

Research @
Mechanical Engineering Department



Mechanical Engineering Department

The Mechanical Engineering Department was established in 1956 with the inception of the Institute to produce high quality engineers the field of Mechanical Engineering to cater the needs of the newly Independent India. Since the Institute became a Deemed University in 1985, the department has increasingly focused on post graduate education and research. The Department offers undergraduate program leading to B.E. Mechanical Engineering, Mechatronics Engineering, Postgraduate programs leading to M.E. (CAD/CAM & Robotics), M.E. (Production & Industrial Engineering), M.E. (Thermal Engineering), Part Time M.E. program in Production and Industrial Engineering and Doctoral program leading to PhD Degree. The Department aims to produce quality professionals in Mechanical Engineering to compete globally and excel by carrying out basic and applied research in emerging areas by forging strong industry-institute interaction. In January 2008, the undergraduate program of Mechanical Engineering Department has been accredited for 5 years by NBA. The Department is also notable for its laurels in international forums like Society of Automobile Engineers (SAE) Formula Student, Europe and has an active staff/student exchange program with the University of Waterloo, Canada. The Department has been able to attract numerous prestigious research and infrastructural grants in recent years from agencies such as AICTE, DRDO, DST, UGC, to list a few. The department is having high quality laboratories in areas of Bulk Solids and Particulate Technologies, Heat & Mass Transfer, I.C engine, Manufacturing, Automation/Robotics, Computer Aided Designs etc. The faculty and staff are actively involved in fostering industrial collaborations through training programs, workshops, consulting projects etc.



Research Information (July 2013 – June 2014)

Number of journal publications	36
Number of conference publications	22
Number of ongoing sponsored projects	11
Total worth of ongoing sponsored projects (Rs. in Lacs)	155.73
Number of ongoing PhD thesis	46
Number of ongoing Masters thesis	85
Number of faculty	32



Key Research Areas

Non Traditional Machining

Erosion Wear for the Flow of Ash-Water Slurry

Development of a Flat-Bed 3-Axis VMC

Bulk Solids Handling, Storage and Conveying

Abrasive Blasting Process

Metal Matrix Composites

Electric Discharge Machining (EDM)

Nanofluid

Intelligent Autonomous Vehicle (IAV)

Fused Deposition Modeling Process

Traffic Noise

Fluidisation

Ultrasonic Micro-Machining

Microwave Heating

Detection of Corrosion by Ultrasonic Method

Fiber Reinforced Polymer Nanocomposites

Ornamental Wood Working System

Ergonomic Analysis

Centrifugal Slurry Pump

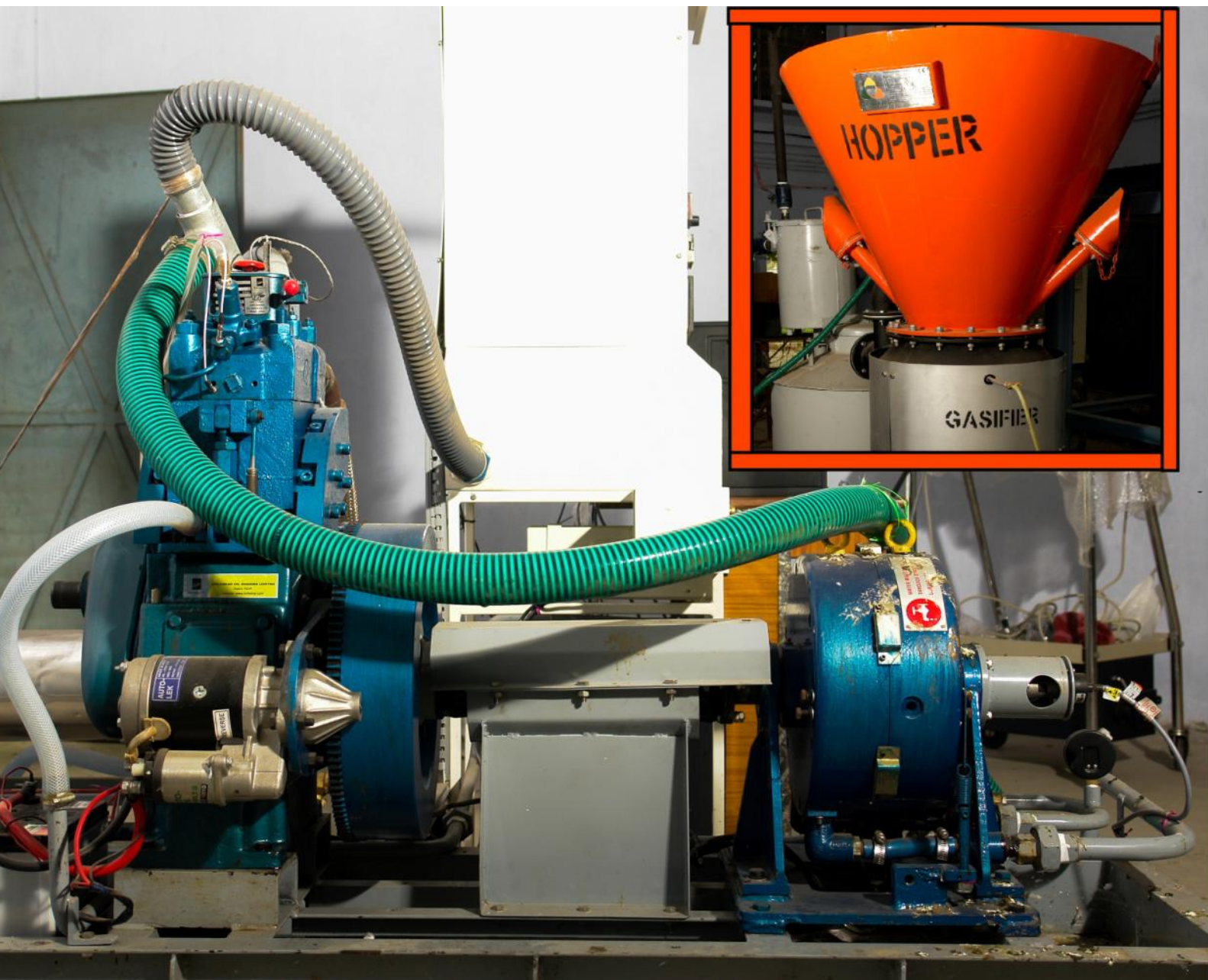
Forming

Flexible Conveying System

Submerged Arc Welding (SAW)

Human Body Vibrations Models

Dual Fuel Diesel Engine



Major Research Facilities

Dual Fuel Engine Test Rig

Coordinate Measuring Machine

Surface Profilometer for Contour Measurement

Ultrasonic Flaw Detector

Submerged Arc Welding

Fused Deposition Modeling Machine

3D Blue Light Scanner – Artec Spider

Conventional CNC Machining Centers 2Axis, 3Axis

SPM CNC Lathe-Mill Wood Working Machines

Abrasive Blaster

Universal Testing Machine

Wear Testing Machine

Pilot Plant for Pneumatic Conveying

Deaeration Chamber

Powder and Suspension Rheology Tester

Thermal Property Analyzers for Nano Fluids

SYMBOLS Software for Bond Graph Modelling

Ultrasonic Probes (Contact and Immersion Types)

Acoustic Emission Setup

Slurry Rheology Tester



(contd.) Major Research Facilities

COMSOL-Multiphysics Simulation software

Tribo Tester

Multi-Channel Noise and Vibration Analyzer

Setup for Synthesizing Magneto Rheological Fluids

LEGO and Tetrix Kits

Anemometer

Vacuum Assisted Resin Infusion Molding

High Shear Homogenizer

Magneto Rheological Micro and Nanofinishing Setup.

TGA

Slurry Transport Facility

Solar Concentrator System

Gasifier to Produce Producer Gas

5 kW Dual Fuel Engine System

Smoke Analyzer

VCR Diesel Engine

Pyranometer

Electrodynamic Shaker for Vibration Testing.

