

Kathryn A. Wingate
Instructor
Ann and H.J. Smead Aerospace Engineering Sciences
University of Colorado, Boulder
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I. EARNED DEGREES

Degree	Year	University	Field
Doctor of Philosophy	2013	University of Colorado Boulder	Mechanical Engineering
Master of Science	2011	University of Colorado Boulder	Mechanical Engineering
Bachelor of Science	2005	University of Illinois at Urbana-Champaign	Mechanical Engineering
Bachelor of Science	2005	University of Illinois at Urbana-Champaign	Astronomy

II. EMPLOYMENT HISTORY

Title	Organization	Years
Instructor	University of Colorado Boulder AES	8/18- current
Academic Professional	Georgia Institute of Technology ME	5/14-6/18
Adjunct Instructor	Georgia Institute of Technology ME	8/13-5/14
Graduate Student	University of Colorado Boulder ME	1/09-8/13
Graduate Part Time Instructor	University of Colorado Boulder ME	8/11-12/11
PM&P Engineer II	Northrop Grumman Space Technology	12/06-1/09
Manufacturing Engineer	Northrop Grumman Space Technology	6/05-12/06

III. HONORS AND AWARDS

- WIE Teaching Excellence Award, Georgia Institute of Technology, Spring 2016
- Thank A Teacher Certificate, CETL, Georgia Institute of Technology, Spring 2015, Spring 2016
- ARCS Scholarship, University of Colorado at Boulder, 2012-2013.
- Leadership Development Program, Northrop Grumman Space Technology, 2007-2009. 20 employees selected out of 11,000.

IV. TEACHING

A. Courses Taught

Semester, Year	Course Title	Number of Students	FCQ Score
Coursera Ongoing	Machine Design MOOC	> 6000	NA
AES, University of Colorado Boulder			
Fall 2018	Statics (ASEN 2001)	261	4.8/6
Fall 2018	Senior Projects (ASEN 4018)	24	NA
Fall 2018	Grad Projects (ASEN 5018)	10	NA
ME, Georgia Institute of Technology			
Spring, 2018	Machine Design (ME 3180)	80	4.9/5
Spring, 2018	Capstone Design (ME 4182)	30	4.9/5
Spring, 2017	Machine Design (ME 3180)	65	4.9/5
Spring, 2017	Capstone Design (ME 4182)	30	5/5
Fall, 2016	Capstone Design (ME 4182)	36	4.9/5
Spring, 2016	Capstone Design (ME 4182)	36	4.9/5
Spring, 2016	Machine Design (ME 3180)	82	4.9/5
Fall, 2015	Machine Design (ME 3180)	63	5/5
Fall, 2015	Capstone Design (ME 4182)	36	4.8/5
Summer, 2015	Creative Design (ME 2110)	50	4.9/5
Spring, 2015	Machine Design (ME 3180)	60	4.9/5
Spring, 2015	Capstone Design (ME 4182)	36	5/5
Fall, 2014	Machine Design (ME 3180)	55	4.9/5
Fall, 2014	Creative Design (ME 2110)	50	4.7/5
Spring, 2014	Machine Design (ME 3180)	55	4.9/5
Fall, 2013	Machine Design (ME 3180)	40	4.9/5

B. Course Instruction and Development of Instructional Materials

University of Colorado Boulder, Department of Aerospace Engineering and Sciences

ASEN 2001 (Statics)

- Developed and delivered all lectures, assignments, and exams for first half of lecture portion of sophomore statics course.
- Managed team of 6 TAs and CAs to oversee exam and lab grading, office hours.

PAB Member, ASEN 4018 (Senior Projects)

- Serving as PAB member, acting as design reviewer for CDD, PDR, CDR, MMR, and TRR for teams
- Advising two teams of students: one designing a child scout rover to traverse rough forest terrain and determine a safe path, another designing a IR thermal imaging system for use inside a small satellite.

Advisor, ASEN 5018 (Grad Projects)

- Advising a team of students designing the payload, power system, and bus of small robotic spacecraft which will land on an asteroid, dig on the

asteroid, and launch asteroid regolith off the asteroid surface.

Coursera

Machine Design Part 1, Massive Open Online Lecture.

