M BRIJ BHUSHAN   Curriculum Vitae

CONTACT
INFORMATION

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EDUCATION

Doctor of Philosophy (PhD) in Mechanical Engineering   **Feb 2018 - present**
Massachusetts Institute of Technology, Cambridge, MA, United States

Master of Science in Mechanical Engineering (SMME)   **Aug 2015 - Feb 2018**
Massachusetts Institute of Technology, Cambridge, MA, United States

- Cumulative Graduate GPA: **5.0/5**

Bachelor of Technology - Mechanical Engineering   **Aug 2008 - Jul 2012**
Indian Institute of Technology (IIT) Madras, Chennai, Tamil Nadu, India

- Cumulative Grade Point Average (CGPA): **9.54/10**
- Professional Minor: Operations Research

PUBLICATIONS &
CONFERENCES

C.D. Edington, W.L.K. Chen, E. Geishecker, T. Kassis, L.R. Soenksen, **B. M. Bhushan**, et al., Interconnected Microphysiological Systems for Quantitative Biology and Pharmacology Studies, Sci. Rep. 8 (2018) 4530. doi: 10.1038/s41598-018-22749-0.

R. Vairamuthu, **Brij M. Bhushan**, R. Srikanth, N. Ramesh Babu, Performance Enhancement of Cylindrical Grinding Process with a Portable Diagnostic System, Procedia Manufacturing, Volume 5, 2016. doi: 10.1016/j.promfg.2016.08.103.

Subramanian K, Jain A, Rajagopal V, **Bhushan B. M.**, Tribology as an Enabler for Innovation in Surface Generation Processes. ASME International Mechanical Engineering Congress and Exposition, Volume 15: Advances in Multidisciplinary Engineering (2015). doi:10.1115/IMECE2015-52952.

Rao, P.K.; **Bhushan, M. B.**; Bukkapatnam, S.T.S.; Zhenyu Kong; Byalal, S.; Beyca, O.F.; Fields, A; Komanduri, R., Process-Machine Interaction (PMI) Modeling and Monitoring of Chemical Mechanical Planarization (CMP) Process Using Wireless Vibration Sensors, IEEE Trans. on Semiconductor Manufacturing, vol.27, no.1, pp.1, 15-Feb-2014. doi: 10.1109/TSM.2013.2293095.

PATENTS

- PCT/US2018/023411 (Application): Modular Organ Microphysiological System with Microbiome

- US 16/400,840 (Application): Pumps and Hardware for Organ-on-Chip Platforms

RESEARCH
PROJECTS

Energy efficient electromagnetic diaphragm pumps   **Aug 2017 - present**
Guides: *Prof. David L. Trumper, Dept. of Mech. Engg., MIT*

- Developed an energy efficient, bi-stable teeter-totter actuator. It utilizes permanent magnet latching, flux biasing and contact springs for diaphragm deflection.
- Demonstrated proof of concept pumping and valve sealing. Currently working miniaturizing the actuators and integrating them into a platform.

Human Physiome on a Chip   **Aug 2015 - Aug 2017**
Guides: *Prof. David L. Trumper, Prof. Linda G. Griffith, Dept. of Mech. Engg., MIT*

- Worked in the hardware development team to design and manufacture platforms to grow multiple in vitro human Microphysiological systems (MPSs).
- MPSs emulate physiological behavior of in vivo organ function through use of specialized culture microenvironments, including 3D matrices and microperfusion.
- Hardware consists of on-board pneumatic pumps, scaffolds and organ wells, fluid levelling features and oxygentators for maintianing physiological oxygen concentration.
- Successfully demonstrated 10-MPS interactions studies on a single platform.

