software**: Dedicated simulation tools, such as ANSYS Additive Suite, Autodesk Netfabb, or Simufact Additive, provide detailed process analysis.
4. **Physics-Based Modeling**:
    - **Material Behavior**: Simulate thermal expansion, stress, and distortion.
    - **Layer Deposition**: Visualize each layer's build and potential adhesion issues.
    - **Environmental Factors**: Account for cooling, heating, and other ambient conditions.

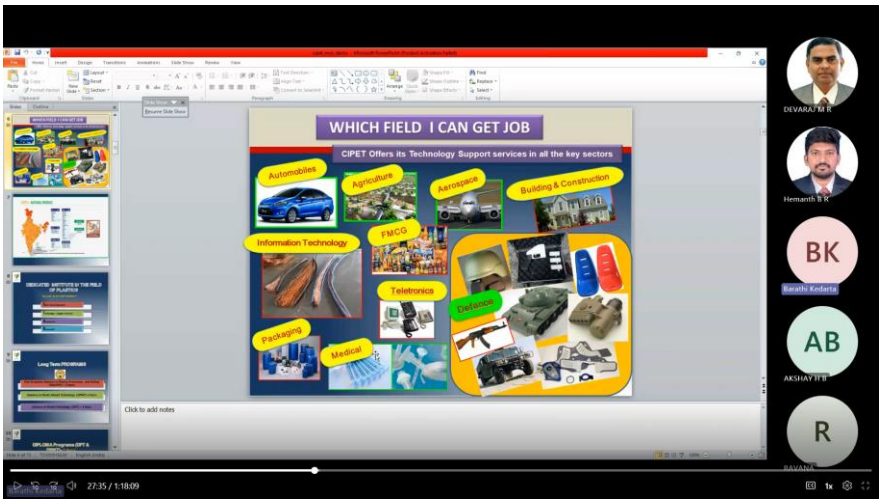
Day-2, Session-1, Hands on session in CIM-lab

How It Works

1. **Import the Model**:
    - Start with a CAD file (e.g., .STL, .OBJ) and load it into slicing or simulation software.
2. **Set Simulation Parameters**:
    - Choose materials (e.g., PLA, ABS, metal powder) and printer type (FDM, SLA, SLS).
    - Define build settings like layer height, print speed, and infill percentage.

3. **Run the Simulation**:
    - Observe layer-by-layer construction.
    - Identify errors like overhang failures, thermal stress, or voids.
4. **Analyze Results**:
    - Visualize thermal distributions, deformation, and residual stresses.
    - Evaluate structural strength and post-print quality.
5. **Optimize Settings**:
    - Adjust parameters (e.g., support structures, cooling rates) and re-run simulations.
    - Iterate until achieving desired performance.

Day-2, Session-2, Online Technical session on 3D printing and Plastic technology



Plastic Materials Used in 3D Printing

Plastics in 3D printing can be categorized based on their properties and printing methods:

1. Thermoplastics (Most Common)

- **FDM (Fused Deposition Modeling)** is primarily used.
- Examples:
    - **PLA (Polylactic Acid)**:
        - Biodegradable and easy to print.
        - Suitable for prototyping and educational models.
    - **ABS (Acrylonitrile Butadiene Styrene)**:
        - Durable and impact-resistant.
        - Common in automotive and LEGO-like applications.
    - **PETG (Polyethylene Terephthalate Glycol)**:
        - Food-safe and strong.
        - Ideal for mechanical parts.
    - **Nylon (Polyamide)**:
        - Flexible and wear-resistant.
        - Suitable for gears and hinges.

Day-2, Session-3 Technical session on CNC laser cutting

Laser Cutting

Laser cutting is a subtractive manufacturing process that uses a high-powered laser beam to cut, engrave, or etch materials with precision. It is widely used in engineering applications to create intricate designs and functional parts.

Key Features:

- **High Precision:** Capable of cutting complex shapes with accuracy.
- **Material Compatibility:** Works with wood, acrylic, metals, cardboard, and more.
- **Applications:** Custom enclosures, mechanical parts, artistic designs, and prototypes.

Day-3, Session-1 Hands on session on CNC laser cutting

How It Works:

1. Design in CAD software.
2. Prepare the design for the laser cutter using CAM software.
3. Set material parameters like power and speed on the laser cutter.
4. Execute the cut and inspect the final output.

Day-3, Session-2, Valedictory and feedback

Finally, Valedictory function was organized. Dr. Srinivasa K, Professor and Dean-student affair, presided over the function. Totally 38 students from 3rd and 5th semester of mechanical engineering department have participated in the workshop. Professor Devaraj M R presented the brief report of the all activities conducted 3-day workshop. Few participants gave shared their experience and thanked the organizer for the opportunity. Feedback was taken from all the participants about the workshop. At the end, HOD thanked all resource persons and participants for kind co-operation in conducting the workshop successfully.