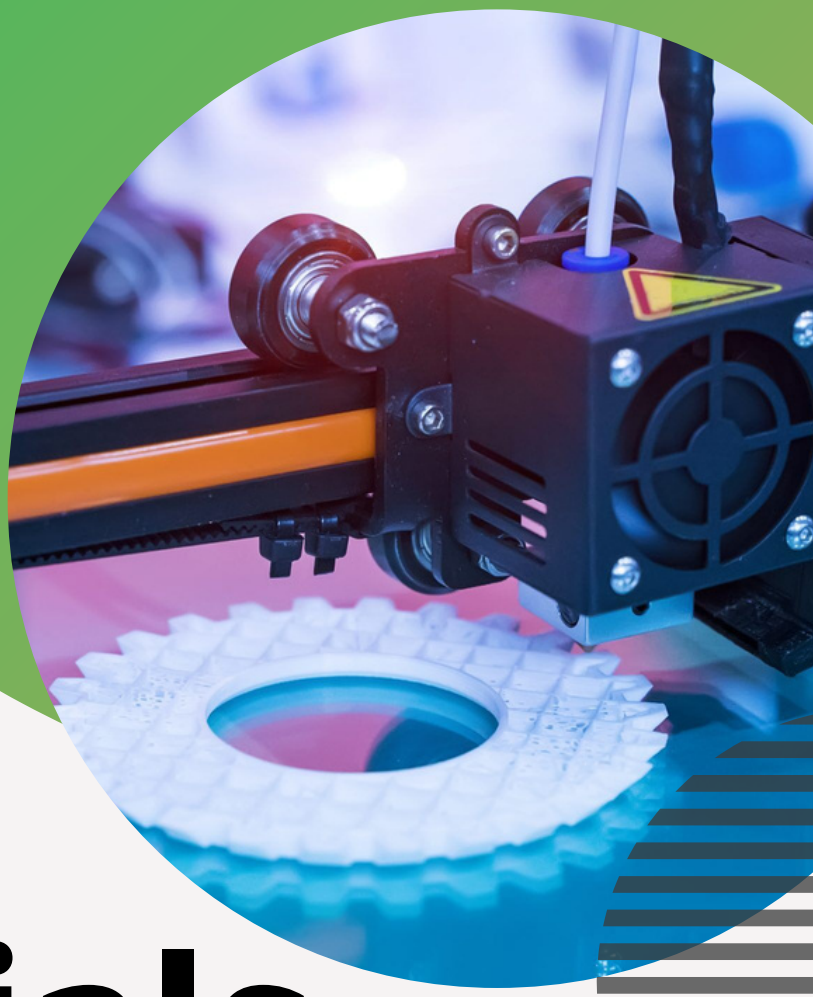
POLYMERUPDATE® ACADEMY
EDUCATIONEM RESPONSUM EST

Gramaudyogik Shikshan Mandal's MIT A Group of Academic & Research Institutions AURANGABAD



Materials & Processes in Polymer 3D Printing

PREPARED & CONDUCTED BY

DR. SAURABH TAYDE

ADDRESS:
1001/1002, LODHA SUPREMUS, OPP 'THE WORLD TOWERS' SENAPATI BAPAT MARG, LOWER PAREL (WEST), MUMBAI - 400013, TEL: (91-22) 61772000 (25 LINES)

Table of

INDEX

Table of

INDEX

POLYMERUPDATE® ACADEMY
EDUCATIONEM RESPONSUM EST

Gramaudyogik Shikshan Mandal's MIT A Group of Academic & Research Institutions AURANGABAD

Course

DATE & TIMING

DAY:

TUESDAY,

March 12th, 2024

COURSE TIMING:

2:00 PM TO 6:00 PM (IST)

PAY ONLINE:

https://www.polymerupdate.com/payment/makepayment

Project

Summary

Polymer 3D printing is a revolutionary manufacturing process that utilizes various polymers to create intricate three-dimensional objects. The process involves layer-by-layer deposition or curing of these materials, resulting in precise and customizable end products. Understanding the materials and processes involved in this technique is crucial for optimizing outcomes and exploring its vast potential.

