

Sachin Kotecha

uwaterloo.ca/scholar/skotecha

Academic Interests

- Mathematics Education
- Physics Education
- Astrophysics: Cosmology & Galaxy Evolution

Contact Information

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Brief Teaching Philosophy

Above all else, my aim is to share my passion for what I teach and generate enthusiasm for learning. Education is a shared experience between a teacher and their students. Whether I am an educator in the classroom or doing outreach, I expect to learn from my audience, just as they learn from me. Teaching should be adaptive and inclusive. I also strongly believe that learners, especially in mathematics and physics, should understand why they learn what they do. I support different learning styles and the development of critical thinking skills using various traditional teaching techniques as well as modern active learning methods. My approach to using technology is based on the belief that it should be a support and not a substitute when teaching, especially in mathematics and physics.

Summary of Academic Positions

Lecturer Mathematics Undergraduate Group, University of Waterloo	Jan 2024 – Present
Sessional Lecturer Faculty of Mathematics, University of Waterloo	Sept 2020 – December 2023
Sessional Lecturer Department of Mathematics, Wilfrid Laurier University	Aug 2021 – Apr 2023
Sessional Lecturer Department of Mathematics, Mount Allison University	Apr 2021 – Aug 2022
Sessional Lecturer School of University Arts & Sciences, Selkirk College	Dec 2020 – Aug 2022
Sessional Lecturer School of Business, Conestoga College	Aug 2021 – Dec 2021

Teaching and Outreach

***Lecturer Roles* (39 cumulative sections, 17 distinct courses, 24 sole/lead* instructor roles)**

- MATH138: Calculus 2 for Honours Mathematics*** (2 sections) Spring 2024
University of Waterloo
- Presenting in-person lectures with an emphasis on active learning. I was the sole instructor and course coordinator.
- MATH117: Calculus 1 for Engineering*** Spring 2024
University of Waterloo
- Creating and presenting in-person lectures for a service course.

- MATH137: Calculus 1 for Honours Mathematics*** (2 sections) Winter 2024
University of Waterloo
- Developing and presenting in-person lectures with an emphasis on active learning in addition to traditional lecturing. I was the sole instructor and course coordinator.
- MATH211/ECE205: Adv. Calculus 1 for Electrical and Computer Engineers*** Fall 2023
University of Waterloo
- Developing and presenting in-person lectures on ODEs and PDEs for a large second-year engineering cohort.
- MATH137: Calculus 1 for Honours Mathematics** (2 sections) Fall 2023
University of Waterloo
- Developing and presenting in-person lectures with an emphasis on active learning in addition to traditional lecturing. This course had several sections.
- MATH136: Linear Algebra 1 for Honours Mathematics*** (2 sections) Spring 2023
University of Waterloo
- Developing and presenting in-person lectures with an emphasis on active learning and new technology in addition to traditional lecturing.
- MATH117: Calculus 1 for Engineering*** Spring 2023
University of Waterloo
- Creating and presenting in-person lectures for a service course.
- MATH211/ECE205: Adv. Calculus 1 for Electrical and Computer Engineers*** Winter 2023
University of Waterloo
- Developing and presenting in-person lectures on ODEs and PDEs for a large second-year engineering cohort.
- MATH127: Mathematics for Business Technology Management*** Winter 2023
Wilfrid Laurier University
- Presenting in-person lectures as the sole instructor for a smaller class size of non-majors for a course with wide breadth.
- MATH138: Calculus 2 for Honours Mathematics** Winter 2023
University of Waterloo
- Presenting in-person lectures with an emphasis on active learning. This course had several sections.
- MATH103: Calculus 1*** Winter 2023
Wilfrid Laurier University
- Teaching a smaller cohort of international students bridging into Laurier's main programs.
- MATH136: Linear Algebra 1 for Honours Mathematics*** (2 sections) Fall 2022
University of Waterloo
- Developing and presenting in-person lectures with an emphasis on active learning and new technology in addition to traditional lecturing.
- MATH100: Introductory Calculus for the Natural Sciences** Fall 2022
Wilfrid Laurier University
- Heavily focused on ensuring consistent engagement and interest in course content for a large class of non-majors. Collaborative creation of exams.