Sound Level Meters

Bomb Calorimeter



Major Sponsors

Department of Science and Technology

Council for Scientific and Industrial Research

Department of Scientific and Industrial Research

Ministry of Textiles, Government of India

Naval Research Board

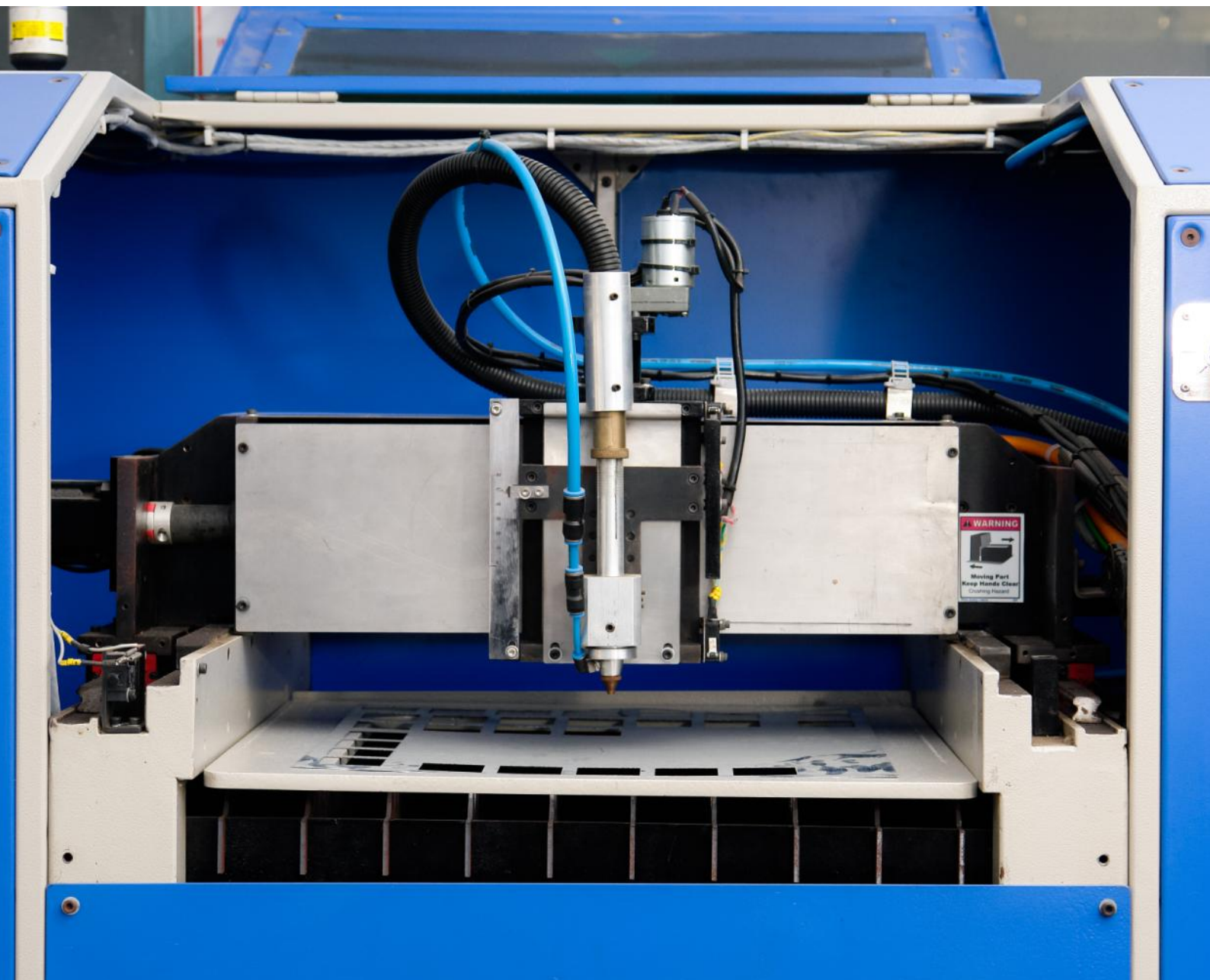
Defence Research and Development Organisation

University Grants Commission

M/s Rockman Industries Ltd.

All India Council for Technical Education

Thapar University



List of Ongoing Sponsored Projects

S.No.	Name of the Project	Year of sanction	Funding Agency	Project Cost (Lacs Rs)	Investigator(s)
1	Establishment of Non Traditional Machining Centre (UGC-SAP)	2009	UGC	44.50	Dr. S. K. Mohapatra
2	Design and Control of Intelligent Autonomous Vehicle for Indian Sea Ports.	2013	UGC	6.00	Dr.T.K. Bera
3	Modelling Solids Friction and Minimum Transport Criteria for Dense-Phase Pneumatic Conveying of Powders	2012	DST	21.95	Dr.S.S.Mallick
4	Developing Validated Scale-up Procedure for Dense-Phase Pneumatic Transport of Fine Powders using Two-Layer Dune-Flow Model	2012	CSIR	19.56	Dr.S.S.Mallick
5	Experimental investigation for surface improvement of die steels during electric discharge machining with tungsten and titanium powder mixed dielectric	2012	UGC	0.90	Dr. Anirban Bhattacharya Dr. Ajay Batish
6	Experimental investigation of EDM machined surface of Al-SiC and Al-SiC-B ₄ C metal matrix composites	2012	UGC	9.97	Dr..Ajay Batish Dr. Anirban Bhattacharya
7	Multi-response Optimization of Process Parameters for the Improved Part Accuracy in Fused Deposition Modeling Process	2013	AICTE	9.75	Dr. Ajay Batish Dr. Anirban Bhattacharya
8	Metallurgical Behaviour of HSLA Steel during SAW Welding	2011	DRDO	14.65	Dr.Ajay Batish Dr. Anirban Bhattacharya
9	Study of erosion wear for the flow of ash-water slurry	2011	UGC	7.60	Dr. Satish Kumar Dr. S.K. Mohapatra
10	Optimization and modelling of process parameters for improvement in material characteristics in abrasive blasting process using fuzzy logic methodology	2011	AICTE	9.77	Dr. V. K. Singla Dr. Ajay Batish
11	Chain Weight Reduction	2011	Rockman	11.08	Dr. Ajay Batish Dr. Anirban Bhattacharya

Faculty @

Mechanical Engineering Department

Dr. S. K. Mohapatra
**Senior Professor and Head, Mechanical Engineering Department
In-charge of Internal Combustion Engines Laboratory**

Ph.D., Indian School of Mines, Dhanbad, 1997

Research interests

Modeling and Simulation of Fluidised Bed Combustors

Performance and emission of biodiesel in CI engines

Centrifugal slurry pump handling fly/bottom ash

skmohapatra@thapar.edu, hmed@thapar.edu

Selected References

Ragit, S., Mohapatra, S. K., and Kundu, K. K, Optimization of neem methyl ester from transesterification and fuel characteristics as a diesel substitute, *Biomass and Bio-energy*, 35, 2011, 1138-1144.

Sehgal, S., Murugesan, K., Mohapatra, S. K., Experimental investigation of the effect of flow arrangements on the performance of a micro channel heat sink, *Experimental Heat Transfer*, 24, pp 215-233, June 2011.

Ragit, S. S, Mohapatra, S. K., Gill, P. Kundu, K., 'Brown hemp methyl transesterification process and evaluation of fuel properties, *Biomass and Bioenergy*, 41 (2012) 14-20.

Sehgal, S., Murugesan, K., Mohapatra, S. K., Effect of channel and plenum aspect ratios on the performance of microchannel heat sink under different flow arrangements, *Journal of Mechanical Science and Technology*, Springer, 26 (9) 2985-2994, (2012).

Kumar S., Gandhi B. K., and Mohapatra, S. K., Performance characteristics of centrifugal slurry pump with multi-sized particulate bottom and fly ash mixtures, *Particulate Science and Technology*, Taylor and Francis, 32, July 2014, pp 466-476.

The major area of current research includes modelling and simulation of bubbling fluidised bed combustors. Bubbling fluidised bed combustors are extensively used in northern India for incineration of agri-residue for generation of power. Apart from predicting the performance parameters of a bubbling fluidised bed combustor, CFD analysis of temperature and velocity profiles in a fluid-bed incinerator are also being extensively studied.

Ongoing/recently completed sponsored research projects and thesis

Study of performance parameters of a 10 MW FBC power plant

Study of temperature and velocity profiles

Study of formation of agglomeration in FBC system

Study of erosion wear in a centrifugal pump handling bottom and fly ash

Study of performance parameters of a dual fuel engine.

Research facilities available

Dual fuel engine test rig.

Brookefield rheometer.

TGA.

Bomb calorimeter.

Sponsors for research and infrastructure projects:

All India Council of Technical Education.

University Grants Commission .

Major areas for consultancy services:

Agglomeration/clinker formation in FBC power plants.

Centrifugal slurry pumps discharging bottom and fly ash.

Solid fuel analysis.

Dr. Ajay Batish



Professor and Dean of Partnerships & Accreditation

PhD, Thapar University, Patiala, 2005

Research interests

Conventional and Non-Conventional Machining, Welding
 Incremental Sheet Metal Forming, Rapid Prototyping, Fused Deposition Modeling
 Modeling of Manufacturing Systems, Process Modeling and Finite Element Analysis
abatish@thapar.edu

Selected References

Sarabjeet Singh Sidhu, Ajay Batish, Sanjeev Kumar, Study of surface properties in particulate reinforced MMC using powder-Mixed EDM, Materials and Manufacturing Processes, 29: 46–52, 2014.

Sarabjeet Singh Sidhu, Ajay Batish, Sanjeev Kumar, EDM of Metal Matrix Composite for Parameter Design using Lexicographic Goal Programming, Materials and Manufacturing Processes Vol 28 (2013) 495-500.

Ajay Batish, Anirban Bhattacharya, V K Singla, Gurmail Singh, Study of Material Transfer Mechanism in Die Steels using Powder Mixed EDM, Materials and Manufacturing Processes, Vol 27, pp 449-456 (2012).

Ravinder K Duvedi, Sanjeev Bedi, Ajay Batish, Stephen Mann, A Multipoint Method for 5-Axis Machining of Triangulated Surface Models, Computer-Aided Design, Elsevier, Vol. 52, page 17–26, 2014.

Anikate Gupta, SV Ramagopal, Ajay Batish, Anirban Bhattacharya, Surface Roughness and Profile Error in Precision Diamond Turning of C18000, Materials and Manufacturing Processes Vol. 29, No. 5, Pages: 606-613

Ongoing/recently completed sponsored research projects and thesis

Ornamental Wood Working System using 3-D modeling and computerized tool path.

Analysis of Asymmetrical Manual Lifting Tasks to determine maximum recommended weight limit by Indian Male workers.

Experimentation for improvement in surface properties of die and tool steels by EDM process.

Special Assistance Project (SAP-DRS) in Mechanical Engineering.

Manufacturing Engineering - Entrepreneurship Development

Research facilities available

Coordinate Measuring Machine.

Surface Profilometer for contour measurement.

Measuring microscope.

Ultrasonic Flaw Detector.

Metallurgical Microscope.

Fused Deposition Modeling machine.

Spectrometer.

Microhardness tester.

Submerged arc welding.

Sponsors for research and infrastructure projects:

Defence Research and Development Organisation (DRDO)

Ministry of Textiles

SERC - DST

UGC

AICTE

Major areas for consultancy services:

Ergonomic Studies, Six Sigma Deployment, Manpower Productivity studies, ISO 9000 implementation, Time and Motion Studies.

Mr. Ajayinder Singh Jawanda



Associate Professor and In-charge of Laboratory 'State Initiated Design Centre for Ornamental Woodworking'

Pursuing PhD, Thapar University, Patiala.