A. Materials:
Different types of polymers, such as thermoplastics, photopolymers, and composite materials, are used in polymer 3D printing. Each material possesses distinct properties like strength, flexibility, heat resistance, and biocompatibility, enabling a wide range of applications across industries. Selecting the right material is pivotal as it directly impacts the final product's characteristics and performance.

B. Processes:
Polymer 3D printing encompasses various techniques, including Fused Deposition Modeling (FDM), Stereolithography (SLA), Selective Laser Sintering (SLS), and more. Each method employs specific mechanisms to transform raw materials into intricate structures. Understanding these processes aids in choosing the most suitable technique based on factors like resolution, speed, material compatibility, and cost-effectiveness.

C. Considerations:
Several factors influence the choice of materials and processes, including mechanical properties, chemical resistance, printability, and post-processing requirements. Balancing these considerations ensures the creation of functional and durable objects meeting specific design requirements.

Project

Summary

D. Applications:

The applications of polymer 3D printing span diverse industries, including aerospace, healthcare, automotive, and consumer goods. It's used for rapid prototyping, custom tooling, creating intricate medical implants, producing lightweight aerospace components, and much more, showcasing its versatility and potential.

E. Challenges and Future Trends:

Despite its remarkable capabilities, challenges persist, such as limited material choices, surface finish issues, and production speed. Ongoing research focuses on overcoming these limitations, exploring new materials, enhancing printing techniques, and unlocking the technology's full potential for larger-scale manufacturing.

In essence, materials and processes in polymer 3D printing form the foundation of a transformative manufacturing approach, offering unparalleled design freedom, customization, and efficiency across a myriad of industries, with continual advancements propelling its evolution and integration into mainstream production.

Course

Contents

Lecture 1: Introduction to Polymer 3D Printing

Objective: Provide an overview of 3D printing, its evolution, and the significance of polymers in this manufacturing technique.

Outline:

1.1 Introduction to Additive Manufacturing

- Definition and basic principles
- Evolution and growth in industries

1.2 Foundations of Polymer 3D Printing

- Explanation of 3D printing processes
- Comparison with traditional manufacturing methods

1.3 Role of Polymers in Additive Manufacturing

- Types of polymers used in 3D printing
- Unique properties and advantages

Course

Contents

Lecture 2: Materials Used in Polymer 3D Printing

Objective: Explore various materials utilized in polymer 3D printing, their properties, and applications.

Outline:

2.1 Types of Polymer Materials

- Overview of thermoplastics, photopolymers, composites, etc.
- Properties and characteristics of each material type

2.2 Selection Criteria for 3D Printing Materials

- Considerations for material choice (mechanical, thermal, chemical properties)
- Material compatibility with different printing processes

Course

Contents

Lecture 3: Processes in Polymer 3D Printing

Objective: Dive into the various printing processes used in polymer 3D printing and their functionalities.

Outline:

3.1 Overview of 3D Printing Techniques

- Detailed explanation of FDM, SLA, SLS, and other methods
- How each technique works and its strengths/limitations

3.2 Factors Influencing Process Selection

- Considerations for choosing the right printing technique
- Resolution, speed, material compatibility, & cost considerations

3.3 Post-Processing Techniques

- Surface Finishing
- Support Removal
- Part Cleaning

Course

Contents

Lecture 4: Challenges, Future Trends, and Applications

Objective: Discuss challenges, future prospects, and the wide-ranging applications of polymer 3D printing.

Outline:

4.1 Challenges in Polymer 3D Printing

- Current limitations and obstacles faced by the technology
- Strategies for overcoming challenges

4.2 Future Trends and Innovations

- Predictions for the future of 3D printing in materials & processes
- Potential breakthroughs and evolving trends

4.3 Applications Across Industries

- Exploring diverse industry applications (aerospace, healthcare, automotive, etc.)
- Potential societal impact and transformative applications

What will you Learn?