- MATH117: Calculus 1 for Engineering*** Spring 2022
University of Waterloo
- Creating and presenting in-person lectures for a service course.
- MATH101: Calculus 1 for the Natural Sciences*** Spring 2022
Wilfrid Laurier University
- Focused on ensuring consistent engagement and interest in course content for a small class of non-majors in an in-person environment.
- MATH1151: Applied Calculus*** Spring 2022
Mount Allison University
- Teaching in a fully asynchronous online learning environment. Sole instructor role.
- MATH101: Calculus 2*** Spring 2022
Selkirk College
- Synchronous virtual instruction, responsible for lectures and creating assessments. Sole instructor role.
- MATH127: Mathematics for Business Technology Management*** Winter 2022
Wilfrid Laurier University
- Developing and presenting in-person lectures as the sole instructor for a smaller class size of non-majors for a course with wide breadth.
- MATH228: Differential Equations for Physics and Chemistry*** Winter 2022
University of Waterloo
- Teaching a developed online course for non-majors with a focus on applications.
- MATH119: Calculus 2 for Engineering** (half-term) Winter 2022
University of Waterloo
- Presenting large class lectures for a service course, on a short-notice half-term basis.
- MATH100: Introductory Calculus for the Natural Sciences** Fall 2021
Wilfrid Laurier University
- Heavily focused on ensuring consistent engagement and interest in course content for a large class of non-majors in a remote environment. Collaborative creation of exams.
- MATH137: Calculus 1 for Honours Mathematics** (3 sections) Fall 2021
University of Waterloo
- Developing and presenting in-person lectures with an emphasis on active learning in addition to traditional lecturing. This course had several sections.
- MATH1010: Business Mathematics 1** Fall 2021
Conestoga College
- Fully remote teaching for a small class of students where assessment and course content was largely centralized. Priority on working to ensure students recognize value in math.
- MATH1020: Business Mathematics 2** Fall 2021
Conestoga College
- Fully remote teaching for a class of mostly international students where assessment and course content was largely centralized. Priority on engaging with a diverse student group.
- MATH1151: Applied Calculus*** Spring 2021
Mount Allison University
- A focus on restructuring the course for its debut in a fully asynchronous learning environment. Sole instructor role.

- MATH101: Calculus 2*** Spring 2021
Selkirk College
- Synchronous virtual instruction, responsible for choosing textbook, and creating assessments. Sole instructor role.
- MATH54: Business and Technical Mathematics – Advanced Level*** Spring 2021
Selkirk College
- A focus on virtual asynchronous learning and video creation. Sole instructor role.
- MATH138: Calculus 2 for Honours Mathematics** Winter 2021
University of Waterloo
- Fully digital teaching, with a focus on creation of exemplar videos, holding office hours, and building assessment questions. This course had several sections.
- MATH140: Calculus 1 for Social Sciences*** Winter 2021
Selkirk College
- Synchronous virtual instruction, responsible for re-structuring course for online format, building syllabus, choosing textbook, and creating assessments. Sole instructor role.
- MATH137: Calculus 1 for Honours Mathematics (3 sections)** Fall 2020
University of Waterloo
- Developing and presenting in-person lectures with an emphasis on active learning in addition to traditional lecturing. This course had several sections.
- AST3X03: Galaxies and Cosmology (Guest Lecture)** March 2020
McMaster University
- Creating a lecture based around my research area, built on principles of active learning, to a class of 30 third- and fourth-year students. Delivery cancelled due to COVID-19.