Research interests

CAD-CAM for tool path generation for open architecture control to produce sculptured surfaces

CAE for Mechanical Design Optimization

Graphical simulator design for machining and dynamic quality control

asjawanda@thapar.edu

Selected References

Gilad Israeli, Stephen Mann, Sanjeev Bedi, Ajayinder Singh Jawanda, 2011, Numerical Verification of CNC Machine Simulations, Computer-Aided Design and Applications. Publisher: CAD Solutions. USA. Co published with Taylor and Francis, Volume 8, Issue 4, Pages 507-518.

Mohammadreza Khorasaninejad, Navid Abedzadeh, Ajayinder Singh Jawanda, Nixon O, M. P. Anantram, and Simarjeet Singh Saini, 2012, Bunching characteristics of silicon nanowire arrays, Journal of Applied Physics, Publisher: American Institute of Physics, Volume 111/Issue 4/ARTICLES/ Nanoscale Science and Design, 044328.

Ajayinder Singh Jawanda, Ashish Singh Kapoor, 2008, Non Parametric Design Methodology For Chassis Reinforcements Using Pro-Mechanica, Proceedings of the 3rd National Conference on Recent Developments in Mechanical Engineering. At Mechanical Engg. Dept. Thapar University. Patiala, Nov 14 -15, 2008, P277-301.

The major area of current research includes development of open architecture control based tool paths for sculptured surfaces using STL, MACROs for B-rep in CAD. The development of a real time intelligent CNC controller with a virtual machinist. OpenGL based machining simulator for quality assessment and controller feedback. Use of CAD CAE sw for optimum design of machine elements. Development of MACROs for CAD-CAM tool path generation automation.

Ongoing/recently completed sponsored research projects and thesis

MACRO based gouge free tool path generation from B-rep model for freeform sculptured surface model.

STL based tool path generation for freeform sculptured surface model.

OpenGL based graphical machining simulator development with topology quality feedback

CAE based mechanical design analysis and optimization.

3D scanner based real-time quality control of CNC machining of sculptured surfaces.

Research facilities available

Conventional CNC machining centers 2Axis, 3Axis.

SPM CNC Lathe-Mill wood working machines for sculpturing.

3D blue light scanner – Artec Spider.

ProEngineer/ Creo 5.0, ProMachining, ProNC, SolidWorks 2009, ANSYS 15, CAD CAM CAE s/w.

Graphics Workstations for reverse engineering.

Sponsors for research and infrastructure projects:

State Initiated Design Centre for Ornamental Wood Working System by Ministry of Textile, Government of India.

FIST-II for 3D scanner by Department of Science and Technology, Government of India

Major areas for consultancy services:

CAD CAM CAE implementation.

Mechanical design automation and optimization using software.

Robotics applications.

CNC machining of freeform surfaces.

Design and Manufacturing review for a mechanical product.

Specific scopes of services

CAD software automation using MACROs

CAE based optimization of mechanical systems

Design review of mechanical systems

Use of CAD CAM technologies for a product line

Reverse Engineering

Review design and manufacturing for a part production quality control

Review of CAD CAM CAE technologies for use in an industry

Mr. Sumeet Sharma



Associate Professor

Pursuing PhD, Thapar University, Patiala.

Research interests

Waste heat recovery.

Internal Combustion Engines

Heat exchangers.

ssharma@thapar.edu

Ongoing/recently completed sponsored research projects and thesis

Thermal energy storage systems.

Thermophysical properties of nanofluids.

Environmental control of underground duct.

Mr. Supreet Bhullar



Associate Professor and In-charge of Laboratory for Industrial Engineering

Pursuing PhD, Thapar University, Patiala.

Research interests

Knowledge Economy

Reverse Logistics

Material Requirements Planning

sbhullar@thapar.edu

The area of current research includes knowledge economy, reverse logistics and MRP systems. The research in knowledge economy is directed towards building a model of government-academia-industry collaboration architecture in the manufacturing sector to bring about a complementary and synergistic agglomeration of the resources leading to high innovation intensity. Other areas of research include an assessment of the reverse logistics system of Lead Acid Battery Manufacturing units in North India in order to affect an optimized material planning and consumption of lead as input to battery manufacturing units, an assessment of the efficiency and effectiveness of MRP system in manufacturing companies.

Ongoing/recently completed sponsored research projects and thesis

Reverse Logistics.

MRP Systems.

Capacity Planning.

Technology Transfer .

Major areas for consultancy services:

Work Study.

Material Requirements Planning Systems.

Industry-Academia collaboration .

Specific scopes of services

Productivity improvement in the manufacturing and service sector.

Assessment and improvement of methods of shop floor operations in manufacturing sector.

Optimizing material planning and consumption through MRP systems.

Evaluate/design critical aspects in Government-Academia-Industry collaboration in the manufacturing sector, within the knowledge economy framework .

Dr.Vinod Kumar Singla



Associate Professor and In-charge of Laboratory for Non-Traditional Machining Methods

PhD, Thapar University Patiala, 2009

Research interests

Non-traditional machining Methods

Conventional manufacturing processes

vsingla@thapar.edu

Selected References

Anish kumar, Vinod kumar, Jatinder kumar, Multi response optimization of process parameters based on Response surface methodology for pure titanium using WEDM process, International Journal of Advanced Manufacturing Technology, Springer publishers, DOI 10.1007/s00170-013-4861-9, 68:2645-2668 (SCI Expanded), Impact factor: 1.779

Anish kumar, Vinod kumar, Jatinder kumar, Experimental investigation of material transfer mechanism in WEDM of pure titanium (Grade-2), Advances in Materials Science and Engineering, Vol.2013, Article ID: 847876, PP.1-20, DOI: 10.1155/2013/847876, Hindawi Publishers (SCI Expanded)

Anish kumar, Vinod kumar, Jatinder kumar, Surface integrity and material transfer investigation of pure titanium for rough cut surface after wire electro discharge machining, Proceedings of the Institution of Mechanical Engineers, Part B, Journal of Engineering Manufacture, SAGE publications, (Published online, December 2013), DOI:10.1177/0954405413513013, PP 1-22, (SCI Expanded).

The major area of current research includes WEDM of pure titanium used in aerospace industries, heat exchangers etc. The details of preliminary investigations and finalization of working range of WEDM process parameters were explored. The main experimentation using Box-Behnken Design approach and optimization of WEDM process parameters using RSM with desirability approach was done.

Ongoing/recently completed sponsored research projects and thesis

Optimization of process parameters for improvement in material characteristics in abrasive blasting process.

Investigation of machining parameters and surface integrity in wire electric discharge machining of pure titanium.

Multi response optimization of process parameters based on Response surface methodology for pure titanium using WEDM process.

Research facilities available

Electric discharge machine.

Laser beam set up.

Abrasive blaster.

Sponsors for research and infrastructure projects:

All India Council for Technical Education (AICTE), New Delhi

Dr. Tarun Nanda



Assistant Professor and In-charge of Laboratory for Metrology Lab

PhD, Thapar University, 2011

Research interests

Industrial Metallurgy

Composite Materials

tarunnanda@thapar.edu

Selected References

EFFECT OF ISOTHERMAL ANNEALING ON MICROSTRUCTURAL MORPHOLOGY OF MARTENSITE IN A SUPER MARTENSITIC STAINLESS STEEL SUBJECTED TO DIFFERENT PRIOR CONDITIONS (in press)

The major area of current research includes development of alloys especially multiphase steels & stainless steels for improved strength and ductility combination. Development of polymer epoxy based nanocomposites for improved physical and mechanical properties.

Ongoing/recently completed sponsored research projects and thesis

Effect of Inter-critical Annealing Parameters on the Recrystallization, Austenite Formation and Stabilization in a Dual Phase Steel.

Fabrication and Property Evaluation of a Epoxy-Clay-PET Nanocomposite System.

Inter-critical Annealing of a Lean Composition Steel under Controlled Cooling to Produce Multiphase Microstructure .

Research facilities available

Profile Projector.

Roughness Tester.

Measuring Microscope.

Specific scopes of services

Roughness Testing of machined components.

Profile measurements through profile projector, tool maker's microscope etc.



Assistant Professor and In-charge of CAD Lab

PhD, Thapar University, Patiala, 2014

Research interests

Non-Destructive Testing using active and passive techniques for testing civil and mechanical infrastructural components.

sksharma@thapar.edu

Selected References

Sharma S., Mukherjee A.,
Damage detection in submerged plates using ultrasonic guided waves- SAD-HANA - Academy Proceedings in Engineering Sciences -DOI 10.1007/s12046-014-0255-4

Sharma S., Mukherjee A., A Non-Contact Technique for Damage Monitoring in Submerged Plates Using Guided Waves- Journal of testing and evaluation- ASTM-DOI 10.1520/JTE20120357

Sharma S., Mukherjee A., Ultrasonic guided waves for monitoring corrosion in submerged plates- STRUCTURAL CONTROL AND HEALTH MONITORING-DOI 10.1002/stc.1657

The major area of current research includes modelling gas-solids flows of fine powders through pipelines. This research has wide industrial applications – in thermal power stations, cement, chemical, petrochemical , food, pharmaceutical plants etc. Specific areas of research include modelling and scale-up validation of solids-gas friction, flow regimes and minimum transport boundary. Studies in areas on nanofluid technology include modelling thermo-physical properties and improving suspension stability of nanofluids.

Ongoing/recently completed sponsored research projects and thesis

Health Monitoring of submerged Naval Vessels using wave propagation techniques.

Ultrasonic guided wave approach for monitoring setting and hardening of concrete.

Detection of corrosion by acoustic emission and ultrasonic techniques.

Research facilities available

DPR 300 Pulser Receiver System with Peak to peak voltage 475 Volts.

Ultrasonic probes (contact and immersion types).

Acoustic Emission setup .

Sponsors for research and infrastructure projects:

Department of Science and Technology, Government of India.

Naval Research Board .

Major areas for consultancy services:

Nondestructive testing of civil and mechanical infrastructural components by employing Ultrasonic and Acoustic emission techniques .