- Knowledge of Additive Manufacturing Fundamentals
- Introduction to Additive Manufacturing: Understanding the basic principles, evolution, and significance of 3D printing in modern manufacturing.
- In-depth Understanding of Polymer Materials
- Material Selection Criteria
- Insight into 3D Printing Processes
- Factors Influencing Process Selection
- Application and Case Studies:
- Real-world Applications: Discovering diverse industry applications of polymer 3D printing, including aerospace, healthcare, automotive, consumer goods, and more.
- Challenges and Future Trends
- Material Selection and Optimization
- Decision-making in 3D Printing

Who should Attend?

The course on "Materials and Processes in Polymer 3D Printing" can cater to a diverse audience due to its interdisciplinary nature and relevance across various fields. Here are potential target groups for this course:

- Plastic & Polymer and Mechanical Engineers
- Design and Architecture Professionals
- Professionals in Manufacturing Industries
- Professionals from Additive Manufacturing Industries
- Quality Control and Assurance Personnel
- Entrepreneurs and Innovators
- Researchers and Academics
- Business Executives and Managers
- General Enthusiasts

In essence, this course is versatile and applicable across a wide spectrum of professions and interests, catering to individuals looking to deepen their understanding of polymer 3D printing materials and processes for academic, professional, or personal purposes.

Dr. Saurabh Tayde

Ph.D (Chemical Technology)
SGBAU Amravati University

Dedicated and Self Driven with 10+ years of experience as An Assistant Professor. Good number of research publication in high impact factor journal related to Polymer and Chemical Technology. Demonstrated expertise in academia, research and administrative responsibility as a Training and Placement Officer. Excellent ability to plan activities, easily adapt to change and handle pressure.

Work Experience

- Assistant Training and Placement Officer Maharashtra Institute of Technology, Aurangabad (M.S): Feb 2021 to till date
- Assistant Professor and Dept. Placement Coordinator Plastic and Polymer Engg. Dept. MIT, Aurangabad (M.S): Dec 2020 to till date
- Assistant Professor Dept. of Chemical Engineering | Polymer Technology, College of Engineering and Technology, Akola (M.S): July 2012 to April 2020

Research Work

- Ph.D Research: Synthesis and Characterization of Polyurethane using Castor Oil as a Biobased Source of Polyol and Its Applications.

- M.Tech Project: "Synthesis of Epoxidized Cottonseed Oil and Its Application over Epoxy System".

- Key Research Area: Biopolymers, Polymer Composites, Polymer Materials, Polymer Characterization, Additive Manufacturing, Heat Transfer.

Courses Taught

Polymer Chemistry, Physical Chemistry of Polymers, Polymeric Materials, Polymer Rheology, 3D Printing Technology (Additive Manufacturing), Heat Transfer, Process Calculations, Mechanical Operations, Plant Design and Project Engineering.

Google Scholar Citations (Till Date)

- Citations = 659
- h-index = 8
- i10-index = 8

Achievements

- Recognized as a Best Poster (Researcher and Academician Category) in UGC-SAP Sponsored National Conference on Recent Trends in Green Chemistry and Nano Technology-2022 organized at UICT, Jalgaon.
- Stood Third Position (Research Category) in the National Level Paper Presentation Competition Recent Trends in Chemical Technology (RTCT-2021) organized at College of Engineering and Technology, Akola (M.S).

THANK YOU

PREPARED & CONDUCTED BY

DR. SAURABH TAYDE

Dean - Training, MIT Aurangabad

ADDRESS:

1001/1002, Lodha Supremus,
Opp 'The World Towers' Senapati Bapat Marg, Lower Parel (West),
Mumbai – 400013,
Tel: (91-22) 61772000 (25 Lines)