Sean Thomas, Ph.D.

(582) 203-9192 | 90024, Los Angeles, USA | sean.thomas@ucla.edu | linkedin.com/in/seanthomasphd | sean-thomas.org

Summary

Mechanical design engineer with a PhD and 9+ years of hands-on experience designing compact, high-performance electromechanical systems—from implantable devices to robotic actuators. Expert in 3D CAD (SolidWorks), FEA (Abaqus/ANSYS), GD&T, tolerance analysis, and DFM/DFA for complex assemblies. Proven track record bringing hardware from first-principles concept through fabrication, supplier review, test validation, and design-to-production release. Skilled at integrating sensors, electronics, and mechanical structures in space- and mass-constrained systems, with hands-on Python and data-driven analysis to close the design loop.

Skills

Mechanical Design & Hardware Engineering: 3D CAD modeling (SolidWorks), Advanced GD&T, Tolerance analysis, DFM/DFA, Compliant mechanisms, Plastic injection molding design, Sheet metal part design, Die-cast part design, Medical device product development, Early-stage R&D, IP generation & patent support

Analysis & Verification: Finite Element Analysis (FEA: implicit/nonlinear, static, modal, stiffness/deflection), Topology optimization, Tolerance stack-up, Design verification & validation (V&V), Biomechanical testing, Benchtop & fatigue testing, Additive manufacturing

Computational & Embedded: Python, MATLAB, OpenSim, Machine learning / Optimization algorithms, Numerical modelling, PCB design, CAM (G-code), Embedded systems & advanced motor control

Integration & Systems: Sensor design & integration, Electronics-mechanical co-design, Electromechanical assembly design, Human–robot interaction, Preclinical & cadaveric testing, Cross-functional collaboration with clinicians and product engineers

Professional Experience

ANATOMICAL ENGINEERING GROUP   **University of California, Los Angeles, CA, USA**
Research Scientist (Mechanical Design)   *March 2025 – Present*

- Designed and iterated compact implantable orthopedic hardware (bone anchors, load-bearing mechanisms) in SolidWorks from concept through cadaveric test validation, applying GD&T and tolerance analysis throughout.
- Performed DFM reviews and worked iteratively with fabrication partners to refine part geometries in plastic, metal, and composite materials for prototype and pre-production builds.
- Conducted robotic cadaveric testing with a 6-DOF manipulator, applying physiological load profiles and quantifying device performance; used Python for data analysis and statistical reporting.
- Collaborated with surgeons and clinical engineers to translate lab prototypes into clinically relevant, producible designs—bridging requirement definition, benchtop validation, and preclinical test planning.

NEUROMECHANICS LABORATORY   **The Pennsylvania State University, PA, USA**
Research Scientist   *March 2024 – March 2025*

- Designed a biomimetic robotic hand orthosis using parametric SolidWorks modeling and FEA-driven optimization to replicate tendon–joint mechanics within strict size and mass constraints.
- Performed structural FEA and tolerance stack-up analyses to validate assembly fit and mechanical performance prior to fabrication release.
- Integrated EMG sensors, actuators, and signal-processing electronics into a compact wearable enclosure; developed test protocols and data workflows to evaluate control robustness and functional outcomes.

MUSCLE FUNCTION + LOCOMOTION LAB   **The Pennsylvania State University, PA, USA**
Research Scientist, Innovation Fellows Program   *March 2022 – March 2025*

- Designed and built benchtop and in vivo implantable artificial muscle prototypes, integrating shape memory alloy actuators, embedded sensors, and control electronics in highly constrained anatomical envelopes.
- Led IP development and invention disclosures, producing detailed engineering drawings, tolerance specifications, and material call-outs to support patent filings and commercialization.
- Translated first-principles biomechanics models into scalable hardware concepts, validated through in vivo animal testing and iterative design refinement.

INTEGRATED ACTUATORS LABORATORY   **EPFL, Switzerland**
Doctoral Scholar   *September 2017 – January 2022*

- Designed a flexure-based bistable SMA gripper for clean-room automation: developed 3D CAD models, performed FEA for stiffness and fatigue, produced 2D drawings with full GD&T, and validated through fabrication and test cycles.
- Built an ultra-lightweight drone gripper using AI-assisted topology optimization in Abaqus to maximize strength-to-weight;

applied DFM principles to enable additive and CNC manufacture.

- Designed a mechanically intelligent inchworm robot integrating compliant mechanisms and SMA actuation; performed thermal–mechanical FEA and tolerance analysis to achieve repeatable, low-power locomotion in constrained environments.
- Applied physics-based modeling and topology optimization to SMA actuator geometries, improving force density, thermal response, and fatigue life—reducing design iteration time through simulation-driven development.
- Engineered precision sensors for a maglev motor bearing (PPE suit system), reducing friction and vibration through tight tolerance design and sensor integration.

HUMAN ROBOTICS GROUP   **Imperial College London, UK**
Master's Research Thesis, Prof. Etienne Burdet   *October 2016 – March 2017*

- Designed and implemented a joint-impedance measurement system for rehabilitation exoskeletons; developed experimental protocols and data analysis tools to quantify human–robot interaction dynamics.

ONWARD MEDICAL   **Lausanne, Switzerland**
R&D Engineering Intern   *July 2016 – October 2016*

- Prototyped mechanical components for a clinical rehabilitation robot; supported system-level integration of actuators, sensors, and control hardware within regulatory and translational constraints.

Education

PhD in Robotics, Control and Intelligent Systems   **Jan. 2022**
Swiss Federal Technology Institute of Lausanne (EPFL)   Lausanne, Switzerland
"Synthesis of Novel Integrated Actuators Powered by Shape Memory Alloys"

Master of Science in Robotics and Autonomous Systems   **Mar. 2017**
Swiss Federal Technology Institute of Lausanne (EPFL)   Lausanne, Switzerland

Bachelor of Science in Micro-Engineering   **Mar. 2015**
Swiss Federal Technology Institute of Lausanne (EPFL)   Lausanne, Switzerland

Patents & Selected Publications

- U.S. Provisional Application No. 63/919,151 "Implantable Device for Musculoskeletal Rehabilitation" (2025)
- U.S. Provisional Application No. 63/864,668 "Implanted Brace Devices, Methods, and Systems" (2025)
- European Patent "Ep4026659 - microgripper device." (2021)
- IOP *Smart Materials and Structures*: "Design and Modelling of a Flexure-based Bistable Gripper Powered by Shape Memory Alloys" (2025).
- IEEE *Transactions on Industry Applications*: "Fabrication and Characterization of the Kirigami-Inspired SMA-Powered Actuator" (2023).
- IEEE/RSJ *IROS Proceedings*: "An Implantable Variable Length Actuator for Modulating in-vivo Musculo-Tendon Force in a Bipedal Animal Model" (2023).

Honors & Grants

- Selected Fellow, Center for Medical Innovation Fellows Program, Penn State Huck Institute of Life Sciences (2024).
- Best Poster Award, Annual Postdoctoral Research Symposium, Penn State University (2023).
- Innosuisse Grant Writer (Awarded), sensorless SMA actuator for manufacturing (2022).
- Innosuisse Lead Grant Writer (Awarded), smart grippers based on shape memory alloys (2018).