- Developed all lecture material, exams, worksheets, and industry case studies for machine design course. Due to copyright constraints, created many new figures for static and fatigue failure.
- Collaborated with Georgia Tech C21U to create and produce high-quality online videos of lecture material for Coursera platform. Oversaw course roll-out and engaged with students in discussion forum.
- Course went live Fall 2016, and features a new session every 4 weeks. As of Summer 2017, course has a rating of 4.8 stars out of 5, and over 11,000 active learners.

Georgia Institute of Technology, GWW School of Mechanical Engineering

ME 4182 Capstone Design

- Mentored six student teams each semester on wide variety of industry, student, and university sponsored design projects, including cube satellites, crane hoisting devices, and biomedical implants.
- Stressed the importance of detailed requirement development and trade studies. Required design validation through prototyping, analysis, and test. Held several mini lectures on report writing, citation software, and trade studies within section.
- Arranged for each student team to have one to two external reviewers with expertise in the design project attend three formal design reviews throughout the semester: System Requirements Review (SRR), Preliminary Design Review (PDR) and Critical Design Review (CDR).
- Constructed detailed grading rubrics for SRR, PDR, and CDR reports and presentations, which implemented critical milestones for students throughout the semester.
- Developed and delivered lecture on design validation through analysis and test for entire ME and inter-disciplinary capstone class (>300 students per semester).

ME 3180 Machine Design

- Created all lectures, exams, and homework per ABET standards. Topics included material selection, static failure theories, fatigue failure theories, shaft, bearing, gear, spring, and fastener analysis.
- Developed multiple in-class industry case studies, including material selection in a total hip implant, equivalent stresses in a Boeing 777 wing, and spring design in a ram air turbine.
- Reached out to industry contacts at GM and Zimmer, and negotiated gratis donations of two automatic transmission cutaways and one total hip implant for use in course
- Designed two homework assignments in which students utilize a GM

automotive transmission cutaway to calculate torque transmission, shaft life, and study bearing selection.

- Invited guest speakers from GM and Northrop Grumman to give lectures on complex system design, such as an automatic automotive transmission or the James Webb Space Telescope.
- Implemented an active learning exercise where students dissect hand held cordless drills and analyze planetary gear train ratios, torque speed curve, and component mounting.

C. Interdisciplinary Teaching Activities

Georgia Institute of Technology ME 4182 Capstone Design:

- Mentored the following interdisciplinary capstone teams:
- Team Alpha Medical, BME and ME students, designed a device for loading stem cells into a cannula.
- Team RECONSO, comprised of ME students that worked with a number of other student teams in AE, ME, and EE to design a cube satellite for space debris observation.
- Team Leo Laser, comprised of ME students that worked with AE students and faculty to design a cube satellite with deployable sun shield for Lockheed Martin and Australia CERC. Lockheed was so impressed with the final design that they sponsored the team to present at the Advanced Maui Optical and Space Surveillance Technologies Conference in Fall 2017.

D. Service on Thesis Committees

- John F Papayanopoulos, *Autonomous UAV Precision Pickup*. Defended MS in Dec 2017. (advisor: Prof. Jon Rogers)

V. RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITIES

A. Refereed Publications and Submitted Articles

a. Published and Accepted Journal Articles

- K. Wingate, M. Floren, Y. Tan, T. Tseng, C. Ou, and W. Tan, Synergism of matrix stiffness and vascular endothelial growth factor on mesenchymal stem cells for vascular endothelial regeneration. *Tissue Engineering Part A*, September 2014, 20(17-18): 2503-2512.
- K. Wingate, W. Bonani, Y. Tan, S.J. Bryant, W. Tan, Compressive elasticity of three-dimensional nanofiber matrix directs mesenchymal stem cell differentiation to vascular cells with endothelial or smooth muscle cell markers, *Acta Biomaterialia*, Volume 8, Issue 4, April 2012, Pages 1440-1449, ISSN 1742-7061.

b. Conference Presentation with Proceedings (Refereed)