A diagnostic tool for in-process monitoring of grinding   **Jan 2012 - Jul 2015**
Guides: *Prof. N Ramesh Babu, Dept. of Mech. Engg., IIT Madras &*
Dr. K (Subbu) Subramanian, President, STIMS Institute, USA

- Developed a diagnostic tool to monitor grinding power and axes position.
- Deployed in industry for process diagnostics and optimization, utilized in more than 50 cases.
- Utilized as an educational tool for IMTMA system approach to grinding course. (2012-14)
- Developed a business model of Grinding Process Solutions (GPS), based on the process expertise gained through applications in discrete-part precision grinding in the industry.)

Vibration modeling of the CMP process **May-Jul, 2010**
Guides: Prof. Satish T Bukkapatnam & Prof. Ranga Komanduri
Dept. of Mechanical and Aerospace Engg., Oklahoma State University, Stillwater, OK, USA

- Developed a two-degree of freedom, deterministic, non-linear model in Simulink to capture the physical sources of CMP vibrations to explain various process features observed in practice.
- Conducted experiments on a Buehler grinder-polisher to further develop and verify the model.
- The model explains some characteristic non-linear, dynamic behaviour observed in experimental vibration signals from the CMP process.

PROFESSIONAL
EXPERIENCE

Assistant Manager (R&D) **Aug 2012 - Jul 2015**
Micromatic Grinding Technologies Limited (MGTL), Bangalore, India

- Hired through an innovative program for advanced technology development leading to identifiable commercial impact in less than 24 months.
- Worked on core technology, process know-how, new product development, education and training.
- Led a team of 4 people for new solution development and knowledge integration.

Summer Intern **May - Jul 2011**
ITC Ltd., Guntur, India

- Accomplished an annual cost saving of about ₹1 million by applying a systems approach of study to analyze the steam and compressed air usage patterns in the plant and suggested improvements based on the best practices in industry.
- Redesigned the entire compressed air distribution layout to meet the future increase in demand.

Summer Research Intern **May - Jul 2010**
Oklahoma State University (OSU), Stillwater, OK, USA

Developed a Process-Machine Interaction (PMI) model for vibration in the Chemical Mechanical Planarization (CMP) process.

TEACHING
EXPERIENCE

2.737 Mechatronics (MIT) **Fall-2018**

- *Responsibilities:* Preparing lab setups, running the lab sessions, conducting lab check-offs and grading of lab-reports, holding office/lab hours.
- *Overall Rating:* **7.0/7.0**

2.14 Analysis and Design of Feedback Control Systems (MIT) **Spring-2018**

- *Responsibilities:* Preparing lab setups, running the lab sessions, conducting lab check-offs and grading of lab-reports, holding office hours, grading Problem Sets.
- *Overall Rating:* **6.8/7**

HONORS &
AWARDS

- Banco foundation prize for the best academic record (Rank: 1st) in the Mechanical Engineering 2008 batch (B-Tech & Dual Degree) of 115 students at IIT Madras. **2012**

- O P Jindal Engineering and Management Scholarship (OPJEMS), awarded to 1 student in every batch for academic and leadership excellence. **2010 & 2011**

- Todai-IIT undergraduate scholarship for academic excellence. **2010 & 2011**

SKILLS

Mechanical Engineering: Machine design with focus on mechatronics, design and analysis (FEA, GD&T, FMEA), manufacturing and prototyping.
Programming Languages: C, C++, HTML, LaTeX, Python, Numpy, Scipy, Julia, Open CV, CNC (FANUC, Siemens)
Software applications: MATLAB, AutoCAD, ProE, Ansys, Autodesk Inventor, Mathematica, Fusion 360, , LabVIEW (*CLD cert.*), Solidworks, Simulink

VOLUNTEER
EXPERIENCE

- President of Westgate Community Association, a family residence hall at MIT.
- Member of the Graduate Student Council - a graduate student representative govering body at MIT.
- Organizing de-stress and meditation sessions with the YesPlus Club at MIT
- Member of iREFS team at MIT - as a confidential peer resource for fellow students during times of uncertainty, stress or conflict.

For more information, please visit: mbrijbhushan.com