Kathryn A. Wingate
Instructor
Ann and H.J. Smead Aerospace Engineering Sciences
University of Colorado, Boulder
28 January 2021

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17 November 2020

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. 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 2020	Senior Projects (ASEN 4018)	24	
Fall 2020	Statics Lecture, Lab (ASEN 2001)	331	
Spring 2020	Materials Science (ASEN 1022)	356	New scoring system
Spring 2020	Senior Projects (ASEN 4018)	24	New scoring system
Spring 2020	Grad Projects (ASEN 5018)	8	New scoring system
Spring 2020	Freshmen Projects (GEEN 1400)	32	New scoring system
Fall 2019	Statics (ASEN 2001)	261	5.4/6
Fall 2019	Senior Projects (ASEN 4018)	24	5.3/6

Fall 2019	Grad Projects (ASEN 5018)	8	5.7/6
Spring 2019	Freshmen Projects (GEEN 1400)	32	5.4/6
Spring 2019	Grad Projects (ASEN 5018)	10	6.0/6
Spring 2019	Senior Projects (ASEN 4018)	24	5.8/6
Fall 2018	Statics (ASEN 2001)	256	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)

- Fall 2020: Collaborating with Dr. Aaron Johnson to develop three new statics labs that are open ended modeling problems. These problems give students opportunities to determine design requirements, model engineering systems utilizing free body diagrams, and analyze the systems with the static equilibrium and solid mechanics principles. My focus was on the development of the first two labs. The first lab has students model a gondola system and ram air turbine blade, select 2D supports, draw a FBD, solve equilibrium equations, and utilize distributed loads and equivalent systems. The second lab has students model playground equipment, explain the differences between statically determinate and indeterminate systems, and design and solve 3D static equilibrium systems. Individual lab 'checks' were implemented as Canvas quizzes to assess individual learning. Detailed grading rubrics were developed for Gradescope to allow TAs to quickly and consistently grade the group lab submissions.
- Fall 2019: Revised first 2001 'programming' group lab to an individual

programming lab with the end goal that all students get an 'on ramp' to programming with rapid online feedback. Created online prelab lecture videos, split original assignment into four week long sections, and developed online grade checks of code for each assignment using MATLAB grader.
- Developed and delivered all lectures, assignments, and exams for first half of lecture portion of sophomore statics course.
- Managed team of 6 TAs and TFs to oversee lab, 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

Advisor, ASEN 5018 (Grad Projects)
- Advised a team of students to design 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.
- Advised a second team of students on ideation, mechanical and materials design, prototype fabrication and testing of soft robotic 'petals' to allow the small robotic spacecraft to walk on the surface of an asteroid

GEEN 1400 Freshmen Projects
- Taught design process including requirement development, subsystem breakdown, ideation, trade studies, preliminary analysis techniques and prototyping to 6 teams of 5-6 freshmen. All teams completed open ended design projects.
- Adjusted class to online format for COVID-19 pandemic, changing project to an individual design challenge that could be completed in a standard apartment/dorm and a final video presentation with peer review

ASEN 1022 (Materials Science)
- Developed and delivered all lectures, assignments, and exams for materials science course (entire semester)
- Adjusted class to online format for COVID-19 pandemic, taping lecture videos, holding zoom office hours, and setting up online exams via Canvas. FCQ feedback: 'Professor Wingate was incredibly supportive during the transition to online learning, making the transition the easiest out of all of my classes. She made her class engaging, accessible, and allowed us to push ourselves into learning without leaving us behind in confusion'
- Collaborated with the TA/TF team and lab instructional staff to 'flip' the tensile test lab, giving students the option to complete the lab testing in person or via video, and therefore reducing strain on lab TA/TF/LA time.
- Managed team of 8 TAs and TFs to oversee exam and lab grading, office

hours.

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.
- 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. Team presented at 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)

IV. RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITIES

A. Refereed Journal Publications

- 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 Presentations with Proceedings (Refereed)

- K. Wingate. The Impact of Doubling Department Course Offerings on Faculty Coverage, Student Performance, and Student Attrition Rates. ASEE Annual Conference and Exposition, Long Beach CA, June 2021. Accepted.

- Z. Sunberg, K. Wingate. Fair senior capstone project teaming based on skills, preferences, and friend groups. ASEE Annual Conference and Exposition, Long Beach CA, June 2021. Accepted.

- C. Ott, A. Johnson, K. Wingate. Student Achievement Goals with Alternative and Traditional Exam Formats. ASEE Annual Conference and Exposition, Long Beach CA, June 2021. Accepted.

- K. Wingate, A. Johnson, L. Ruane, D. Akos. Variables that Impact Student Performance in Sophomore Aerospace Programming Assignments. ASEE Annual Conference and Exposition, Montreal Canada, June 2020.

- 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.

C. 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

- Panel: Women in Aeronautics and Astronautics, Fall 2019, Fall 2020 Panel discussion hosted by WIAS on tips for success in the aerospace industry.

- 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.

- Undergraduate Research Opportunities. Spring 2016, ASME, Georgia Institute of Technology.

- Strategies for Industry. Society of Women Engineers (SWE) Region D Conference, Spring 2016.

- Closing the Gender Pay Gap: How do I achieve equal pay throughout my career? Fall 2015, Society for Women Engineers, Georgia Institute of Technology.
- Resume, Interviewing, and Industry Skills. Fall 2016, 2015, Spring 2015, GWW School of Mechanical Engineering at Georgia Institute of Technology.

- Strategies for Industry: Tackling Presentations, Promotions, and Tough Situations. Summer 2015, Society for Woman Engineers, Georgia Institute of Technology.

- Value of a Graduate Degree, Panelist. Spring 2015, Society of Woman Engineers, Georgia Institute of Technology.

- Women in Engineering Sponsored Coffee Talk. Fall 2014, Georgia Institute of Technology.

- Women in Engineering Sponsored Luncheon. Spring 2014, Georgia Institute of Technology.

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

V. SERVICE

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

CEAS Academic Instruction Fall Planning Team: Senior Projects: Summer, Fall 2020

- Determined instructional plan for senior projects courses across the COE during Covid-19. Developed student guidelines for working in remotely in teams and in project workspaces safely during Covid-19.

Executive Committee, 2020- Current

- Executive committee advises chair on high level department decisions

Undergraduate Curriculum Committee, 2018- Current.

- UG Curriculum Committee works to ensure the UG curriculum can handle high student enrollment while fitting in new building space, and develop and improve the UG curriculum for future students.
- Performed teaching credit study via weighted means analysis to determine persistent 'holes' in teaching coverage in UG curriculum
- Chaired 2030 curriculum subcommittee. Analyzed and summarized curricula at the 10 peer AE institutions. Developed a survey to give to EAB/department alumni to determine critical topics for future curriculum

CG Member: Design CG and Structures CG, 2019-Current

- CG co-lead for Design CG- AY19/20.
- Collected UG teaching preferences, recommended UG teaching plan for 2020, analyzed learning outcomes throughout courses in CG.

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, 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
- Completed ME Undergraduate Committee Curriculum Evaluation
  COE 3001 Fall 2015..

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.

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.

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.

VI. 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.