Assistant Professor

PhD, Thapar University, Patiala, 2012

Research interests

Finite Element Methods

Polymer Nano Composites

jsaini@thapar.edu

Selected References

Baljeet Singh, Daljeet Singh, Jaswinder Singh, 2012, A New Method to Design Cam used in Automobile Heating, Ventilating and Cooling System, Journal of the Institution of Engineers (India), Series C; (Springer Publication), 93 : 275-286.

Manjeet Singh, Daljeet Singh, Jaswinder Singh, 2013, Dynamic Analysis of Condenser Assembly of Automobile Air Conditioning System using CAE Tools, Journal of the Institution of Engineers (India), Series C; (Springer Publication), 94: 135-145.

Chandan Singh, Jaswinder Singh, Accurate and Fast Algorithm for the Plotting of Contours using Eight-Node Quadrilateral Meshes, Journal of the Institution of Engineers (India), Series B; (Springer Publication) (in-press)

The major area of current research includes the preparation and analysis of pinned joints using fiber reinforced composites with the addition of different nanoparticles.

Ongoing/recently completed sponsored research projects and thesis

Mechanical Properties of Clay/TiO₂ Epoxy Hybrid Nanocomposites.

Wear Testing of Hybrid Epoxy Nanocomposites.

Investigation on the Mechanical Properties of TiO₂/SiO₂ Epoxy Hybrid Nanocomposites.

Failure analysis of pin jointed unidirectional glass-epoxy nanoclay laminated composite.

Research facilities available

Compression Moulding Machine

Universal Testing Machine

Wear Testing Machine.

Sponsors for research and infrastructure projects:

Department of Science and Technology, Government of India.

Major areas for consultancy services:

Analysis using Finite Element Methods.
Polymer Nano Composites.

Specific scopes of services

Design and Analysis using Finite Element Methods.

Preparation and analysis of Polymer Nano Composites.

Dr. S.S.Mallick**Assistant Professor and In-charge of Laboratory for Bulk Solids and Particulate Technologies**

PhD, University of Wollongong, Australia, 2010

Research interests

Gas-solids flows

Bulk solids handling, storage and conveying

Nanofluid technology

ssmallick@thapar.edu

Selected References

Setia, G. and Mallick, S.S., 2014, Modelling fluidized dense-phase pneumatic conveying of fly ash, Powder Technology (in-press)

Mittal, M., Mallick, S.S., Wypych P., 2014, Investigation into pressure fluctuations for dense-phase pneumatic conveying of powders, Particuology (in-press)

Setia, G., Mallick, S.S., Wypych P., 2014, On improving solid friction factor modelling for fluidized dense-phase pneumatic conveying systems, Powder Technology, 257: 88-103

Mallick, S.S., Mishra A., Kundan L., 2013, An investigation into modelling thermal conductivity for alumina-water nanofluids, Powder Technology, 233: 234-244

Setia, G., Mallick, S.S., Wypych P., Pan R., 2012, Validated scale-up procedure to predict blockage condition for fluidized dense-phase pneumatic conveying systems, Particuology, 11: 657-663

My group's research interests are focused on modelling gas-solids flows of fine powders through pipelines. This research has wide industrial applications – in thermal power stations, cement, chemical, petrochemical, food, pharmaceutical plants etc. Specific areas of research include modelling and scale-up validation of solids-gas friction, flow regimes and minimum transport boundary. Studies in areas on nanofluid technology include modelling thermo-physical properties and improving suspension stability of nanofluids.

Ongoing/recently completed sponsored research projects and thesis

Modelling solids friction and minimum transport boundaries for pneumatic conveying of fine powders.

Investigation into pressure fluctuations during gas-solids transport.

Study for flow regime transition during gas-solids transport.

Modelling deaeration and rheological characteristics of bulk solids.

On improving thermal conductivity and stability of nanofluids.

Research facilities available

Pilot plant for pneumatic conveying.

Deaeration chamber.

Powder and suspension rheology tester.

Thermal property analyzers for solids and powder suspensions.

High speed digital camera.

Powder Flow Tester (under procurement).

Sponsors for research and infrastructure projects:

Department of Science and Technology, Government of India.

Council for Scientific and Industrial Research, Government of India.

Major areas for consultancy services:

Pneumatic conveying of bulk solids.

Solids-gas transport within industries.

Ash handling systems in power plants.

Specific scopes of services

Pilot-plant testing (pneumatic conveying) of bulk solids.

Evaluation dense-phase pneumatic conveyability of bulk solids.

Prediction of pressure drop, blockage and pick-up velocity for industrial pneumatic conveying systems.

Deaeration, rheological testing and characterization of bulk solids.

Optimization of pneumatic conveying systems.

Design review of pneumatic conveying systems.

Design review of ash handling systems in power plants.

Design and troubleshooting of industrial pneumatic conveying systems.

**Assistant Professor**

PhD, IIT Kharagpur, India, 2011

Research interests

Vehicle Dynamics

Robotics and Control

Process Dynamics

tkbera@thapar.edu**Selected References**

Bhattacharya A., Bera T. K. and Thakur A., "On Cutter Deflection Profile Errors in End Milling: Modeling and Experimental Validation", *Materials and Manufacturing Processes*, Taylor and Francis (ISSN 1042-6914 (Print), 1532-2475 (Online)) (Accepted).

Tathgir S., Bhattacharya A., and Bera T. K., "Influence of current and shielding gas in TiO₂ flux activated TIG welding", *Materials and Manufacturing Processes*, Taylor and Francis (ISSN 1042-6914 (Print), 1532-2475 (Online)) (Accepted).

Bhattacharya A., Bera T. K. and Suri V.K., "Influence of Heat Input in Automatic GMAW: Penetration Prediction and Microstructural Observation", *Materials and Manufacturing Processes*, Taylor and Francis (ISSN 1042-6914 (Print), 1532-2475 (Online)) Vol. 29, No. 10, pp. 1210-1218, 2014.

Bhattacharya A., and Bera T. K., "Development of Automatic GMAW Setup for Process Improvements: Experimental and Modeling Approach", *Materials and Manufacturing Processes*, Taylor and Francis (ISSN 1042-6914 (Print), 1532-2475 (Online)) Vol. 29, No. 8, pp. 988-995, 2014.

The major area of current research includes modelling, simulation and control of different components of vehicle. This research has wide industrial applications – in automotive sector. Specific areas of research include modelling and simulation of variable camber mechanism, semi active suspension, inverse vehicle dynamic model, electrical power steering etc. Studies in areas on robotics include modelling of hybrid manipulator and obstacle avoidance of mobile robots.

Ongoing/recently completed sponsored research projects and thesis

Design and Control of Intelligent Autonomous Vehicle.

Design, development and control of Hybrid manipulator.

Inverse kinematics and obstacle avoidance of vehicle.

Dynamic Analysis and Control of Semi active Suspension System for a Heavy Vehicle.

Performance Analysis of Antilock Braking System for a Vehicle with Camber and Fork Angle .

Research facilities available

Computing facilities with SYMBOLS software for Bond Graph modelling of different systems.

Sponsors for research and infrastructure projects:

University Grants Commission, Government of India

Major areas for consultancy services:

Vehicle Dynamics

Robotics

Machining Dynamics

Dynamics in Welding

Specific scopes of services

Modelling and simulation of systems residing in any domain.



Assistant Professor and In-charge of Advanced Measurements Laboratory

PhD, Indian Institute of Technology Kanpur, 2014

Research interests

Incremental Sheet Metal Forming, Rapid Prototyping, Fused Deposition Modeling
Conventional and Non-Conventional Machining, Welding

Modeling of Manufacturing Systems, Process Modeling and Finite Element Analysis

abhattacharya@thapar.edu

Selected References

Bhattacharya, A., Bera, T.K., Thakur, A., 2014, On cutter deflection profile errors in end milling: modeling and experimental validation, *Materials and Manufacturing Processes*, available online DOI: 10.1080/10426914.2014.973598.

Tathgir, S., Bhattacharya, A., Bera, T.K., Influence of current and shielding gas in TiO₂ flux activated TIG welding, *Materials and Manufacturing Processes*, available online DOI: 10.1080/10426914.2014.973591

Bhatt, G., Batish, A., Bhattacharya, A., Experimental Investigation of Magnetic Field Assisted Powder Mixed Electric Discharge Machining, *Particulate Science and Technology – An International Journal*, available online, DOI:10.1080/02726351.2014.968303.

Bhattacharya, A., Bera, T.K., Development of Automatic GMAW Setup for Process Improvements: Experimental and Modelling Approach, *Materials and Manufacturing Processes*, 29(8): 988 – 995.

Gupta, A., Ramagopal, S.V., Batish, A., Bhattacharya, A., Surface Roughness and Profile Error in Precision Diamond Turning of C18000, *Materials and Manufacturing*

My major areas of current research include conventional and non-conventional machining process e.g. vertical milling, precision turning, powder mixed electric discharge machining with and without applying external magnetic field for process improvements etc. Some other current research includes multipass welding of thick plates and process optimization for some special graded ferrous materials, improvement in joint quality using flux activated welding etc. Process modeling and experimental validations for different manufacturing processes for process improvements.

Ongoing/recently completed sponsored research projects and thesis

Improvement in accuracy and mechanical strength of parts fabricated by Fused Deposition Modeling Process.

Process improvements and surface modification in powder mixed Electric Discharge Machining.

Process optimization during Submerged Arc Welding of High Strength Low Alloy steel for mechanical and metallurgical property.

Chain weight reduction for drive chain: experimental and finite element analysis.

Research facilities available

Coordinate Measuring Machine.

Surface Profilometer for contour measurement.

Measuring microscope.

Ultrasonic Flaw Detector.

Metallurgical Microscope.

Fused Deposition Modeling machine.

Spectrometer.

Microhardness tester.

Sponsors for research and infrastructure projects:

Defence Research and Development Organisation (DRDO) , Ministry of Defence, Government of India

University Grants Commission, India

M/s Rockman Industries Ltd. (Hero Honda Group), Ludhiana, Punjab

All India Council for Technical Education (AICTE), New Delhi

Major areas for consultancy services:

Manpower, OEE, cycle time, method studies in production lines of Processing Industry.

