

Md Ataul Haque

OPTICS & MECHANICAL ENGINEER

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Professional Summary

Optics Engineer specializing in optical component manufacturing, process optimization, and advanced metrology. Demonstrated expertise in setting up advanced manufacturing workflows, from 5-axis CNC machining of optomechanical fixtures to Single Point Diamond Turning (SPDT) and polishing of ultra-precision optics. Successfully enhancing and improving process capability, reducing defects, and enhancing optical performance through data-driven analysis and rigorous measurement techniques. Adept at supporting production, qualification, and continuous improvement initiatives across the full manufacturing lifecycle.

Core Competencies & Technical Skills

- **Optical Fabrication & Testing:** Single Point Diamond Turning (SPDT), Precision Optical Polishing, Form & Figure Characterization, Optical/Mechanical Profilometry, Interferometric Metrology (Fizeau/Phase-shifting)
- **Manufacturing & Machining:** 5-Axis CNC Machining (Milling & Turning), Machine Calibration, Tooling & Fixture Design, Optomechanical mount design and manufacturing.
- **CAD / CAE / CAM:** SolidWorks, Autodesk Inventor, Fusion 360, AutoCAD (2D/3D), Ansys, MATLAB.
- **Quality & Data Analytics:** CMM Operations, Quality Control (QA/QC), Predictive Analytics, SAP, Tolerancing (GD&T).
- **Soft Skills:** Cross-functional Collaboration, Project Management, Technical Documentation (LaTeX), Client Communication.

Education

Master of Science Research (M.S.R) in Instrument Technology (Parttime) | 2023-2026

Indian Institute of Technology (IIT Delhi), New Delhi, India

Focus Area: Advanced Ultra-Precision Optics Manufacturing and Optomechanical Metrology.

Bachelor of Technology (B.Tech) in Mechanical Engineering | 2017-2021

Krishna Engineering College (Dr. A.P.J. Abdul Kalam Technical University), Ghaziabad, India

Professional Experience

Indian Institute of Technology (IIT Delhi), New Delhi

Project Associate – Centre of Excellence (CoE) in Ultra-Precision Optics | [March 2023] – Present

- **CoE Establishment & Operations:** Playing a pivotal role in establishing and scaling the Centre of Excellence for advanced ultra-precision optics manufacturing technologies, bridging academic research with defense and space industry requirements.
- **Ultra-Precision Fabrication:** Operating Single Point Diamond Turning (SPDT) machines and precision optical polishing systems to fabricate plano, spherical, aspheric, Freeform, Diffractive and Various optical components across various substrates (IRG, metals, IR materials).
- Precision optical polishing of flat optics using Chemical Mechanical Polishing (CMP) to achieve super-finished surfaces with sub-nanometre roughness under tight control of surface roughness and form error.

- **Advanced Metrology Integration:** Conducted comprehensive form, figure, and surface characterization using mechanical/optical surface profilers, and interferometric metrology (measuring sub-nanometer peak-to-valley accuracies and sub-surface damage).
- **Optomechanical Engineering:** Hands-on operation and programming of 5-axis CNC machining centers (milling & turning) to design and manufacture complex optomechanical mounts, fixtures, and customized tooling required for precise optical system integration and characterization using Coordinate Measuring Machines (CMM)
- **Process Optimization:** Executed process optimizations, machine calibrations, and closed-loop figuring workflows (feeding metrology data back into manufacturing parameters) to significantly enhance manufacturing repeatability, yield, and production readiness for industry-collaborated projects.

Venture Scientific Pvt. Ltd. Okhla Industrial Area, New Delhi

Production Engineer | August 2021 –Feb 2023

- **Production & Process Management:** Supervised daily mechanical and instrument manufacturing processes, ensuring high-quality output while adhering to strict environmental, health, and safety (EHS) guidelines.
 - **Project Lifecycle Execution:** Assessed project scope, translated technical requirements into accurate design determinations, and formulated comprehensive project execution plans.
 - **Quality Assurance & Troubleshooting:** Spearheaded root-cause analysis on the production line, diagnosing electromechanical and manufacturing bottlenecks; implemented corrective actions and delivered training to technicians to reduce defect rates.
 - **Equipment & Resource Management:** Managed the ongoing calibration, maintenance, and safe storage of highly sensitive test and measurement equipment.
 - **Cost & Data Tracking:** Maintained rigorous records of cost analyses, material quantities, and engineering deliverables, ensuring projects were delivered on time and within budgetary constraints.
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Research & Industrial Projects

- **Large-Size Precision Mirror Fabrication and Validation:** Managed the end-to-end fabrication cycle of large-aperture mirrors 600 mm, custom setup for metrology for spot detection during fabrication surface characterization. Optimized fabrication parameters to enhance yield, minimize subsurface damage, and meet stringent optical performance requirements for space telescope applications. Integrated Finite Element Analysis (FEA) to evaluate and mitigate stress generation during machining and fixturing, ensuring dimensional stability and preserving optical surface integrity throughout the fabrication process.
 - **Intelligent Modeling & Optimization of Ultra-Precision Machining for Space Optics:** Developed predictive models combining MATLAB and CAD to optimize toolpath generation and cutting parameters in SPDT, minimizing mid-spatial frequency errors for space-grade mirrors.
 - **Ultra-Precision IOL (Intraocular Lens) Master Mold Fabrication:** Engineered high-precision Mold prototypes using ultra-precision machining techniques, adhering to strict surface roughness and form error required for medical/ophthalmic devices.
 - **Predictive Quality Analytics for Surface Roughness in CNC Turning:** Extracted and analyzed FANUC CNC controller data to build predictive models for surface roughness, correlating machine vibration and spindle speeds to final product quality.
 - **LOS (Line of Sight) Stabilization Mirror Fabrication and Characterization:** Designed, machined, and optically tested fast-steering mirrors, balancing lightweight optomechanical design with dynamic rigidity for stabilization systems. Validated custom fixture designing and
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Certifications & Specialized Training

- ✓ Open House Technology Demonstration – *IIT Delhi*
 - ✓ Special Training Program in Optics Design – *IIT Delhi*
 - ✓ Additive Manufacturing & Evaluation – *IIT Delhi*
 - ✓ Certified Associate in Project Management (CAPM) – *SkillUp*
 - ✓ AutoCAD & SolidWorks Masterclasses – *Udemy*
 - ✓ Advanced Excel & Data Analytics – *Elearnmarket*
 - ✓ The Fundamentals of Digital Marketing – *Google Inc.*
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Accomplishments & Extracurriculars

- ✓ **Leadership & Service:** Active NSS (National Service Scheme) Volunteer; demonstrated commitment to community development.
 - ✓ **Global Recognition:** Awarded the *International Youth Fellowship Award* during undergraduate studies.
 - ✓ **Academic Excellence:** Recipient of the *Gyan Ratana Award* for ranking as School Topper.
 - ✓ **Extracurricular:** Gold Medallist in Carom Board at the collegiate level, showcasing focus and strategic thinking.
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Languages

- ✓ English (Professional Working Proficiency)
- ✓ Hindi (Native/Bilingual Proficiency)
- ✓ Urdu (Reading & Writing)