

# Hayden Taylor

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## Professional experience

### University of California, Berkeley

Jul 2020 – present Associate Professor (with tenure), Mechanical Engineering.  
Jan 2014 – Jun 2020 Assistant Professor, Mechanical Engineering.

### Nanyang Technological University, Singapore

Jan 2012 – Dec 2013 Assistant Professor, Mechanical and Aerospace Engineering. Manufacturing Engineering Division.

### Singapore–MIT Alliance for Research and Technology

Oct 2010 – Dec 2011 Postdoctoral Research Fellow, BioSystems and Micromechanics Research Group.

### Simprint Nanotechnologies Limited

Jul 2010 – Jul 2022 Founder. The company commercialized my PhD thesis work to produce software for nanoimprint lithography process development.

### Massachusetts Institute of Technology

Jul 2009 – Sep 2010 Postdoctoral Associate, Microsystems Technology Laboratories.  
Jun 2005 – Jun 2009 Graduate Research Assistant, Microsystems Technology Laboratories.  
Sep 2002 – May 2003 Undergraduate research project: layout modelling for MEMS etching.

### Owlstone Limited, Cambridge, UK

Jun–Aug 2004 Design of an ionization source for integration with a MEMS ion-mobility spectrometer.

### Cambridge University Engineering Department, UK

Aug–Sep 2003 Research Assistant in optical microsystems design: developed a beam-bending technique for determining Young's modulus of micrometre-thickness films.

### ST Microelectronics, Bristol, UK

Sep 1999 – Jul 2000 Pre-university internship developing fast cache memory designs for system-on-chip integrated circuits. The summers of 2001 and 2002 were spent working in the same group. Was sponsored through undergraduate education by ST.

## Education

### 2004 – 2009 Massachusetts Institute of Technology

- Ph.D. in Electrical Engineering and Computer Science. GPA 5.0/5.0.
- Thesis advisor: Duane Boning. Thesis title: *Modeling and controlling topographical nonuniformity in thermoplastic micro- and nano-embossing.*
- Minor in Sustainable Energy, completed May 2006.

### 2000 – 2004 Cambridge University, UK (Trinity College)

- B.A. and M.Eng. in Electrical and Electronic Engineering.
- M.Eng. project supervised by D.F. Moore. Project title: *Beam-based MEMS Structures.*
- Part IA, June 2001: class I (within the top 5 of ~250 candidates).
- Part IB, June 2002: class I (within the top 5 of ~250 candidates).
- Third year (2002–3) spent on exchange at MIT: GPA 5.0/5.0.
- Part IIB, June 2004: Distinction (ranked highest in Electrical and Electronic Engineering). Baker Prize.

## Research interests

The unifying objective of my research is processing technology innovation and process-aware design that enables industrial decarbonisation through lower use of materials and energy. My research programme is organised in three themes: (1) Multiscale additive manufacturing, focused on materials and computation for the energy-efficient, volumetric light-based manufacturing process of Computed Axial Lithography that I invented; (2) Materials for sustainable construction, including concrete-polymer composites, experimental approaches to low-cost air conditioning, and an envisioned approach to integrating direct air capture of CO<sub>2</sub> into buildings; (3) Contact mechanics for environmentally benign semiconductor manufacturing, in particular nanoimprint lithography, chemical-mechanical planarization, and mechanical exfoliation and transfer of 2D materials.