Specific scopes of services

Three dimensional geometric and profile measurements.

Metallurgical studies of metallic and non-metallic materials.

Microscopic measurements of features.

Contour measurements of samples.

Measurements of microhardness of metallic and non-metallic materials.

Composition checking of ferrous materials.

Flaw detection by ultrasonic testing method.

Fabrication of any complex three dimensional components (material ABS) by additive layer manufacturing method.

Dr. Satish Kumar



Assistant Professor and In-charge of Laboratory for Fluid Machinery

PhD, Thapar University, Patiala, 2014

Research interests

Solid – liquid flows.

Rheology.

Hydraulic conveying .

satish.kumar@thapar.edu

Selected References

Kumar Satish, Gandhi, B.K., and Mohapatra, S. K. 2014. Performance characteristics of centrifugal slurry pump with multi-sized particulate bottom and fly Ash mixtures, Particulate Science and Technology. 32:366-376.

Kumar Satish, Mohapatra, S. K., and Gandhi, B.K. 2013. Effect of addition of fly ash and drag reducing on the rheological properties of bottom ash, International Journal of Mechanical and Materials Engineering, 8(1): 1-8

Kumar Satish, Mohapatra, S. K., and Gandhi, B.K. 2013. Investigation on centrifugal slurry pump performance with variation of operating speed, International Journal of Mechanical and Materials Engineering, 8 (1): 40-47

The major area of current research includes modeling and simulation of Engineering system, Solid- liquid flows through pipelines. This research has wide industrial applications – in thermal power stations, pump and piping industries. .

Ongoing/recently completed sponsored research projects and thesis

Study of erosion wear for the flow of ash-water slurry

Evaluation of resistance properties of coal-water slurry flowing through local piping fittings

Study of performance of centrifugal slurry pump handling slurry .

Research facilities available

Pilot plant test loop for hydraulic transportation

Rheology Lab

Erosion pot Tester (under procurement)

Commercial computational fluid dynamics software –ANSYS FLUENT .

Sponsors for research and infrastructure projects:

University Grants Commission, India.

Major areas for consultancy services:

Ash disposal in power plants

Rheological characterization of solid – liquid suspension

Computational fluid dynamics

Erosion wear testing

Specific scopes of services

Rheological characterization of solid – liquid suspension like coal, Iron, Zinc, coal ash etc.

Design of Engineering component using CFD

Design review of hydraulic transportation systems in power plants

Investigation of flow characteristics of solid –liquid mixture in pipeline

Dr. Vivek Jain



Assistant Professor

PhD, Indian Institute of Technology Roorkee (IITR), 2012

Research interests

Advance Machining/Micromachining

Composites

Biomedical

vivek.jain@thapar.edu

Selected References

Singh, S., Gupta, D., Jain, V., Sharma, AK. Microwave Processing Of Materials and Applications in Manufacturing Industries: A Review, Journal of Materials and Manufacturing Processes (Accepted). [Publisher: Taylor and Francis, Impact Factor: 1.8]

Kapil Kumar Goyal, Vivek Jain and Sudha kumari, "Optimization of cutting parameters for surface roughness of stainless steel SS304 in abrasive assisted drilling, 3rd International Conference on Materials Processing and Characterisation (ICMPC 2014), Procedia Material Science (2014), Elsevier

Vivek Jain, Apurbba Kumar Sharma, and Pradeep Kumar, "Recent Developments and Research Issues in Microultrasonic Machining," ISRN Mechanical Engineering, vol. 2011, Article ID 413231, 15 pages, 2011. doi:10.5402/2011/413231. [Publisher: Hindawi]

Vivek Jain, A K Sharma and Pradeep Kumar, "Investigations on Tool Wear in Micro Ultrasonic Machining" Applied Mechanics and Materials Vols. 110-116 (2012), doi:10.4028/www.scientific.net/AMM.110-116.1561, pp. 1561-1566. [Publisher: Trans tech]

The major area of current research includes drilling of bovine bone. Major problems faced during bone drilling were crack initiation, thermal necrosis and burr formation. The current attempt has been made to show the feasibility of bone drilling with non-conventional technique and it's after effect on the bone structure. This research has wide applications in the field of biomedical.

The next area of current research is developing the microchannels for various applications such as MEMS structures, Bio MEMS, Heat Transfer applications and to see their flow behavior using COMSOL software.

Ongoing/recently completed sponsored research projects and thesis

Simulation and Analysis of Flow Through Microchannels Fabricated Using Ultrasonic Micro-Machining.

Investigations of bovine bone drilling using rotary ultrasonic machining.

Feasibility study and their development on Microwave Casting.

Experimental Investigation on Tool Wear during Abrasive Assisted Drilling of Aluminum Matrix Composite .

Research facilities available

COMSOL-Multiphysics Simulation software .

Sponsors for research and infrastructure projects:

Thapar University.

Major areas for consultancy services:

Fabrication of microchannels for heat transfer applications, MEMS and biomedical applications.

Micro-machining of different materials.

Development of metal matrix composites.

Jigs and fixture design and development.

Specific scopes of services

Development of microchannels for different microfluidic devices with quick and economical method.

Feasible solutions for different industrial/manufacturing problems.

Development of new composites for different applications.

Dr. Dheeraj Gupta



Assistant Professor

PhD, Indian Institute of Technology Roorkee, Roorkee, 2012

Research interests

Microwave Materials Processing

Tribology

Surface Engineering

dheeraj.gupta@thapar.edu

Selected References

Dheeraj Gupta, A.K. Sharma, Investigation on sliding wear performance of WC10Co2Ni cladding developed through microwave irradiation, *Wear*, 271 (9-10), 2011, 1642-1650.

Dheeraj Gupta, A.K. Sharma, Development and Microstructural Characterization of Microwave Cladding on Austenitic Stainless Steel, *Surface & Coatings Technology*, 205, 2011, 5147-5155.

Amelia Almeida, Dheeraj Gupta, Carole Loable, Rui Vilar, Laser-Assisted Synthesis of Ti-Mo Alloys for Biomedical Applications, *Materials Science and Engineering: C, Materials Science and Engineering C*, 32, 2012, 1190-1195.

A K Sharma, Dheeraj Gupta, On Microstructure and Flexural Strength of Metal-Ceramic Composite Cladding Developed through Microwave Heating, *Applied Surface Science*, 258, 2012, 5583-5592.

Singh, S., Gupta, D., Jain, V., Sharma, AK. Microwave Processing Of Materials and Applications in Manufacturing Industries: A Review, *Journal of Materials and Manufacturing Processes* (In-Press).

The major area of current research includes enhancement of poor tribological surfaces materials through microwave heating. This research has wide industrial applications – in thermal power stations, hydraulic power plant, automobile, aviation, cement, chemical, petrochemical, food, pharmaceutical plants etc. Specific areas of research include interaction of hardfacing powder with microwave at room temperature, mechanism of heating, surface characterization, simulation etc.

Ongoing/recently completed sponsored research projects and thesis

Microwave alloying of hardfacing metallic particles.

Investigation of metallic materials casting through MHH.

Development of Composite casting.

Research facilities available

Domestic microwave oven.

Microhardness tester.

Tribo tester.

Sponsors for research and infrastructure projects:

Thapar university.

Major areas for consultancy services:

Tribological analysis of industrial components

Enhancement of Surface Properties of poor tribo materials .

Specific scopes of services

Development of components through novel processing route.

Enhancement of surface properties of bulk metallic components through novel route.

Microwave cladding of hardfaced materials on soft target materials

Investigation of slurry erosion behavior of metallic materials .



Assistant Professor & Associated Faculty member for Incubation Centre

PhD (Mechanical), Indian Institute of Science Bangalore, 2013

Research interests

Macro and Nanotribology

Tribological design of machine elements

Synthesis and characterization of Nanomaterials and nanocomposites

hiralal.bhowmick@thapar.edu

Selected References

Bhowmick, H., Majumdar, S.K., and Biswas, S.K., "Influence of physical structure and chemistry of diesel soot suspended in hexadecane on lubrication of steel-on-steel contact", *Wear*, 300 (2013).

Bhowmick, H., Majumdar, S.K., and Biswas, S.K., "Tribology of soot suspension in hexadecane as distinguished by physical structure and chemistry of soot particles". *J. Phy. D: Applied Phys.*, 45 (2012) 175302.

Bhowmick, H., Majumdar, S.K., and Biswas, S.K., "Dry tribology and nanomechanics of gaseous flame soot in comparison with carbon black and diesel soot". *Proc. IMechE Part C: J. Mech. Engg. Sci* 226 (2012) 394-402.

Bhowmick, H., and Biswas, S.K., "Relationship between physical structure and tribology of single soot particles generated by burning ethylene". *Tribology Letter*, 44 (2011) 139-149.

Bhowmick, H., and Biswas, S.K., "Tribology of ethylene-air diffusion flame soot under dry and lubricated contact conditions". *J. Phys. D: Appl. Phys.*, 44 (2011) 485401

Tribology is a generic technology with applications in all industrial sectors, ranging from automotive to MEMS/NEMS devices. My research interest is to explore the multiscale tribological studies. Accordingly, my current research is focused on the tribology of light weight materials, nanocomposites, formulation of novel nanolubricants and machine element design for tribological application. My past research work dealt with a severe problem of tribology degradation in diesel engines, caused due to the presence of combustion generated nanoparticles. Future research works will also include the atomistic and molecular level simulation of tribological phenomena.

Ongoing/recently completed sponsored research projects and thesis

Friction and wear behavior of lamellar structured nanoparticles coated steel.

Behavior of functionalized solid lubricants in metal-metal tribo-contact.

Tribology studies of nanoparticles reinforced metal composite.

Thermal conductivity and stability of nanolubricants.

Erosive wear studies.

