# Progress Report for the Period of Oct to Dec , 2021

## DEAPRTMENT NAME: MECHANICAL ENGINEERING DEPARTMENT

### I. Details of ME Programmes

| ME Subjects | Batches | Name of the Faculty |
|---|---|---|
| 1. Introduction To Composites<br>2. Rapid Manufacturing | M.E. Mechanical Engineering (Manufacturing Technology), Regular Batch 2020, 3rd Semester | Dr. B. S. Pabla, Dr. Rupinder Singh |
| 1. Manufacturing Technology – I<br>2. Computer Based Production Management<br>3. Advanced Manufacturing Methods<br>4. Industrial Automation & Control Machine Learning for Engineering & Scientific Applications<br>5. Manufacturing Lab - I | M.E. Mechanical Engineering (Manufacturing Technology), Regular Batch 2021, 1st Semester | Dr. S. S. Banwait, Dr. S. S. Dhami, Dr. Rupinder Singh, Dr. P. S. Rao |
| 1. Industrial Robotics<br>2. Mechanism Design & Analysis<br>3. Mechatronics Systems<br>4. Machine Learning<br>5. Fundamentals of IoT<br>6. Robotics Lab - I | M.E. Mechanical Engineering (Robotics), Regular Batch 2021, 1st Semester | Dr. B. S. Pabla, Dr. S. S. Dhami, Dr. Rupinder Singh |
| 1. Industrial Automation & Control<br>2. Manufacturing Technology – II | M.E. Mechanical Engineering (Manufacturing Technology), Modular Batches 2019, 2020, 2021 | Dr. S. S. Dhami, Dr. P. S. Rao |
| **Thesis & Pre-Thesis** | • M.E. Mechanical Engineering (Manufacturing Technology), Regular Batch 2020, 3rd Semester<br>• M.E. Mechanical Engineering (Robotics), Regular Batch 2020, 3rd Semester<br>• M.E. Mechanical Engineering (Manufacturing Technology), Modular Batch 2019 | Dr. B. S. Pabla, Dr. S. S. Banwait, Dr. S. S. Dhami, Dr. Rupinder Singh, Dr. P. S. Rao |

**II**

### A. STUDENT TRAINING Organized

| Sr. No. | Name of the Course Alongwith dates & place | No. of weeks | Participation | | Total No. of Participants |
|---|---|---|---|---|---|
| | | | Poly | Engg. | |
| 1. | Six-Weeks B.Tech. Student Training Date- 12.09.2021 to 22.10.2021 | 6 weeks | --------- | University | One |

**B.. INTERNATIONAL CONFERENCES Organized**

| Sr. No. | Name of the Seminar/Conference | Total |
|---|---|---|
| **1** | 12th International Conference on Materials Processing and Characterization, October 6 - 9, 2021 | 250 participants |

**C. NATIONAL CONFERENCES ORGANIZED:**

| Sr. No. | Name of the Seminar/Conference | Total |
|---|---|---|
| **1** | National Level Competition TechSpardha2k21 at NITTTR Chandigarh, from10-12 November 2021 | **20** |
| **2** | National Seminar on Quality Ecosystem Throug NEP 2020, organized by National Institute Technical Teachers Training & Researcl Chandigarh on 26 October 2021 | **350** |

**III WORKSHOPS CONDUCTED (OTHER THAN CURRICULUM DEVELOPMENT WORKSHOPS):**

| Sr. No. | Name of the Workshop alongwith dates and venue | Total No. of participants |
|---|---|---|
| 1. | Workshop on outcome based Education and NBA procure On Oct 30 & 31, 2021 | **173** |

**IV. INSTRUCTIONAL MATERIAL DEVELOPMENT**

| Sr. No. | Type of Instructional Material Developed | Author(s) /Team | Project Completed In progress | Specific Achievements during the year | Target date of completion |
|---|---|---|---|---|---|
| **PRINT MATERIAL** | | | | | |
| 1. | Section Editor for 'Fundamentals of thermoset and thermoplastic polymers & their recycling and sustainability' as part of Encyclopedia of materials: plastics and polymers (M. Saleem. J. Hashmi, 'Editor-in-Chief'), Elsevier, 2021.<br>Guest Editor for Special | Rupinder Singh | Completed | - | - |