- K. Wingate, A. Ferri, S. Kinney. The Impact of the Physics, Statics, and Mechanics Sequence on Student Retention and Performance in Mechanical Engineering. Talk. ASEE Annual Conference and Exposition, Salt Lake City UT, June 2018.
- J. Dixon, J. DiPrete, J. Green, C. Healy, W. Underwood, I. Wittenstein, K. Wingate, M. Holzinger, L. Smith. Preliminary CubeSat Design for Laser Remote Maneuver of Space Debris at the Space Environment Research Centre. Advanced Maui Optical Space Surveillance Technologies Conference, Maui, HI, September 2017.
- K. Wingate, R. Kadel, A. Madden. Utilizing a MOOC to assess student understanding of fundamental principals in combined static loading. Talk. ASEE Annual Conference and Exposition, Cleveland, OH, June 2017.
- K. Wingate, Y. Tan, W. Tan. The effects of mechanical and chemical stimuli on paracrine signaling and functional endothelial differentiation abilities of mesenchymal stem cells. Poster Presentation. ASME Bioengineering Conference, Bend, OR, June 2013.
- K. Wingate, Y. Tan, R. Nemenoff, W. Tan. The combined impact of VEGF-A growth factor and matrix stiffness on mesenchymal stem cell differentiation towards endothelial cells. Poster Presentation. ASME Bioengineering Conference, Fajardo, Puerto Rico, June 2012.
- K. Wingate, D. Scott, W. Bonani, W. Tan. Hydrogel nanofiber stiffness influences mesenchymal stem cell spreading and vascular differentiation in

3D matrix. Poster Presentation. Biomaterials Symposium, Orlando, FL, April 2011.

- K. Wingate, W. Bonani, S. LaNasa, W. Tan. Vascular graft design: the impact of nanofiber elasticity on mesenchymal stem cell differentiation and spreading. Talk. MRS Bio-Nano Materials Conference, Denver, CO, October 2010.

B. Other Publications and Creative Products

- Wingate, Kathryn. Machine Design Part 1 MOOC, Coursera, Fall 2016- present. Online Machine Design course developed and implemented on Coursera platform. 5-week course covers static and fatigue failure. Over 12,000 active learners worldwide as of Summer 2017.

C. Presentations

- **Keynote Speaker, Tea with the Dean, Fall 2016. Women in Engineering, Georgia Institute of Technology.** Annual event hosted by WIE and the Dean of Engineering for undergraduate and graduate females. Delivered talk on strategies to survive Georgia Tech and succeed upon graduation.
- **Mechanical and Nuclear Engineering: Engineering Career Conference. Fall 2017, Fall 2016, Fall 2015. Women in Engineering, Georgia Institute of Technology.** Conference hosted by WIE recruiting high school girls to engineering at Georgia Tech. Delivered talk on mechanical and nuclear engineering curriculum, opportunities at Georgia Tech, and career possibilities.
- **Undergraduate Research Opportunities. Spring 2016, ASME, Georgia Institute of Technology.** Delivered talk on opportunities and importance of undergraduate research in GWW School of Mechanical Engineering to undergraduate students.
- **Strategies for Industry. Society of Women Engineers (SWE) Region D Conference, Spring 2016.** Delivered talk on strategies for industry promotions, such as results and deliverable focused-presentations, tactics for impressing upper management, and the importance of high level mentors.
- **Closing the Gender Pay Gap: How do I achieve equal pay throughout my career? Fall 2015, Society for Women Engineers, Georgia Institute of Technology.** Served as panelist, discussing negotiation strategies, work life balance, and methods for advancement in the workplace.
- **Resume, Interviewing, and Industry Skills. Fall 2016, 2015, Spring 2015, GWW School of Mechanical Engineering at Georgia Institute of Technology.** Presentation to >70 undergraduate mechanical engineering students.

Presented on resume structure, key words, and highlighted the importance of utilizing concise examples of technical contributions made in internships and class projects. Outlined the standard corporate hiring process.