Research facilities available

Tribometer (Lab under construction)

SAI Lab & Institute facilities (SEM, AFM, EDS, XRD, NMR, Optical Microscopy, Microhardness testers, moisture contents analyzers, Lubricating oil analyzers, Wear testing machine, profilometers, etc).

Sponsors for research and infrastructure projects:

Thapar University

Major areas for consultancy services:

Reduction of friction and wear in moving elements.

Development of coated surface for friction and wear reduction.

Multiscale surface topography of materials.

Development of novel lubricants.

Specific scopes of services

Micro structural studies and damage analysis of surfaces under tribo-contacts.

Wear mechanisms and friction studies of metals under tribo-contacts.

Particle morphology and concentration effects on the tribological behavior of particle reinforced/ coated materials.

Development of Wear Resistant Light Weight Composites.

Explore the different nanoparticles for the formulation of nanolubricants.

Dr. Ashish Singla**Assistant Professor and In-charge of Mechatronics Laboratory**

PhD, Indian Institute of Technology, Kanpur, 2012

Research interests

Flexible and Redundant Manipulators

Medical/Surgical robots

Applied optimization

ashish.singla@thapar.edu

Selected References

Ashish Singla, Ashish Tewari and Bhaskar Dasgupta, "Command shaped closed-loop control of flexible robotic manipulators".

(Accepted in Journal of Vibration Engineering and Technologies, JVETv4n2-3), 2014.

Amanpreet Singh, Ashish Singla and Sanjeev Soni, 2014, D-H Parameters Augmented with Dummy Frames for Serial Manipulators containing Spatial Links, The 23rd IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN 2014), pp. 975-980, August 25-29, 2014, Edinburgh, Scotland, UK. (DOI: 10.1109/ROMAN.2014.6926379)

Ashish Singla, 2013, High Index Norm Approach: A Redundancy Resolution Scheme For Inverse Kinematics of Redundant Serial Manipulators, Proceedings of 6th International IEEE Conference on Robotics and Mechatronics (ROBMECH-2013), pp. 40-45, Oct 30-31, 2013, Durban South Africa. (DOI: 10.1109/RoboMech.2013.6685489)

Ashish Singla, 2013, Vibration Suppression of a Cart-Flexible Pole System Using a Hybrid Controller, Proceedings of the 1st International and 16th National Conference on 9.5 382, Dec 18-20, 2013, IIT Roorkee, India.

The major area of current research includes modeling, analysis and control of flexible, redundant, modular and medical robots. The current areas of research are related to various industrial applications like – space applications, medical surgery, nuclear plants, automobile and agriculture sector, mining, welding, painting etc. Specific areas of research include modeling, analysis and vibration suppression of flexible systems, design and analysis of modular manipulators, kinematics and dynamics of hybrid manipulators to be used in robot-assisted surgery, and redundancy resolution of serial chains.

Ongoing/recently completed sponsored research projects and thesis

Kinematic modeling of a hybrid manipulator to be used in a robot-assisted surgery.

Extension of DH parameters to hybrid manipulators.

Kinematics, dynamics and design of modular robotic arms.

Influence of Tyre's Dimensional Characteristics on Tyre-Pavement Noise Emission .

Research facilities available

Humanoid acrobatic robot (under procurement)

Eight-Axis Merlyn TRN-1 Modular Industrial Robot Kit (under procurement)

LEGO and Tetrix Kits

Various types of sensors: Color, temperature, position, velocity, acceleration, force, sound, ultrasonic, light, vision etc.

Various types of microcontrollers, universal boards and PLCs.

Various software like Matlab, Mathematica, Solidworks, ProE, Ansys.

Major areas for consultancy services:

Flexible Manipulators: Modeling, control and vibration suppression.

Redundant Manipulators: Task priority, obstacle avoidance, singularity avoidance.

Medical/Surgical robots: Kinematics, dynamics and control.

Modular Manipulators: Design, kinematics and dynamics.

Applied optimization of different processes and mechanisms.

Specific scopes of services

Kinematics and dynamics of multi-body systems.

Modeling and control of flexible, redundant and underactuated systems.

Kinematics and dynamics of hybrid manipulators used in robot-assisted surgery.

Vibration suppression of flexible systems using command-shaping techniques.

Design and analysis of modular manipulators.

Path planning and control of serial manipulators.

Task priority: redundancy resolution for obstacle avoidance, singularity avoidance, minimum torque movement etc.

Optimization of engineering design problems.

Control of linear and nonlinear systems.

Dr. Madhup Kumar Mittal**Assistant Professor**

PhD, Indian Institute of Technology, Roorkee, 2010

Research interests

Solar thermal systems.

Two-phase flow and heat transfer.

Dual fuel internal combustion engine technology.

madhup.mittal@thapar.edu

Selected References

Mittal, M. K. and Varshney, L., "Optimal Thermohydraulic Performance of a Wire Mesh Packed Solar Air Heater". Solar Energy (Elsevier), Vol. 80, No. 9, pp. 1112-1120, 2006.

Mittal, M. K., Varun and Saini, R. P. and Singhal, S. K., "Effective Efficiency of Solar Air Heaters having different types of Roughness Elements on the Absorber Plate". Energy (Elsevier), Vol. 32, No. 5, pp. 739-745, 2007.

Mittal, M. K., Kumar, R. and Gupta, A., "Numerical Analysis of Adiabatic Flow of Refrigerant through a Spiral Capillary Tube". Int. J. of Thermal Science (Elsevier), Vol. 48, No. 7, pp. 1348-1354, 2009.

Mittal, M. K., Kumar, R. and Gupta, A., "An Experimental Study of the Flow of R-407C in an Adiabatic Spiral Capillary Tube". J. of Thermal Science and Engg. Applications (ASME), Vol. 1, No. 4, pp. 1-8, 2009.

Mittal, M. K., Kumar, R. and Gupta, A., "An Experimental Study of the Flow of R-407C in an Adiabatic Helical Capillary Tube". Int. J. of Refrigeration (Elsevier), Vol. 33, No. 4, pp. 840-847, 2010.

The major area of current research includes development of cost effective, high -efficient and eco-friendly solar distillation technology for producing safe drinking water. Apart from providing safe drinking water, this distillation technology has applications in pharmaceutical industry which uses distilled water, mineral water industry, battery water, packed food and cosmetics industry and other many industries which utilize distilled water. The objective of other research area, i.e., dual fuel engine technology is to reduce the consumption of ever decreasing diesel fuel by suitably modifying the engine to run with two fuels, i.e., diesel and producer gas obtained from gasification of waste bio mass.

Ongoing/recently completed sponsored research projects and thesis

Development of cost-effective and eco-friendly technology for water purification with use of solar energy.

Design and fabrication of test prototype solar still to produce distill water using solar energy.

Improving the efficiency of solar still by attaching add on such as solar concentrator and solar pond.

Investigation into combustion and emission characteristics in dual fuel engine.

Research facilities available

Solar concentrator system

Gasifier to produce producer gas

5 kW dual fuel engine system

Smoke analyzer

VCR diesel engine

Pyranometer

Sponsors for research and infrastructure projects:

Department of Science and Technology, Government of India.

Major areas for consultancy services:

Solar Thermal Systems

Refrigeration & Air-conditioning

Two-phase Flow & Heat Transfer

Dual Fuel Internal Combustion Engine

Specific scopes of services

Design and design review of solar thermal systems such as solar still, solar pond, solar air heater, solar water heater and solar refrigeration system

Performance testing of engine with producer gas produced from different types of biomass

Testing of emission characteristics of vehicle

Retrofitting and troubleshooting of refrigeration systems

Dr. Vineet Srivastava



Assistant Professor

PhD, Indian Institute of Technology Delhi (IIT Delhi), 2013

Research interests

Unconventional Machining

Rapid Prototyping

Fabrication and machining of Ceramics

vineet.srivastava@thapar.edu

Selected References

Vineet Srivastava, Pulak M. Pandey. "Statistical modeling and material removal mechanism of electrical discharge machining process with cryogenically cooled electrode", *Procedia Materials Science*, 5 (2014) 2004-2013.

Vineet Srivastava, Pulak M. Pandey. "Study of ultrasonic assisted cryogenically cooled EDM process using sintered (Cu-TiC) tooltip", *Journal of Manufacturing Processes*, 15 (2013) 158-166.

Vineet Srivastava, Pulak M. Pandey. "Experimental Investigation on EDM process with ultrasonic assisted cryogenically cooled electrode", *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, 227(2) (2013) 301-314.

Vineet Srivastava, Pulak M. Pandey. "Effect of process parameters on the performances of EDM process with ultrasonic assisted cryogenically cooled electrode", *Journal of Manufacturing Processes*, 14 (2012) 393-402.

Vineet Srivastava, Pulak M. Pandey. "Performance evaluation of EDM process using cryogenically cooled electrode", *Material and Manufacturing Processes*, 27 (6) (2012) 683-688 .

The major area of current research includes the fabrication of ceramics and using the ceramics as tool and workpiece materials in machining. Further the idea of using ceramics in established unconventional machining processes is being explored. The advent of Rapid Prototyping (RP) has opened new avenues in rapid manufacturing and rapid tooling, hence the application areas of RP is being explored. The integration of reverse engineering and RP is also a future area of exploration in product development field .

Ongoing/recently completed sponsored research projects and thesis

Development of Hybrid system in Electrical Discharge Machining (EDM).

Fabrication of ceramic tooltip to be used in EDM.

Investigation of temperature profile of electrode during EDM.

Integration of ultrasonic vibration in established machining systems .

Research facilities available

Sintering Furnace.

Electrical Discharge Machine.

Rapid Prototyping Machine.

Reverse Engineering Camera.

Sponsors for research and infrastructure projects:

Department of Science and Technology, Government of India

Council for Scientific and Industrial Research, Government of India

Major areas for consultancy services:

Fabrication of tooltips for EDM using ceramics, Design of new processes for super finishing and integration of RP and Reverse Engineering.