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|---|---|---|---|---|---|
| | issue "3D and 4D Hybrid Printed Functional Prototypes" Materials International Open Access Journal, 2021 (ISSN: 2668-5728). | | | | |
| 2. | Editor for Materials today: Proceedings for Symposium on Synthesis, Characterization & Processing of Inorganic, Bio and Nano Materials – 2021, (Edited by Jasgurpreet Singh Chohan, Rupinder Singh, Harjot Singh Gill, Raman Kumar), Volume 48, Part 5, 2022, pp 927-1774 (Elsevier). | Jasgurpreet Singh Chohan, Rupinder Singh, Harjot Singh Gill, Raman Kumar | Completed | - | - |
| 3. | Editor for book on '4D Printing: Fundamentals and Applications, Elsevier, 2022 (ISBN: 9780128237250). | Rupinder Singh | Completed | - | - |
| 4. | Editor for book on Advances in Manufacturing Technology: Computational Materials Processing and Characterization, (Co-Editor: S.S.Dhami, B.S.Pabla) CRC Press, Taylor & Francis, 2022 | Rupinder Singh, S.S.Dhami, B.S.Pabla | Completed | - | - |
| 5. | Editor for book on Additive Manufacturing for Plastic Recycling: Efforts in Boosting A Circular Economy (Co-Editor Ranvijay Kumar), CRC Press, Taylor & Francis, 2022 | Rupinder Singh | Completed | - | - |
| **NON-PRINT MATERIAL** | | | | | |
| NIL | NIL | NIL | NIL | NIL | NIL |

**INSTRUCTIONAL MATERIAL DEVELOPMENT**

| Type of Instructional Material | No. Completed during 2021-22 | Remarks (if any) |
|---|---|---|
| | | |

| | | |
|---|---|---|
| **PRINT :** | | |
| Text Books | NIL | NIL |
| Lab. Manuals | NIL | NIL |
| Teachers' Manual | NIL | NIL |
| Modules | NIL | NIL |
| Readers | NIL | NIL |
| Any other (Please specify) | NIL | NIL |
| **NON-PRINT :** | | |
| Video Films | NIL | NIL |
| CAI Packages | NIL | NIL |
| Experimental Kits | NIL | NIL |
| Charts | NIL | NIL |
| Any other (Please specify) | NIL | NIL |

Information above to be given only in case of completed Learning Resources. Title of the material(s) (topics/subjects as the case may be) should also be given.

## V. CURRICULUM DEVELOPMENT

### A. CURRICULA DESIGNED:

### B. CURRICULA REVISED:

### C. CURRICULUM DEVELOPMENT WORKSHOPS:

| Sr. No. | Name of Curriculum | Number of Subjects/Course | Beneficiary States | Participation | | |
|---|---|---|---|---|---|---|
| | | | | Poly. | Ind. | Others |
| | NIL | NIL | NIL | NIL | NIL | NIL |

## VI. RESEARCH AND DEVELOPMENT

| Sr. No. | Name of Project | Team | Beneficiary State | Status of Project completed/ In progress | Specific work done during the year | Target date of completion |
|---|---|---|---|---|---|---|
| **A. RESEARCH STUDIES** | | | | | | |
| | NIL | NIL | NIL | NIL | NIL | NIL |

| Sr. No. | Name of Project | Team | Beneficiary State | Status of Project completed/ In progress | Specific work done during the year | Target date of completion |
|---|---|---|---|---|---|---|
| **B. DEVELOPMENT PROJECTS** | | | | | | |
| | | | | | | |
| 1. | **Research Grant of Rs 18.30 Lac** only for the year 2021-24, for the project, "Teachers Associateship for Research Excellence (TARE). (Mechanical & Manufacturing Engineering & Robotics)**"** to Dr. Jasgurpreet Singh Chohan, Chandigarh University, Gharuan, Mohali, Chandigarh, Punjab-140413- under the mentorship of Dr. Rupinder Singh, at National Institute of Technical Teachers Training and Research, Chandigarh by SERB. | Rupinder Singh, BS Pabla | All states | In-progress | - | 2024 |
| 2. | **Research Grant of Rs 18.30 Lac** only for the year 2021-24, for the project, "Teachers Associateship for Research Excellence (TARE). (Mechanical & Manufacturing Engineering & Robotics)**"** to Dr. Ranvijay Kumar, Chandigarh University, Gharuan, Mohali, Chandigarh, Punjab-140413- under the mentorship of Dr. Rupinder Singh, at National Institute of Technical Teachers Training and Research, Chandigarh by SERB. | Rupinder Singh, BS Pabla | All states | In-progress | - | 2024 |
| 3. | ARTPARK, Bengaluru, funded project on **Development of Digital Twin of an Articulated Robotic Arm, Rs. 3.40 lakh, Prof. Sukhdeep Singh Dhami** | | | | | |
| **C. DISSERTATION FOR MASTER'S DEGREE PROGRAMMES COMPLETED** | | | | | | |

