

Sachin Kotecha

uwaterloo.ca/scholar/skotecha

Research Interests

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

Contact Information

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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.

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.

Main Teaching Interests: Calculus, introductory physics (mechanics, waves), introductory linear algebra, astrophysics, introductory mathematical logic and proofs. I am interested in and capable of teaching both majors and non-majors in all these disciplines. I am equally competent in these disciplines, but they are listed in order of teaching preference.

Teaching and Outreach

Lecturer Roles

MATH1151: Applied Calculus (1 Section) Spring 2021

Mount Allison University

- A focus on restructuring the course for a fully asynchronous learning environment.

MATH101: Calculus 2 for STEM Majors (1 Section) Spring 2021

Selkirk College

- Synchronous virtual instruction, responsible for choosing textbook, and creating assessments.

MATH54: Business and Technical Mathematics – Advanced Level (1 Section) Spring 2021
Selkirk College

- A focus on virtual asynchronous learning and video creation.

MATH138: Calculus 2 for Honours Mathematics (1 section) 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 was team-taught.

MATH140: Calculus 1 for Social Sciences (1 section) Winter 2021
Selkirk College

- Synchronous virtual instruction, responsible for fully re-structuring course for online format, building syllabus, choosing textbook, and creating assessments.

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 was team-taught.

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 Fall 2015 and Spring 2016

Dan Andreae 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

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

Graduate Student Ambassador Dec 2018 – Aug 2020

Department of Physics & Astronomy Graduate Programs
Faculty of Science
McMaster University, Hamilton, ON

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

Committee Member Feb 2017

Pascal Contest Committee
Centre for Education in Mathematics and Computing
University of Waterloo, Waterloo, ON

- Took part in a committee meeting for the 2017/18 Pascal contest, workshopping and selecting problems.

HeForShe Ambassador Jan 2017 – Apr 2017

Faculty of Mathematics
University of Waterloo, Waterloo, ON

- 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.

Marker Apr 2015 – Present

Euclid and Canadian Senior Mathematics Contests
Centre for Education in Mathematics and Computing
University of Waterloo, Waterloo, ON

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

Reviewer Jan 2015 – Apr 2015

Online Courseware
Centre for Education in Mathematics and Computing
University of Waterloo, Waterloo, ON

- 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, Waterloo, ON

- 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 2016
Textbook
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

Teaching and Learning Scholar Certificate of Completion May 2020
MacPherson Institute for Leadership, Innovation, and Excellence in Teaching
• This certificate involves 100 hours of combined 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
• This certificate involves 36 hours of combined teaching experiences and coursework on the Scholarship of Teaching and Learning. Courses are EDU600 (Essential Skills in Teaching and Learning 1) and EDU650 (Peer-Evaluated Teaching Experience).

Education

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

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

Academic Employment

Graduate Researcher Sept 2018 – Aug 2020
Supervisors: Dr. James Wadsley, Dr. Charlotte Welker
McMaster University, Hamilton, ON, Canada
• Theoretical physics research using hydrodynamical simulations to understand how galaxies shut off star formation in cluster environments in relation to the cosmic web.
• Presented a poster on *The Cosmic Web: Delaying Quenching in Clusters* (Kotecha, S., Welker, C., Wadsley, J.) 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, Waterloo, ON, Canada
• Observational physics research using data from the SCUBA-2 telescope to analyze the temperature profiles of cores of HII regions.