Rajat Jain

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RESEARCH INTERESTS

Fabrication and Laser Assisted Machining of Ceramic Composites, Ceramic 3D Printing using DIW Process, Hybrid Manufacturing Systems, Robotics, Industry 4.0 & IIOT, Digital Twins of Manufacturing Systems, Natural Fiber Composite Materials, Finite Element Analysis & Mechanics of Materials.

EDUCATION

Research Scholar / Fellow, Mechanical Engineering Department Sept 2021–Present
Nationals Institute of Technology (NIT), Warangal, India

Master of Engineering (M.E.) in CAD/CAM Engineering Aug 2019–Sept 2021
Thapar Institute of Engineering and Technology (TIET) Patiala, India
CGPA – 8.35/10

Bachelor of Engineering (B.E.) in Mechanical Production Engineering Aug 2015–Jul 2019
Thapar Institute of Engineering and Technology (TIET) Patiala, India
CGPA – 8.66/10, Branch wise rank: 3rd

Senior Secondary Education (Class 12th – PSEB – PCM) Mar–2015
DAV Collegiate Senior Secondary School, Malout, India (Aggregate 94.44%)

High School (Class 10th – ICSE) Mar–2013
Sacred Heart Convent School, Malout, India (Aggregate 90.33%)

EXPERIENCE

Research Experience Sept 2021–Present
Manufacturing Simulation Research Lab, Department of Mechanical Engineering, National Institute of Technology, Warangal, India and DRDO – Defense Research and Development Organization (RCI Hyderabad), India
Advisor: Professor P Subhash Chandra Bose

- Digital Twins for Reconfigurable Additive and Subtractive manufacturing systems are being developed using Microsoft Azure Digital Twins Explorer for optimizing process planning and platform design.

Composite Materials Research Lab, Department of Mechanical Engineering, Thapar Institute of Engineering and Technology (TIET), Patiala. India Jan 2019–Feb 2020
Advisor: Dr Deepak Jain

- Agave Americana Natural Fibers were pretreated and alkali and water hornification on them was carried out during the experimentation process.
- The specimens were prepared following ASTM D570-98 standard and mass gain analysis is performed experimentally under the controlled environments.
- The comparison and validation of the experimental results were carried out with the modelling by finite element method using ABAQUS software.

Rapid Prototyping Lab, Department of Mechanical Engineering Thapar Institute of Engineering and Technology (TIET), Patiala. India
Advisor: Dr Vishal Gupta

- The interaction of different process parameters on printing time, surface roughness and dimensional accuracy of a 3D printed object was investigated.
- The impact of different parameters on the performance of the 3D printer was also investigated and their optimal values have been identified.

Industrial Experience Jan 2018–Jul 2018
Business Excellence Department (B.Ex.)
Eicher Tractors, Bhopal, India
Advisor: Mr Pradeep Ghadi (GM, B.Ex.) and Mr Kalpanath Chatterjee (SM, B.Ex.)Updating and preparation of departmental procedure manuals (DPM's) in accordance to latest ISO 9001:2015 (QMS) standard.

- Assisted in the conduction of internal audits and External Audit Stage – 1 in the company.

PROJECTS

Capstone Project (UME 793) Jan 2019-May 2019
Design and Fabrication of Plastic Extrusion Machine

Advisor: Dr T.P. Singh and Dr Anu Mittal, MED, TIET Patiala, India

- Developed 3-D model of shredder assembly and calculated force, torque and power required for cutting the waste plastic into small pellets.
- Developed a 3-D model of the hopper and calculated the mass flow rate required for extrudate formation.
- Created production drawings and manufacturing plan for the fabrication of the Plastic Extrusion Machine.

Buggy Project (UTA 011) Aug 2016–Dec 2016

- Built a line follower robot capable of obstacle avoidance using Arduino Uno microcontroller, infrared and ultrasonic sensors.
- Integrated wireless transmission and gantry identification using serial communication, XCTU and Zigbee module.