Specific scopes of services

Selection of various metals for preparing ceramics, preparing the ceramic, Designing and modifying new super finishing processes like Magnetic Abrasive Finishing (MAF), Ultrasonic assisted MAF etc. and Redesign and development of existing product using RP and RE.

Mr. Ravinder Kumar Duvedi



Assistant Professor and In-charge of Laboratory for Computer Aided Manufacturing

Pursuing PhD, Thapar University, Patiala.

Research interests

Computer Aided Design and manufacturing
Automatic Toolpath Planning for multi-axis CNC machining
Development of NC controllers for ornamental carvings
rduvedi@thapar.edu

Selected References

R.K.Duvedi, H.C. Garg, and V. K. Jadon, "Analysis of Hybrid Journal Bearings for non-Newtonian Lubricants", Published in Journal of Lubrication Science, Wiley Inter Science, Vol. 18. issue 3, , pp. 187-207, July/September 2006.

R.K.Duvedi, Manpreet Singh, and V. K. Jadon, "FEM Analysis for Different configurations of non-recessed hole-entry Hybrid Journal Bearing for non-Newtonian Lubricants- journal of Industrial Lubrication and Tribology, Emerald, U.K, Vol 59, No. 6., pp. 266-277, October, 2007.

Praveen Kumar, Ajay Batish, Anirban Bhattacharya, and R K Duvedi, "Effect of Process Parameters on Microhardness and Microstructure of Heat Affected Zone in Submerged Arc Welding", Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, pp. 711-721, May 2011.

Ravinder Kumar Duvedi, Sanjeev Bedi, Ajay Batish, Stephen Mann, "A multipoint method for 5-axis machining of triangulated surface models", Computer-Aided Design, Elsevier, Vol. 52, pp. 17-26, 2014

The main area of research is the development of toolpath planning algorithms for multi-axis machining of triangulated surfaces which is being carried out under a collaborative research program with University of Waterloo and Thapar University. My recent research activities includes the development of a prototype of a customized PC based CNC controller for 3-axis simultaneous interpolation for ornamental carving of wood and development of an ornamental wood carving NC machine tools for Indian handicraft works. This development work also includes the development toolpath planning algorithms for multi-axis NC machining for various tool shapes and automation of designing of 3D ornamental features and the NC toolpath data for machining using customized web based applications using professional CAD software.

Ongoing/recently completed sponsored research projects and thesis

Development of prototype of Flat Bed 3-axis PC controlled vertical NC milling machine for sculptured surface machining for ornamental wood carving.

Development of methodology for simulation and verification of tool path data for 3-axis and 5-axis CNC machining.

Automatic NC Toolpath Generation for 3D Sculptured Features Extracted from 2D Image.

Controlled Scallop Height Tool Path Generation for 3-Axis Vertical CNC Machining of STL Surfaces.

Methodology for Design and Selection of Components of 3-Axis Granite Carving Machine Tool .

Research facilities available

CNC Turning Center with 8 station ATC.
3-axis milling Lathe for pseudo-symmetrical ornamental carvings.
Coordinate Measuring Machine.

Digital 3D scanner with texture scanning capability.

Custom developed NC tool path planning software for CNC machining of sculptured surfaces.

Sponsors for research and infrastructure projects:

Department of Scientific and Industrial Research (DSIR).

Department of Science and Technology, Government of India.

Ministry of Textiles, Government of India.

All India Council of Technical Education (AICTE).

Major areas for consultancy services:

CNC Machining of sculptured surfaces
Development of CNC machine tools for efficient machining.

Macro enabled automation of CAD systems.

Development of web-based CAD CAM systems for efficient machining of customized ornamental products.

Development of PC based CNC controllers .

Specific scopes of services

CNC machining of sculptured surfaces

Web based automation of customized part designing and toolpath generation for CNC machining

Designing of custom engineered PC based CNC controllers

Development of customized machine tools for CNC machining

CNC machining using customized cutting tools

Efficient CNC machining of sculptured surfaces with controlled machining tolerances

Realizing 3D features from 2D images

Mr. Kishore Khanna



Assistant Professor and In-charge of Solid Mechanics Laboratory

Pursuing PhD, Thapar University, Patiala.

Research interests

Creep in a rotating disc

Composite materials

kishore.khanna@thapar.edu

The major area of current research includes modelling of creep behavior in a thin rotating functionally graded rotating disc of variable thickness. The other area of research includes studying the mechanical behavior of metal matrix composites by varying/ changing the reinforcement material.

Ongoing/recently completed sponsored research projects and thesis

Modelling of creep in a FGM rotating disc of variable thickness.

Study the mechanical behaviour of metal matrix composites (MMCs) processed by stir casting method .

Major areas for consultancy services:

Creep modelling of in a rotating disc.

Mechanical behaviour of metal matrix composites (MMCs).

Mr. Devender Kumar



Assistant Professor

Pursuing PhD, Thapar University, Patiala.

Research interests

Automotive Product Development/improvement

Tungsten Carbide Nano Ceramics

devenderkr@thapar.edu

The major area of current research includes development of new age Tungsten Carbide Nano Ceramics and related refractory materials. This research has wide industrial applications – in cutting tool industry, tool and die manufacturing. Research work also includes studies and experimentation in the field of Automotive Product Development.

Ongoing/recently completed sponsored research projects and thesis

Studies on structural and mechanical properties of Tungsten Carbide Nano Ceramics.

Investigation in the field of passenger comfort, inside a car cabin.

Investigation for reducing heat accumulated inside a car cabin, parked in direct sunlight.

Improvement in passenger safety while driving a car in rain.

Research facilities available

Traffic Noise Sensor.

Air flow meters.

Anemometer.

Major areas for consultancy services:

Automotive Product Development

Driver and Passenger Safety

Improvement of Tungsten Carbide Nano Ceramics .

Mr. Kundan Lal



Assistant Professor and In-charge of Laboratory for Heat and Mass Transfer and Refrigeration and Air Conditioning

Pursuing PhD, Thapar University, Patiala.

Research interests

Heat transfer

Nanofluids technology

kundanlalrana@thapar.edu

Selected References

Mallick, S.S., Mishra A., Kundan L., 2013, An investigation into modelling thermal conductivity for alumina-water nanofluids, Powder Technology, 233: 234-244

Mishra A, Kundan L. Mallick SS, 2014, Modelling thermal conductivity for alumina-water nanofluid, International Journal of Particulate Science and Technology-Taylor Francis, 32 (3), 319-326

The major area of current research includes Studies in areas on nanofluid technology include nanofluids application in refrigerants, transformer oil, solar collectors etc, modelling thermo-physical properties and improving suspension stability of nanofluids.

Ongoing/recently completed sponsored research projects and thesis

Experimental investigation of nanofluids based refrigerants taken in refrigeration cycle

Experimental investigation of nanofluid in solar applications

Investigations on rheological properties of the nanofluids/ fly ash.

Mr. Bikramjit Sharma**Assistant Professor and In-charge of laboratory of computer aided design**

Pursuing PhD, Thapar University, Patiala.

Research interests

Synthesis and characterization of nanocomposites

Finite element modeling and analysis of structures

Environmental degradation of composites

bikramjit@thapar.edu

Selected References

Sharma B, Mahajan S., Chhibber R., Mehta R., 2012, Glass Fiber Reinforced Polymer-Clay Nanocomposites: Processing, Structure and Hydrothermal Effects on Mechanical Properties, Procedia Chemistry, 4, 39-46.

Sharma B., Chibber R., Mehta R, 2011, Layered Silicates in fiber reinforced composites, Research bulletin of Australian institute of high energetic materials, page 106, volume 1.

Ongoing research on a new class of materials called fiber reinforced polymer nanocomposites is aimed at improving mechanical, heat resistance and barrier properties of composites used in aircraft, marine and civil structures. It has been demonstrated that an addition of nanofillers (nanoclays, multiwall carbon nanotubes) in small quantity significantly improved mechanical properties of fiber reinforced composites. Further these materials have better strength retention under hydrothermal loadings. The numerical modeling of epoxy clay nanocomposites based on real mapping of nanostructures, using an object oriented finite element code developed by National Institute of Standards and Technology, has been performed to model the behavior of material under different loading conditions. Finite element model is solved by commercially available solver (ANSYS, ABACUS) under different loading conditions .

Ongoing/recently completed sponsored research projects and thesis

Processing and characterization of fiber reinforced polymer Nanocomposites and their degradation in marine environments (ongoing project).

Synthesis and characterization of epoxy layered silicate fiber reinforced composites.

Finite element analysis of epoxy nanocomposites based on mapping of morphology .

Research facilities available

Vacuum assisted resin infusion molding

High shear homogenizer

Ultrasonic probe .

Sponsors for research and infrastructure projects:

Naval Research Board, Government of India.

Major areas for consultancy services:

Design and fabrication of composites and nanocomposites.

Design of machine elements.

Assessment of degradation in polymer composites due to hydrothermal loads.

Specific scopes of services

Design and fabrication of laminates for wide range of applications.

Computational analysis and design of machine elements.

Failure life prediction of composites under marine conditions .

Mr. Daljeet Singh



Assistant Professor and In-charge of Laboratory for Noise and Vibration

Pursuing PhD, Thapar University, Patiala.

Research interests

Traffic Noise Assessment and Modelling

Application of Graph theory in the area of traffic noise

Stress Analysis / Multibody Dynamics Analysis using CAE tools

daljeet.singh@thapar.edu

Selected References

Singh B., Singh D., Saini J.S., 2012, A New Method to Design Cam Used in Automobile Heating, Ventilating and Cooling System, Journal of The Institution of Engineers (India): Series C, 93: 275-286.

Singh M., Singh D., Saini J.S., 2013, Dynamic Analysis of Condenser Assembly of Automobile Air Conditioning System Using CAE Tools, Journal of The Institution of Engineers (India): Series C, 94: 135-145.

