AIMS MSc in Mathematical Sciences - August 2018 intake

Abstracts of Skills courses

27 August – 23 November

Computing and LaTeX
Jan Groenewald (AIMS)

This course introduces students to the AIMS computing facilities and packages. The course covers an introduction to LaTeX using TexStudio, followed by working through the book: http://en.wikibooks.org/wiki/LaTeX, and associated documents such as those from the American Mathematical Society.

English and Communication Skills
Noluvuyo Hobana (AIMS)

This course introduces students to the essentials of English communication, writing and presentation in a scientific environment.

3 – 21 September

Mathematical Problem Solving
Stephan Wagner and Dimbinaina Ralaivaosoana (Stellenbosch)

In this course we shall consider a variety of elementary, but challenging, problems in different branches of pure mathematics. Investigations, comparisons of different methods of attack, literature searches, solutions and generalizations of the problems will arise in discussions in class. The objective is for students to learn, by example, different approaches to problem solving and research.

Programming in Python
Jeff Sanders, Martha Kamkuemah and Jordan Masakuna (AIMS)

The purpose of this course is to teach students how to program, using the language Python as a vehicle. Programming is difficult, and one of the reasons is that programmers are offered no “space” in which to develop their ideas. Instead they are forced to write code, then test and modify it, iteratively, in the hope that a more accurate program results. Inevitably, it seldom does. In this course, we introduce “design space” for the specification and development of programmes. The result is that students are able to use discrete mathematics in formulating algorithms and analysing their efficiency before having to downcode to Python. Also covered: version control; unix; and shell script.

24 September – 12 October
Experimental Mathematics with Sage
Yae Gaba (African Centre for Advanced Studies)

This course introduces an approach to doing mathematics that is founded on experiment and inquiry. It does so in the medium of Sage, a Python-based tool for computation and experiment. Some of the problems studied come from Number Theory and some from Graph Theory. Skill with Sage will be important for many subsequent courses.

24 September to 12 October
Statistics
Siaka Lougue (University of KwaZulu- Natal)

Applying statistics within public health examples (biostatistics) is the main purpose of this course. Students will be exposed to the usual experimental designs used in public health as well as common data analysis and impact evaluation techniques. To this end, students should be able to fully understand, explain, implement and interpret common statistics methods in biostatistics and public health using the software R (R studio).

15-26 October

Entrepreneurial Skills
Jonathan Marks (Gordon Institute of Business Science)
This course introduces students to the discipline and process of entrepreneurship and new venture planning. Entrepreneurship crosses many disciplines and is a pursuit and a subject domain that is now commonly found in technical areas such as science, engineering, technology and mathematics. In this course we will introduce students to the process of originating a business idea and to creating a business model (an 'engine' for economic growth and sustainability) using a tool called the Business Model Canvas. The course will give students both the knowledge and the competence to consider entrepreneurship as part of a future career path.

9-20 October

Concepts and Problem Solving in Physics
David Aschman (Cape Town)
This course shows that physics describes the real world using the language of mathematics. Problem solving techniques such as changing the point of view, using different reference frames, estimating orders of magnitude, dimensional analysis, and numerical approaches using Python will be used.

Examples will be taken from several areas of physics, such as
moving objects, electrodynamics, gravity, movement of molecules in fluids, and nuclear and elementary particle physics.

Students are required to read, think, discuss, engage, interact, argue, present their ideas verbally, do homework, compute with Python and present their ideas verbally and in writing. Details of the topics covered will be available on the course page.