Mangonel Project (UTA 010) Jan 2016–May 2016

- Evaluated trajectories of payload for no drag and drag conditions and analyzed stresses on sling arm of the mangonel.
- Constructed a mangonel assembly to achieve maximum range for payload without compromising the structural integrity.

Independent Projects Aug 2019- Oct 2019

- "Design and Fabrication of a Socket Jockey and its use in Home Automation" – this project aimed to modernize the electrical sockets to overcome the problem of overcharging of mobile phones.

PUBLICATIONS

Journal Publications:

[1] Deepak Jain, Harpreet Sekhon, Tarun Kumar Bera, **Rajat Jain**. Comparison of Different Hydrophobic Treatments for the Durability Improvement of Palmyra Natural Fiber Composites under Hydrothermal Ageing Environments, Journal of Natural Fibers 2020;17(11):1668-1682, DOI: 10.1080/15440478.2019.1588828. Impact Factor - 5.323

[2] Ishita Kamboj, **Rajat Jain**, Deepak Jain, Tarun Kumar Bera. Effect of Fiber Pre-treatment Methods on Hygrothermal Aging Behavior of Agave Fiber Reinforced Polymer Composites, Journal of Natural Fibers, 2020. DOI: 10.1080/15440478.2020.1838398. Impact Factor - 5.323

[3] **Rajat Jain**, Deepak Jain, Bikramjit Sharma. Analysis of precast concrete structures with sandwiched stubble waste for improving the thermal efficiency of building envelopes. International Journal of Integrated Waste Management, Science and Technology, [manuscript communicated]. Impact Factor – 7.145

International Conferences:

[4] **Rajat Jain**, Shivansh Nauriyal, Vishal Gupta, Kanwaljit S. Khas. Effects of Process Parameters on Surface Roughness, Dimensional Accuracy and Printing Time in 3D Printing. In: Pandey P.M., Kumar P., Sharma V. (eds) Advances in Production and Industrial Engineering. Lecture Notes in Mechanical Engineering. Springer, Singapore. 2021. https://doi.org/10.1007/978-981-15-5519-0_15

[5] **Jain R.** et al. (2021) Design and Fabrication of a Socket Jockey and Its Use in Home Automation. In: Das L.M., Kumar N., Lather R.S., Bhatia P. (eds) Emerging Trends in Mechanical Engineering. Lecture Notes in Mechanical Engineering. Springer, Singapore. https://doi.org/10.1007/978-981-15-8304-9_7

AWARDS AND HONORS

- Obtained All India Rank – **151** in Production and Industrial Engineering GATE (Graduate Aptitude Test in Engineering) Exam – Feb 2019.
- Received Certificate of Appreciation from the plant head of Eicher Tractors, Bhopal (India) for the timely completion of all the project activities during the six-month-long industrial internship.
- Obtained a Band Score – **7.5 in IELTS** Academic (International English Language Testing System) – Oct 2020.

TECH SKILLS

CAD Software's**:** SolidWorks, ANSYS Workbench, AutoCAD, PTC CREO

FEA Packages: ABAQUS CAE 2019

Scientific Computing: MATLAB/Simulink

Programming Languages: Java, C & C++, C#, DTDL, Python

RELEVANT COURSEWORK

Mechanical Engineering Courses: Strength of Materials, Theory of Machines, Thermodynamics, Fluid Dynamics, Manufacturing Processes, Machine Design, Finite Element Methods, Heat Transfer, Machining Science, Refrigeration and Air Conditioning, Fluid Mechanics and Machinery, Computational Fluid Dynamics, Automobile Engineering, Mechatronics, Modern Control of Dynamic Systems, Robotics, Computer-Aided Manufacturing, Geometric Modelling and Analysis, Rapid Prototyping, Computer Integrated Manufacturing Systems, Soft Computing Techniques, Integrated Production and Control Systems, Tribology.

Mathematics: Numerical Analysis, Calculus, Linear Algebra, Differential Equations, Optimization Techniques -I & II, Operations Research.

Computer Science: Machine Learning Algorithms and Soft Computing Techniques, IIOT.