## Teaching experience

- 2021-present **Manufacturing and Design Communication (Engineering 29)**. I conceived, designed, and delivered this new core course for Berkeley Mechanical Engineering undergraduates that encompasses concepts of visualization, sketching, orthographic projection, manufacturing process technology, and geometric dimensioning and tolerancing. This course combines the content of E27 with that of another prior course, E25. It retains and expands the teamwork and design project from E27.
- Fall 2020 **Electronics for The Internet of Things (ME100)**. I expanded the experimental coverage of fundamental electronic circuit operation in this core laboratory course for Mechanical Engineering undergraduates. This is the introductory course on electronics, microcontrollers, sensors and actuators for our students. I redesigned the laboratory kit for remote learning and delivered the course entirely remotely.
- 2015-2020 **Introduction to Manufacturing and Tolerancing (Engineering 27)**. I developed and delivered this new core lower-division undergraduate engineering class. The class was laboratory-intensive and included a project in which teams designed and prototyped a product, deploying principles of tolerancing and manufacturing process selection. Students worked in the Jacobs Institute for Design Innovation.
- 2015, 2017, 2018 **Processing of Materials in Manufacturing (ME122)**. I redesigned this UC Berkeley upper-division undergraduate elective, to create a semester-long mechanical design project focused on material and process selection.
- 2014, 2017, 2019 **Nanoscale Processing of Materials (ME203)**. I designed and introduced this UC Berkeley Mechanical Engineering graduate elective, which I originally taught under the title **Topics in Manufacturing: Lithography (ME290R)**. The class surveys micro- and nano-scale patterning techniques. Students engage in a semester project to invent or analyze a lithographic technique or review the state of the art in a particular topic relating to lithography.
- 2018, 2020 **Manufacturing Field Trips (Design Innovation 97)**. I introduced and ran this elective class in the UC Berkeley Jacobs Institute of Design Innovation. It introduces students to manufacturing industry in the San Francisco Bay Area with a series of site visits followed by written reflection.
- 2021, 2013 **Materials Selection and Design**. Nanyang Technological University (NTU) undergraduate elective. I lectured the material in this course on materials properties and selection principles.
- 2012, 2013 **Manufacturing Processes**. I was a tutorial (discussion section) instructor for this NTU undergraduate core course on the physical principles of manufacturing processes.
- 2008 **Control of Manufacturing Processes**. I was the sole teaching assistant for this MIT graduate subject, 6.780J, focused on statistical process control.
- 2007 **Quantitative Physiology: Cells and Tissues**. I was a teaching assistant for this MIT laboratory course, 6.021J, and contributed to designing a laboratory project on microfluidic cell-trapping.
- 2006 **Micro- and Nano-Fabrication Laboratory**. I was a teaching assistant for this MIT laboratory course, 6.152J. I designed new laboratory projects and teaching manuals.
- Jan 2012 – present During my career I have mentored to a successful graduation six PhD students and 10 Master of Science students. I have advised 15 postdoctoral scholars/fellows in Berkeley and Singapore, 22 MEng capstone project students at Berkeley, 13 final-year undergraduate project students at Nanyang Technological University, and over 75 undergraduate researchers at Berkeley, many of whom have obtained graded credit for their research in the group.