Teaching Assistant/Tutor Roles

- PHYS1E03: Waves, Electricity, and Magnetic Fields For Engineers** Winter 2020
McMaster University
- Leading tutorial sections using active learning, alternating with lab sessions weekly.
- PHYS1A03: Introductory Physics For Non-Science Majors** Winter 2019 and 2020
McMaster University
- Leading lab sessions weekly, evaluating students based on group discussions.
- AST1F03: Introduction to Astronomy and Astrophysics** Fall 2018 and 2019
McMaster University
- Marking assignments, assisting with in-class quizzes, presenting planetarium shows.
- AST2B03: The Big Questions** Fall 2019
McMaster University
- Leading discussion-based tutorials and marking student presentations.
- PHYS1AA3: Introduction to Modern Physics (For Life Science Students)** Spring 2019
McMaster University
- Leading traditional lab sessions and marking lab reports.
- MATH227: Calculus 3 for Honours Physics (Marking)** Fall 2017
University of Waterloo

Math Centre Tutor

Fall 2015 and Spring 2016

Dan Andrae Math Centre, Humber College

- Drop-in tutor for numerous courses, including but not limited to: TMTH010 (Essentials of Technical Math), BMTH010 (Essentials of Business Math), STAT1112 (Statistics for Business), SCMA3100 (Biomechanics).
- Managed Math Centre peer tutors; utilized Blackboard, an online learning platform.
- Created instructional mathematics videos for Humber's HeadStart Program.

MATH217: Calculus 3 for Chemical Engineering (Marking)

Fall 2016

University of Waterloo

MATH237: Calculus 3 for Honours Mathematics (Marking)

Spring 2015

University of Waterloo

MATH137: Calculus 1 for Honours Mathematics (Tutorial Centre)

Fall 2014

University of Waterloo

Outreach Roles**School Visits Presenter**

Sept 2022 – Present

Centre for Education in Mathematics and Computing

- Conducting problem-solving, career, and university transition talks for students in Ontario schools in Grades 9-12.

Math Circles Presenter

Sept 2021 – Apr 2022

Centre for Education in Mathematics and Computing

- Created and presented enrichment math lessons for Grade 9-12 students.
- Circles, Ellipses, and Astrophysics (Gr. 11/12): [Lesson 1](#), [Lesson 2](#), [Solutions 1](#), [Solutions 2](#).
- Analytic Geometry (Gr. 9/10): [Lesson](#), [Problem Set](#), [Solutions](#).

Planetarium Presenter

Jan 2019 – Aug 2020

W.J. McCallion Planetarium, McMaster University

- The Scales of the Universe: Created a public planetarium show which explains the various scales of the Universe, placing a perspective on the tininess of humanity.
- Astronomy for Muggles: Created a public planetarium show which draws connections between the *Harry Potter* series and the night sky. The Planetarium's most popular show.

Mentor

June 2019 – Aug 2019

McMaster University

- Responsible for directly supervising an exchange student from China and helping the student conduct novel research.

Mathematics Workshops Assistant

June 2018 – Aug 2018

Centre for Education in Mathematics and Computing

- Assisted with the execution of the Auckland Invitational, EMACS, Toronto Math Camp, Summer Conference for Computer Studies Educators, and Math Teachers' Conference.
- Invited speaker at the Toronto Math Camp.

Mathematics Outreach Assistant Jan 2017 – Apr 2017
Centre for Education in Mathematics and Computing

- Created *Math in the Real World* lessons and resources for students and teachers
- Created *Problem of the Week* problems.
- Conducted mathematics workshops at schools in Kitchener/Waterloo.

Math Circles Assistant Jan 2015 – Apr 2015
Centre for Education in Mathematics and Computing

- Created and presented enrichment math lessons for Grade 6-8 students.
- Participated in numerous school visits for mathematics enrichment and outreach.

First Year Experience Leader May 2014 – Aug 2014
Student Success Office, University of Waterloo

- Developed and ran programming for incoming mathematics students and their families.