| Sr. No. | Name of Project | Team | Beneficiary State | Status of Project completed/ In progress | Specific work done during the year | Target date of completion |
|---|---|---|---|---|---|---|
| 1. | Comparison of thermoplastic and thermoplastic-thermosetting composite based 3D printed patch antennas for antenna applications | Panjab University. : U.I.E.T Chandigarh Co-Guide: Dr. Amrinderpal Singh Candidate: Mr. Sanjeev Kumar | | Completed | - | - |
| 2. | Development and characterization of flame retardant, recyclable 3D-printed thermoplastic composite-based energy storage device | Panjab University. : NITTTR Chandigarh Co-Guide: Dr. B. S. Pabla Candidate: Mr. Suraj Parkash | | Completed | - | - |
| 3. | Optimization of Machining Parameters in Ultra-Precision Diamond Turning of Zinc Selenide | Dr. S. S. Dhami; Raj Kamal Bharti (172213) | | Completed (02-12-2021) | | |
| 4. | Characterization Of Magnesium Based Surface Composite Fabricated By Friction Stir Processing | Dr. S. S. Dhami; Pradeep Kumar Chandra (141217) | | Completed (06-12-2021) | | |
| 5. | Analysis of Tribological and Mechanical Properties of Stir Cast Al6063/($SiC+Al_2O_3+CeO_2$) MMC | Dr. S. S. Dhami; Raman Gahlaut (141218) | | Completed (23-12-2021) | | |
| 6. | Modelling And Optimisation Of Surface Roughness And Tool Wear For Hard Machining Of C45 Material | Dr. S. S. Dhami; Shiv Rattan (141224) | | Completed (21-12-2021) | | |

**D. DISSERTATION FOR Ph.D. DEGREE PROGRAMMES COMPLETED**

| Sr. No. | Name of Project | Team | Beneficiary State | Status of Project completed/ In progress | Specific work done during the year | Target date of completion |
|---|---|---|---|---|---|---|
| 1. | Investigations on 3D printed meta-material structures using almond skin reinforced polyamide 6 [*Chandigarh University, Mohali*] | Dr. Rupinder Singh Co-guide: Dr. Jasgurpreet S Chohan Candidate: Mr. Karan Mankotia | | Submitted | | |
| 2. | Development of ABS composite matrix as functional prototypes from industrial waste for non-structural engineering applications [*LPU, Phagwara*] | Dr. Rupinder Singh Co-guide: Dr. Jaspreet Singh Candidate: Mr. Kapil Chawla | | Submitted | | |
| 3. | Investigations on debris reinforced thermoplastic-based 3D customized solution for maintenance and repair of heritage structures [*Punjabi University, Patiala*] | Dr. Rupinder Singh Co-guide: Dr. I.P.S. Ahuja Candidate: Mr. Vinay Kumar | | Submitted | | |

## VII. EXTENSION SERVICES AND CONSULTANCY

| Sr.No. | Name of Project | Team | Beneficiary Organization | Status of Project Completed/in Progress | Specific work done during the year |
|---|---|---|---|---|---|
| **A. EXTENSION SERVICES PROJECTS:** | | | | | |
| 1. | Collaborative pedagogy & Training programs (Oplan No Ex-16) | Dr. B. S. Pabla, Dr. S. S. Dhami, Dr. Rupinder Singh | NITTTR Chandigarh & TITI Nepal | In Progress | Joint Meeting held in Nov. 2021 |
| 2. | Workshop on Development of UG Degree Curriculum In **Robotic And Artificial Intelligence; November 30, 2021** | Dr. S. S. Dhami | All States | In Progress | Designed the curriculum |
| 3. | Workshop on Design and Development of New Diploma Course in Emerging Technology (Automation & Robotics) | Dr. S. S. Dhami, Dr. Rupinder Singh | Haryana state | Completed | Designed the curriculum |