The major area of current research includes traffic noise assessment and prediction modelling for highways and urban roads. This research has wide applications for addressing the prevalent traffic noise problems. Specific areas of research include assessment and modelling of traffic noise on highways and urban roads using different techniques like multiple regression, genetic algorithm, artificial neural networks, graph theory etc. Studies on tire-road interaction noise have also been done using a laboratory set-up. Dynamic analyses of automotive components like the compressor and condenser mounting brackets, HVAC components etc. have been done using CAD/CAE software like ANSYS, Pro-E, Solidworks.

Ongoing/recently completed sponsored research projects and thesis

Modelling of urban traffic noise considering traffic dynamics near roundabouts.

Study of tire-road interaction noise.

Traffic Noise assessment and prediction modelling on highways.

Traffic Noise modelling using the graph theory/MADM approach.

Dynamic analyses of automotive components using CAE tools.

Research facilities available

Electrodynamic shaker for vibration testing.

Sound level meters.

Multi-channel noise and vibration analyzer with accessories.

Noise recording and data logging software.

FFT analysis software.

CAD/CAE software like Pro-E, Solidworks, ANSYS .

Sponsors for research and infrastructure projects:

FIST

Major areas for consultancy services:

Noise and Vibration analysis

Virtual simulation and analyses using CAE tools.

Specific scopes of services

Traffic noise monitoring and prediction modeling.

Acoustic Design of noise barriers.

Multibody dynamics analysis

Stress analyses using FEA.

Dr. Anant Kumar Singh



Assistant Professor

PhD, Indian Institute of Technology Delhi, 2013

Research interests

Magnetorheological Micro and Nanofinishing of 3D External as well as Internal Surfaces

Application of MR-Fluids in Manufacturing

Implementation of Low Cost Automation in Indian Industries

anantsingh@thapar.edu

Selected References

Singh, A.K., Jha S, Pandey, P.M., 2014, A novel ball end magnetorheological finishing process, ASME 2014 International Mechanical Engineering Congress & Exposition, IMECE2014, Montreal, Canada.

Singh, A.K., Jha S, Pandey, P.M., 2013, Mechanism of material removal in ball end magnetorheological finishing process, WEAR, 302: 1180–1191.

Singh, A.K., Jha S, Pandey, P.M., 2013, Rheological behavior of MR polishing fluid in ball end magnetorheological finishing process, Magnetohydrodynamics, 49/3- 4: 512–515.

Singh, A.K., Jha S, Pandey, P.M., 2012, Nanofinishing of a typical 3D ferromagnetic workpiece using ball end magnetorheological finishing process, International Journal of Machine Tools and Manufacture, 63: 21–31.

Singh, A.K., Jha S, Pandey, P.M., 2012, Nanofinishing of fused silica glass using ball end magnetorheological finishing tool, Materials and Manufacturing Processes, 27/10: 1139-1144.

Nano-level surface finishing requirements on the components made of materials with extraordinary properties, complex 3D surfaces and miniature surface features on complex geometries etc. are highly demanded in today's advanced engineering industries. The advanced finishing technologies such as magnetorheological finishing process where forces acting on the workpiece surface during the finishing operation can be controlled through external magnetic field. Owing to this, components can be finished with close tolerances and without damaging surface topography. The applications of the advanced finishing technologies can be useful in industries such as die and mold manufacturing, automotive, aerospace, semiconductor and optics machining etc.

Patents filed

A process of generating magnetically controlled ball end smart abrasive laden shape for finishing of 3D intricate shaped surfaces", 394/DEL/2010.

"An improved magnetorheological finishing apparatus for stable, scalable and continuous finishing application", 2611/DEL/2011

Ongoing/recently completed sponsored research projects and thesis

Nanofinishing of 3D External as well as Internal Surfaces Using Magnetorheological Fluids .

Research facilities available

Computer controlled magnetorheological micro and nanofinishing setup.

Setup for synthesizing the different magnetorheological fluids.

Modern Industrial Automation Lab.

Sponsors for research and infrastructure projects:

Thapar University.

Major areas for consultancy services:

Micro and Nanofinishing of 3D External as well as Internal Surfaces

Application of magnetorheological fluids in machine tool design

Nano-level finishing of fused silica glass as well as very precise components

Solving the various complex industrial problems by using low cost automation approach.

Provide trainee modules for industries people about low cost automation.

Specific scopes of services

Micro and nano level finishing component surfaces without damaging surface topography.

Finishing of the irrespective surface geometries.

Finishing of ferromagnetic, diamagnetic and paramagnetic materials.

Provide mirror like surface finishing.

Development of finishing processes as per the need Industries.

Synthesis of various magnetorheological fluids as per their needs.

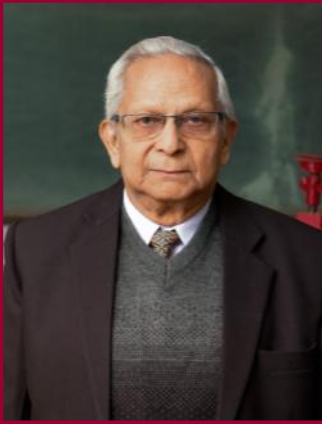
Provide low cost automation solution to solve various day to day industrial problems.

Provide trainee for industries people about latest development in technologies in the field of automation.

Interfacing the hardware with software for automation in modern manufacturing applications.

Design and simulation of various logic circuits on software for different automating processes in manufacturing systems.

Dr. S.P.Nigam



Visiting Professor

PhD, University of Roorkee, Roorkee, 1976

Research interests

Human Body Vibration studies and Modeling

Traffic Noise

Industrial Noise Control

spnigam@thapar.edu

Selected References

"Aerodynamic analysis of Cabriolet passenger car: A design approach" presented on 1-3 April 2013 in 17th Asia Pacific Automotive Conference by SAE, Thailand at Bangkok, Thailand (published in SAE transactions 03/25/2013 TSAE -13 -AP-0037).

"An analytical study on human body vibration for Indian subjects under sitting posture" presented at 5th International Conference on Whole Body Vibration Injuries held on 5th to 7th June 2013 in Amsterdam, Holland.

"A comparative study of various methods for identification of isomorphism in kinematic chains" Proc of 1st International and 16th National Conference on Machines and Mechanisms (iNaCoMM 2013, IIT Roorkee, India, 18-20, Dec 2013 pp 582-588.

"Vehicular traffic noise modeling using artificial neuron network approach" Journal of Transportation Research Part-C, Emerging Technologies U.K. v40 March 2014, pp111-122

The major area of current research includes modeling of Traffic Noise and studies on Human Body Vibration Models under standing and sitting postures.

Ongoing/recently completed sponsored research projects and thesis

A Non-linear Optimization Technique for the Design of a Compact Spur Gear Set.

Development of bio-dynamic models for a seated/standing human body subjected to harmonic vibrations.

Analysis of creep in a variable thickness rotating disc made of functionally graded composite.

Analysis and modeling of traffic noise around roundabouts.

Major areas for consultancy services:

Noise and Vibrations.

Research facilities available

Sound level meters and filter sets for Noise measurements.

Vibration shaker table and exciter.

Dr. V. P. Agarawal



Visiting Professor

PhD, Indian Institute of Technology Delhi, 1983

Research interests

Design of machine elements.

Nanotechnology.

Graph theory.

vpagrawal@thapar.edu

Ongoing/recently completed sponsored research projects and thesis

Optimization of waste heat energy systems.

Generic industrial automation systems.

Bearings and lubrications.

Optimization of manufacturing processes.

Mr. Atul Sharma



Lecturer

Pursuing PhD, Thapar University, Patiala.

Research interests

Pneumatic conveying of Bulk solids in process industries and power plants.

Flow pattern visualization in pneumatic conveying pipelines.

atul.sharma@thapar.edu

Selected References

Tripathi, N., Sharma, A., Mallick, S.S., and Wypych, P.W., 2015, Energy loss at bends in the pneumatic conveying of fly ash , Particuology, available online, DOI: 10.1016/j.partic.2014.09.003

My research focus on modelling multi-phase flow through bends for pneumatic conveying of powders. Some of the industries in which bulk materials are conveyed include agriculture, power plant, cement, mining, chemical, pharmaceuticals, paint manufacture, and metal refining and processing. Specific area of research include pneumatic conveying of fly ash and cement to minimize the transport losses and to improve the system throughput efficiency. The analysis of flow patterns in a pneumatic conveying line.

Mr. Gurpreet Singh Saini



Lecturer

Pursuing PhD, YMCA University of Science and Technology, Faridabad

Research interests

Machine Design

Composite Material

gurpreetsingh@thapar.edu

Selected References

Gurpreet Saini, Gaurav Gera, Rajender Kumar 'Improvement of Operational Efficiency of Equipment through TPM: A case study'. International Journal of Industrial Engineering Research and Development

The major area of current research includes Fabrication and experimental analysis of Aluminum composites using particle reinforcement and optimization of process parameters.

Mr. Arvind Kumar Kaushal



Lecturer

Pursuing PhD, Thapar University, Patiala.

Research interests

Solar distillation

Internal combustion engines

Non-conventional energy sources

arvind.kumar@thapar.edu

The major area of research currently is in design and development of floating wick basin type vertical multiple effect diffusion solar still with waste heat recovery. It has worldwide application in geographical areas which lack drinking water and conventional energy sources.

Major areas for consultancy services:

Solar distillation.

Specific scopes of services

Feasibility studies.

Calibration of stills .

THAPAR UNIVERSITY

Thapar University is a premier educational and research institute located in the 250-acre lush green campus in the historic city of Patiala. It came into existence in 1956 as an engineering college named Thapar Institute of Engineering and Technology. The institute was granted full autonomy and status of a Deemed University in 1985 by the University Grant Commission. Thapar University is today recognized as leading privately managed Engineering institutions of the country and the best of its kind in the north-western region of India. The aim of the University is to provide high quality technical education at the under- and post-graduate level and to conduct fundamental and applied research in various fields of science, engineering and management. The University offers academic programs: undergraduate, post graduate and doctorate degrees at various disciplines. Since its inception, the University has grown in size and activities with its alumni excelled within the industry, academics and administration both in India and abroad.



Contact

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