## Professional service and membership (selected)

Various service periods between 2005 and present	Referee for the following journals: <i>Nature Communications</i> ; <i>Advanced Materials</i> ; <i>Nature Microsystems and Nanoengineering</i> ; <i>Applied Physics Letters</i> ; <i>Journal of Applied Physics</i> ; <i>PLOS One</i> ; <i>Microsystem Technologies</i> ; <i>Chemical Industry and Chemical Engineering Quarterly</i> ; <i>Lab on a Chip</i> ; <i>Journal of Materials Processing Technology</i> ; <i>ASME Journal of Micro and Nano-Manufacturing</i> ; <i>Journal of Fluids</i> ; <i>Journal of Vacuum Science and Technology B</i> ; <i>International Polymer Processing</i> ; Institute of Physics <i>Nanotechnology</i> ; <i>Journal of Cleaner Production</i> ; <i>IEEE Transactions on Nanotechnology</i> ; <i>Journal of Measurement Science and Technology</i> ; <i>Journal of Micromechanics and Microengineering</i> ; <i>Journal of Multiphase Flow</i> ; <i>Sensors</i> ; <i>Advances in Mechanical Engineering</i> ; <i>Nanomaterials</i> ; <i>Nanomaterials and Nanotechnology</i> ; <i>Semiconductor Science and Technology</i> ; <i>Industrial and Engineering Chemistry Research</i> ; <i>Journal of Materials Research</i> ; <i>Applied Electronic Materials</i> ; <i>ASME Journal of Micro/Nanopatterning, Materials, and Metrology</i> ; <i>Materials Research Express</i> .
2019 – present	Editorial Board member for the Institute of Physics journal <i>Engineering Research Express</i> .
2021 – present	Associate Editor of the journal <i>Smart Manufacturing</i> .
2022 – present	Editorial board member, <i>Scientific Reports</i>
2019, 2021, 2022	National Science Foundation review panel member and proposal reviewer.
2021 – present	Editorial Board member, Conference on Micro- and Nano-devices enabled by R2R Manufacturing.
2018 – present	Program committee member, SPIE Microfluidics, BioMEMS, and Medical Microsystems Conference.
2017–18	Expert witness for the U.S. International Trade Commission Investigation 337-TA-1046: Certain Non-volatile Memory Devices and Products Containing Same. Gave a deposition and testified at trial.
2014–16	Program committee member, Nanoimprint and Nanoprint Technology Conference.
2011–13	Institution of Engineering and Technology, Singapore Local Network: committee member 2011–13; Honorary Secretary 2012–13; Chair of the local Young Professionals’ network 2012–13. Organized the Asia-Pacific regional final of the IET’s global “Present Around the World” competition, a two-day event held in August 2012 to find the best technical presentation by an under-26-year-old.
2011–12	Reviewer of research proposals for the Romanian Executive Agency for Higher Education, Research, Development and Innovation Funding.
2007–2010	MIT Microelectromechanical Systems (MEMS) Center: organized MEMS Lunch seminar series.
2001–2020	Associate (2004) and student (2001) member, Institute of Physics.
2001 – present	Member (2011) and student member (2001), Institute of Electrical and Electronics Engineers.
1999 – present	Member (2011) and student member (1999), Institution of Engineering and Technology.

## Awards and honors

2021	Extraordinary Teaching in Extraordinary Times award, U.C. Berkeley
2019	Highly Commended in both the Manufacturing Technology and Emerging Technology Design categories, Institution of Engineering and Technology Innovation Awards, London.
2018	Hellman Faculty Fellowship, U.C. Berkeley
2018	Signatures Innovation Fellowship, U.C. Berkeley
2018	Faculty Fellow, NSF–IUSE <i>Transforming STEM Teaching</i> program
2018	MIT Research Slam, MIT Club of Northern California, Stanford, CA, second prize
2015	Regents’ Faculty Fellowship, University of California, Berkeley.
2009	Software in Design prize at the Institution of Engineering and Technology Innovation Awards.
2009	Semi-finalist in both the MIT and Rice University business plan competitions.
2004	Kennedy Scholarship (~10 Kennedy Scholarships are awarded annually, for attendance at Harvard or MIT. Endowed as part of the British national memorial to President Kennedy).
2004	Institution of Civil Engineers Baker Prize (Cambridge University Engineering Department).
2001–2004	Examination Prizes (Trinity College, Cambridge).
2002	Second-year Computing Prize (Cambridge University Engineering Department).
2001	Senior Scholarship (Trinity College, Cambridge).
2001	First-year Conceptual Design Prize (Cambridge University Engineering Department).
2001	First-year Structural Design Prize (Cambridge University Engineering Department).
2001	Shell Language Prize (Cambridge University Engineering Department).
2000–2004	Jubilee Scholarship (Institution of Electrical Engineers, UK); one of ~10 nationally per year.
2000–2004	Undergraduate sponsorship (STMicroelectronics).
2000	Prize for Communication Skills (Year in Industry Contribution to the Business Awards).
1999	Recognizing Achievement Award; one of 27 awarded nationally by the UK’s OCR exam board.