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| | for HSBTE, Panchkula (organized by CDC); 12th November, 2021 | | | | |
| 4. | Seminar for faculty and students of UIE, CU, Gharuan; 13th October, 2021 | Dr. S. S. Dhami | CU | Completed | Delivered expert lecture on 'Introduction to Emerging Technologies' |
| 5. | National Seminar on Additive Manufacturing organized by PEC, Chandigarh; 16th December, 2021 | Dr. S. S. Dhami | All states | Completed | Delivered expert lecture on 'Predicting Dimensional Accuracy of FDM Printed Parts using ML' |
| 6. | 3D printing Technologies (Opportunities for Innovators and Entrepreneurs) | Expert session organized by ACIC RISE Association supported by AIM Mission, NITI Aayog (Govt. of India) on 12 Oct. 2021 at Gulzar Group of Colleges, Khanna (Ludhiana) | All states | Completed | - |
| 7. | Multi-material 3D printing for 4D applications | Expert Talk (organized by JNTUH – AICTE in association with Nalla Narasimha Reddy Education Society's Group of Institutions, Hyderabad) during STC on "3D Printing for Sustainable Development" on 25 Oct. 2021 | All states | Completed | - |
| 8. | Empowering Faculty for Interdisciplinary Research and Development | Expert Talk during National Seminar on Quality Ecosystem Through NEP 2020, organized by National Institute of Technical Teachers Training & Research, Chandigarh on 26 October 2021 | All states | Completed | - |
| 9. | Reverse Engineering using 4D Printing | Expert Talk (organized by NITTTR Chandigarh) during STC on Reverse Engineering on 28 Oct. 2021 | All states | Completed | - |
| | Augmenting Research in Technical Education | Expert Talk (organized by NITTTR Chandigarh) for Two Days | All states | Completed | - |

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| | | Workshop on NBA Accreditation & OBE on 31 Oct. 2021 | | | |
| 10. | Dual and Multiple Material 3D Printing | Expert talk (organized by the Department of Mechanical Engineering, DCRUST, Murthal) in AICTE Training and Learning (ATAL) online one-week faculty development program on '3D Printing & Design' on 23 Nov. 2021 | All states | Completed | - |
| 11. | Additive Manufacturing in Smart Factory | Expert Talk (organized by NITTTR Chandigarh) during AICTE-QIP Faculty Development Program on 'Industrial IoT and Robotics' on 25 Nov. 2021 | All states | Completed | - |
| 12. | 3D-4D printing for smart manufacturing | Expert Talk (organized by Department of Mechanical Engineering, CEC Landran on 29 Nov. 2021 | All states | Completed | - |
| 13. | Research Funding Opportunities | Expert Talk (organized by Department of CSE Engineering, NITTTR Chandigarh) under AICTE Margdarshan Scheme during online FDP on the Teaching learning process to enhance program outcomes, on 02 Dec. 2021 | All states | Completed | - |
| 14. | 3D printing for tissue reconstruction in veterinary applications | Expert Talk (organized by Department of Mechanical Engineering, KAMARAJ College of Engineering and Technology, Tamilnadu) during ATAL sponsored FDP on 'Organ printing using 3D printing | All states | Completed | - |

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| | | technologies to make self-reliant India' on 8 Dec. 2021 | | | |
| 15. | Rheological, mechanical, thermal, and morphological characterization for in-house preparation of feedstock filaments for open-source 3D printers | Expert Talk (organized by SLIET, Longowal) during ATAL sponsored FDP on Manufacturing and Characterization of 3D Printed Materials (MC3DPM-2021) on 14 Dec. 2021 | All states | Completed | - |
| 16. | Development of multi-materia 3D printed functional prototypes for 4D applications | Expert Talk (organized by SLIET, Longowal) during ATAL sponsored FDP on Manufacturing and Characterization of 3D Printed Materials (MC3DPM-2021) on 15 Dec. 2021 | All states | Completed | - |
| 17. | Additive manufacturing in veterinary applications | Expert Talk (organized by Department of Applied Sciences and Mechanical engineering, PEC Chandigarh) during a One-Day National Seminar on Additive Manufacturing: Trends and Opportunities on 16th December 2021 | All states | Completed | - |
| 18. | Waste management through additive manufacturing | Expert Talk (organized by SLIET, Longowal), during e-STC on 'Smart Manufacturing Technologies & Applications (SMTA 2021) on 2( Dec. 2021 | All states | Completed | - |
| 19. | Smart materials for tissue reconstruction in 3D printing | Expert Talk (organized by GZSCET, MRSPTU Bathinda), during AICTE-ISTE, sponsored FDP on 'Advance materials and manufacturing' on 21 Dec. 2021 | All states | Completed | - |
| **B. CONSULTANCY PROJECTS:** | | | | | |