Service

University Senator May 2024 – Present
University of Waterloo

- Faculty-at-large representative for a three-year term.

Course Notes Author and Reviewer Jan 2024 – Present
Faculty of Mathematics, University of Waterloo

- Responsible for writing new course notes for Calculus 1 for Honours Mathematics and reviewing new course notes for Calculus 2 for Honours Mathematics.

Math Circles Lead Jan 2024 – Present
Centre for Education in Mathematics and Computing

- Responsible for coordinating Grade 9-12 Math Circles. This includes all logistics, recruitment of presenters, and a revamp of the program.

Committee Member, Canadian Intermediate Mathematics Contest Aug 2021 – Present
Centre for Education in Mathematics and Computing

- Sitting member on the committee responsible for development of the CIMC. Responsible for creation, workshopping, and selection of problems.

Marker, Euclid and Canadian Senior Mathematics Contests Dec 2013 – Present
Centre for Education in Mathematics and Computing

- Mark questions on these contests written by Grade 11 and 12 students each year.

Focus Group Member, Mathematics EDI-R & I Principles June 2023
Faculty of Mathematics, University of Waterloo

- Provided feedback on draft principles intended to guide all members of the Faculty of Mathematics in their efforts to actively advance human rights, equity, diversity, inclusion, anti-racism, and Indigenization.

Focus Group Member, Mathematics Strategic Framework May 2023
Faculty of Mathematics, University of Waterloo

- Identified by the Associate Dean, Undergrad as a faculty member whose insights and engagement would be valuable due to my broad perspectives and experiences as well as a demonstrated interest or engagement in opportunities to shape the Faculty.

Graduate Student Ambassador, Physics & Astronomy Programs Dec 2018 – Aug 2020
Faculty of Science, McMaster University

- Part of the first ever group of ambassadors representing graduate programs to incoming students in the Faculty of Science at McMaster.

Committee Member, Pascal Contest Feb 2017
Centre for Education in Mathematics and Computing

- Committee meeting for the 17/18 Pascal contest, workshopping and selecting problems.

HeForShe Ambassador Jan 2017 – Apr 2017
Faculty of Mathematics, University of Waterloo

- Created a promotional event for the HeForShe campaign in the Faculty of Mathematics, which focuses on gender equity. The University of Waterloo is the only Canadian university partner for this United Nations campaign.

Reviewer, Online Courseware Jan 2015 – Apr 2015
Centre for Education in Mathematics and Computing

- Provided comments and suggestions on *Advanced Functions* and *Calculus and Vectors* lessons for the CEMC's online courseware.

Undergraduate Math Ambassador Sept 2014 – Apr 2018
Faculty of Mathematics, University of Waterloo

- First ever ambassador in the Faculty of Mathematics at Waterloo. Over my time in the role I represented Waterloo's mathematics programs at various Open Houses and the Ontario Universities' Fair.

Reviewer, Textbook 2016
Basic Discrete Mathematics: Logic, Set Theory, and Probability by Richard Kohar

- Provided comments and suggestions on drafts of the manuscript of this textbook.

Professional Development

Math Teaching Seminar May 2022 – Present
Faculty of Mathematics, University of Waterloo.

- Attendee of bi-weekly seminar involving discussions and presentations amongst teaching faculty at the University of Waterloo about their experiences and best practices.

Math Meetups July 2022 – Present
First Year Math and Stats in Canada (FYMSiC)

- Attendee of monthly involving discussions and presentations amongst teaching faculty across Canada about their experiences and best practices.

Teaching Engaged Brains Conference Feb 2024
Learning and the Brain

- Attended three-day conference that brought together neuroscientists, psychologists, and educators. Focused on talks on growth mindset and ADHD.

UW Teaching and Learning Conference May 2023
University of Waterloo

- Attended two-day conference with theme '*Teaching and Learning with Kindness and Care*'. Focused on talks on alternative grading, empathy, and technology.