- **Strategies for Industry: Tackling Presentations, Promotions, and Tough Situations. Summer 2015, Society for Woman Engineers, Georgia Institute of Technology.**
Lectured on strategies for industry promotions, such as results and deliverable focused-presentations, tactics for impressing upper management, and the importance of high level mentors.
- **Value of a Graduate Degree, Panelist. Spring 2015, Society of Woman Engineers, Georgia Institute of Technology.**
Served as panelist, discussing job opportunities with a graduate degree, best practices for networking, and work life balance.
- **Women in Engineering Sponsored Coffee Talk. Fall 2014, Georgia Institute of Technology.**
Discussion with female undergraduate students in the College of Engineering on work-life balance, studying techniques, and industry career paths.
- **Women in Engineering Sponsored Luncheon. Spring 2014, Georgia Institute of Technology.**
Presentation to female graduate students in the College of Engineering on techniques for surviving graduate school, graduate studies for industry, and resumes for industry.

D. Grants and Contracts

a. As Principal Investigator

Awarded:

Title:	Massively Open Online Course (MOOC) Proposal
Date Awarded:	May 2016.
Agency/Company:	Georgia Institute of Technology Office of the Provost.
Total Dollar Amount:	\$18000
Role:	PI
Period of Contract:	Summer 2016, Fall 2016

VI. SERVICE

A. Contributions at the University of Colorado, Boulder Department of Aerospace Engineering and Sciences

Undergraduate Curriculum Committee, 2018- Current.

- Committee is working to fit current AES curriculum in new building, and improve curriculum for future students

B. Contributions at the Georgia Institute of Technology

Women in Engineering (WIE) jrTEC Camp

- Teamed with Dr. Cassandra Telenko to develop a module introducing mechanical design to elementary school girls by dissecting common toys such as a Nerf shooter
- Module was loosely based on lesson plan developed at University of Texas Austin, and stressed design ideation, machine component vocabulary, and machine component functionality.
- Co-taught module with Dr. Telenko to 20 elementary school girls during the WIE jrTEC camp in the summer of 2015 and 2016.

Chair Search Committee Member: 2017 2018 Academic Year

- Committee to conduct search for new ME school chair. Duties include developing job ad, reviewing all applicants, participating in all airport and on campus interviews, and giving final recommendation to Dean of Engineering. Committee members selected by Dean of Engineering.

Faculty Advisory Committee Member: Summer 2017- Summer 2018.

- Faculty advisory committee assists in high-level school policy decisions, and interacts with COE and institute level committees. Must be nominated and elected by ME faculty vote to serve.

Undergraduate Committee Member Fall 2015- Summer 2018.

- Participated in undergraduate committee meetings, reviewed new course proposals and GT ME student exit surveys.
- Completed ME ABET CLASS Evaluations:
ME 3180 Machine Design, Fall 2014, Fall 2015, Spring 2017.
ME 4182, Capstone Design, Fall 2016
Evaluated 20 randomly selected students on their ability to meet the ME 3180 and ME 4182 ABET approved course and program outcomes.
- Completed ME Undergraduate Committee Curriculum Evaluation COE 3001 Fall 2015.
Met with numerous College of Engineering (COE) professors to determine if the COE 3001 curriculum reflects the ABET syllabus, is consistent over the 15 sections taught across campus, and has the correct number of credit hours/pre-requisites.

Women in Mechanical Engineering

- ME liaison to the College of Engineering's Women in Engineering.
- Collaborated with ME advisors to organize a ME Women's Chat during Gold Carpet Day (freshmen recruiting event) with a panel of female faculty and students to share their GaTech experiences and answer prospective female student questions.
- Arranged for female colleague from Northrop Grumman Aerospace Systems to travel to Georgia Tech and participate in a Coffee Chat with

female students in ME and AE. Discussion focused on how certain skills not measured by standard engineering curriculums can translate to huge strengths in an industry setting.

Promotion of Undergrad Research

- Disseminated ME faculty undergrad research opportunities to ME undergraduate students.
- Organized, promoted, and awarded Air Products (AP) Research Scholarships and the AP Spring Symposium. Scholarships total approximately 20,000 dollars per year.

PACE Program

- Represented Georgia Institute of Technology School of Mechanical Engineering at 2014 PACE Global Annual Forum in Turin, Italy.

ME 1770 Academic Professional Search Committee

- Member of search committee- Fall 2015. Assisted with resume review, interviewing, and final hiring of candidates for ME 1770 Academic Professional position.