## VIII. TRAINING PROGRAMMES ATTENDED BY THE INSTITUTE FACULTY/STAFF

| Sr. No. | Title of Training Programme | Period of Training | Venue | Attended by |
|---|---|---|---|---|

## IX. IN-HOUSE TRAINING PROGRAMMES

| Sr. No. | Title of Training Programme | Period of Training | Attended by |
|---|---|---|---|
| | | | |
| 1. | Training on Digital Twin Setup | October 11 -13, 2021 | Dr. S. S. Dhami, Dr. B. S. Pabla |

## X. OTHER CONTRIBUTIONS INCLUDING INDIVIDUAL CONTRIBUTION

### A. PATENTS/COPYRIGHT

| Sr.No | Name of Patents/Copyright | Author (s) Name |
|---|---|---|
| **1.** | Customized dental implant assembly (Ref. No. Indian Patent Application No: 202111056440 dated Dec. 06, 2021) | Ashish Jain. V Grover, Rupinde Singh, Ap Singh, S.R Pradhan Rishab, Satinder Singh |

**B.**

### C. PAPERS PUBLISHED BY THE INSTITUTE FACULTY:

**SCI JOURNAL**

| Sr.No. | Name of the Paper Published | Author (s) Name |
|---|---|---|
| **1.** | On synergistic effect of $BaTiO_3$ and graphene reinforcement i PVDF matrix for 4D applications<br>Journal of Mechanical Engineering Science, IMech Part C, Vol. 236 (1), 2022, pp 276-292<br>DOI: 10.1177/09544062211015763 | Ravinder Sharma, **Rupinder Singh** Ajay Batish, Nishant Ranjan |
| **2.** | On programming of polyvinylidene fluoride–limeston composite for four-dimensional printing applications i heritage structures<br>Journal of Materials: Design and Applications<br>IMech Part L, Vol. 236 (2), 2022, pp 319-333<br>DOI: 10.1177/14644207211044298<br>(Sage publication) | Vinay Kumar, **Rupinder Singh** I.P.S. Ahuja |
| **3.** | On 3D printing of 17-4PH stainless steel with direct meta laser sintering in aircraft structural applications<br>Journal of Materials: Design and Applications<br>IMech Part L, Vol. 236 (2), 2022, pp 440-450<br>DOI: 10.1177/14644207211044804<br>(Sage publication) | Rupinder Singh, Rishab, Jashanpree Singh Sidhu |
| **4.** | Characterization of in-house developed Mn-ZnO reinforced | Ranvijay Kumar, **Rupinder Singh** |

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| | polyethylene: a sustainable approach for developing fused filament fabrication-based filament<br>Journal of Materials Engineering and Performance, 2021<br>DoI: 10.1007/s11665-021-05801-5 | Vinay Kumar, P. Kumar, C. Prakesh Sunpreet Singh |
| **5.** | Three-dimensional printing of innovative intramedullary pi profiles with direct metal laser sintering<br>Journal of Materials Engg. and Performance, 2021, DOI 10.1007/s11665-021-06176-3 | **Rupinder Singh**, J.S Sidhu, Rishab B.S.Pabla, Ashwani Kumar |
| **6.** | 3D printing of dual thermoplastic materials with different laye combinations: Tensile, flexural and fractured surfac investigations<br>Journal of Thermoplastic Composite Materials<br>(Sage Publications) | Sudhir Kumar, **Rupinder Singh** T.P. Singh, Ajay Batish, Akshay Kumar |
| **7.** | On PVC-PP composite matrix for 4D applications Flowability, mechanical, thermal, and morphologica characterizations<br>Journal of Thermoplastic Composite Materials<br>DOI: 10.1177/08927057211059754<br>(Sage publication) | Nishant Ranjan, Ranvijay Kumar **Rupinder Singh**, Vinay Kumar |
| **8.** | On comparison of recycled LDPE and LDPE–bakelite composite based 3D printed patch antenna<br>Journal of Materials: Design and Applications<br>IMech Part L<br>DOI: 10.1177/14644207211060465<br>(Sage publication) | **Rupinder Singh,** Sanjeev Kumar Amrinder Pal Singh, Yang Wei |
| **9.** | On 3D printing of electro-active PVDF-Graphene and Mn-doped ZnO nanoparticle-based composite as a self-healing repair solution for heritage structures<br>Part B: Journal of Engineering Manufacture<br>DOI: 10.1177/09544054211060912<br>(Sage publication) | Vinay Kumar, **Rupinder Singh** I.P.S. Ahuja |
| **10** | On rheological, thermal, mechanical, morphological piezoelectric properties and one-way programming features o PVDF-$CaCO_3$ composites<br>Journal of Materials Engineering and Performance<br>DOI: 10.1007/s11665-021-06532-3<br>(Springer publications) | Vinay Kumar, **Rupinder Singh** I.P.S. Ahuja |
| **11.** | MODWT and VMD Based Intelligent Gearbox Early Stage Fault Detection Approach; *J Fail. Anal. and Preven.*21**,**1821–1837; October 2021 | Mansi, Kanika Saini, Vanraj, Sukhdeep Singh Dhami |