MAA Seaway Spring 2023 Meeting May 2023
Mathematical Association of America, University of Waterloo
• Attended two-day conference. Focused on talks on mathematics education.

SIGMAA on RUME 2023 Conference Feb 2023
Special Interest Group of the MAA on Research in Undergraduate Math Education
• Attended 15 talks across 3 days on research in math education, ranging from topics of assessment to EDI, in calculus and algebra courses. Funding provided by the Teaching Development Fund of the University of Waterloo's Faculty of Mathematics.

Mental Health First Aid Supporting Youth Aug 2021
Mental Health Commission of Canada
• 10 hours of training, learning skills for providing initial help to youth (18-24) experiencing a decline in their mental well-being or a mental health or substance use crisis.

Teaching and Learning Scholar Certificate of Completion May 2020
MacPherson Institute for Leadership, Innovation, and Excellence in Teaching
• 100 hours of teaching experiences and coursework on the Scholarship of Teaching and Learning. Courses are EDU700 (Essential Skills in Teaching and Learning 2), EDU751 (Principles and Practices of University Teaching), and EDU760 (Self-Directed Study).

Teaching and Learning Foundations Certificate of Completion Sept 2019
MacPherson Institute for Leadership, Innovation, and Excellence in Teaching
• 36 hours of teaching experiences and coursework on SoTL. Courses are EDU600 (Essential Skills in T&L 1) and EDU650 (Peer-Evaluated Teaching Experience).

Education

MSc in Astrophysics Sept 2018 – Aug 2020
Thesis: *The Effect of Cosmic Web Filaments on Quenching in Galaxy Clusters*
McMaster University, Hamilton, ON, Canada

BMath in Applied Mathematics/Physics, Honours, Co-op Sept 2013 – Apr 2018
Graduated with top academic standing of "With Distinction – Dean's Honours List"
University of Waterloo, Waterloo, ON, Canada

Research Employment

Graduate Researcher Sept 2018 – Aug 2020
Supervisors: Dr. James Wadsley, Dr. Charlotte Welker
McMaster University
• Theoretical physics research using hydrodynamical simulations to understand quenching in cluster environments in relation to the cosmic web.
• Presented a poster at **Great Lakes Cosmology Workshop (Rochester, NY) and the CASCA Annual Meeting (Montreal, QC)** in 2019

Summer Research Student May 2017 – Aug 2017
Supervisor: Dr. Michel Fich
University of Waterloo
• Observational physics research using data from the SCUBA-2 telescope to analyze the temperature profiles of cores of HII regions.

Publications

Kotecha, S., Welker, C., Zhou, Z., Wadsley, J., Kraljic, K., Sorce, J., Rasia, E., Roberts, I., Gray, M., Yepes, G. and Cui, W., 2022. Cosmic filaments delay quenching inside clusters. Monthly Notices of the Royal Astronomical Society, 512(1), pp.926-944, <https://doi.org/10.1093/mnras/stac300>.

Awards and Honours

- Keith Leppmann Teaching Assistant Excellence Award Nominee 2019
- NSERC Canada Graduate Scholarship (CGS-M), Sept 2019 – Aug 2020. **\$17,500.**
- Ontario Graduate Fellowship, Sept 2018 – Aug 2019. **\$12,000.**
- NSERC Undergraduate Student Research Award (USRA), May 2017 – Aug 2017. **\$4,500.**
- Waterloo President's International Experience Award, Jan 2016 – Apr 2016. **\$1,500.**
- Waterloo President's Research Award, Jan 2015 – Apr 2015. **\$1,500.**
- J.G. Kalbfleisch National Mathematics Scholarship, Sept 2013 – Apr 2018. **\$14,000.**
- Waterloo President's Scholarship of Distinction, Sept 2013. **\$2,000.**
- Governor General of Canada Bronze Academic Medal, June 2013.