## D. PAPERS PUBLISHED BY THE INSTITUTE FACULTY:

### INTERNATIONAL JOURNAL OTHER THAN SCI JOURNALS

| Sr.No. | Name of the Paper Published | Author (s) Name |
|---|---|---|
| **1.** | On crown fabrication for prosthetic dentistry of veterinary patients: A review<br>Advances in Materials and Processing Technologies, 2021<br>DoI: 10.1080/2374068X.2021.1970991 | S. R. Pradhan, **Rupinder Singh**, S S. Banwait |
| **2.** | On flexural, wear and morphological properties of 3D printed almond skin powder reinforced PLA matrix<br>Advances in Materials and Processing Technologies, 2021<br>DOI:10.1080/2374068X.2021.1970992 | **Rupinder Singh**, Ranvijay Kumar Mohit Singh, Pawanpreet |
| **3.** | On shear fracture and morphological features of fused filamen fabrication based almond skin powder reinforced PLA structures<br>Advances in Materials and Processing Technologies, 2021 | **Rupinder Singh**, Ranvijay Kumar Mohit Singh, Pawanpreet |

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|---|---|---|
| | DOI:10.1080/2374068X.2021.1970994 | |
| **4.** | *Multi-Response Optimization of Parameters using GRA for Abrasive Water Jet Machining of EN31 Steel*; Materials Today: Proceedings, Volume 47, Part 17, October 2021, Pages 6141-6146 (Scopus) | Ravi Kant, Sukhdeep S. Dhami |

**E. PAPERS PUBLISHED BY THE INSTITUTE FACULTY:**

**NATIONAL JOURNAL**

| Sr.No. | Name of the Paper Published | Author (s) Name |
|---|---|---|

**A. PAPERS PUBLISHED / PRESENTED IN:**

**INTERNATIONAL CONFERENCES/SEMINARS**

| Sr.No. | Title of the Paper Presented/Accepted alongwith a Name of the Conference/Seminar (venue, with date) | Author (s) Name |
|---|---|---|
| **1.** | A comparative study on investment casting of dental crowns for veterinary dentistry by using ABS patterns with and without wax coating, E3S Web of Conferences **309**, 2021 ICMED 2021 901020<br>DoI:10.1051/e3sconf/202130, pp 01020(1-6)<br>Proceedings of 12th ICMPC, NITTTR Chandigarh, India, Oct. 6-9, 2021 | S. R. Pradhan, **Rupinder Singh** S.S.Banwait, Mukesh Singh Puhal S.Singh, Arun Anand |
| **2.** | On rheological, mechanical, thermal, wear and morphologica properties of melamine formaldehyde reinforced recycled ABS for sustainable manufacturing<br>E3S Web of Conferences **309**, 2021 ICMED 2021 901081<br>DoI:10.1051/e3sconf/202130, pp 01081(1-7)<br>Proceedings of 12th ICMPC, NITTTR Chandigarh, India, Oct 6-9, 2021 | Gulraj Singh, Gurinder Singh Brar **Rupinder Singh** |
| | | |

**NATIONAL CONFERENCES/SEMINARS**

| Sr.No. | Title of the Paper Presented/Accepted alongwith a Name of the Conference/Seminar (venue, with date) | Author (s) Name |
|---|---|---|
| | | |