DEPARTMENT OF MATHEMATICS

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Head of Department

WORK OF THE DEPARTMENT

As at July 2013, the teaching staff of the Department of Mathematics comprised of two Professors, five senior lecturers, five lecturers, four assistant lecturers. Among them we have seven members of staff with a PhD, one of whom additionally holds a Higher Doctorate degree; one member of staff is a Fellow of the Canadian Institute of Actuaries and another is a fellow of the Institute and Faculty of Actuaries (UK).

This year the department mourned the loss of Dr. Leighton Henry who passed away on May 29, 2014. Dr. Henry served the Department for a number of years as a senior lecturer and Head of Department. The department extended condolences to his family and friends.

This year (2013/2014), in keeping with the curriculum reform of the faculty, the Department taught for the first time the following approved 3-credit third year courses:

MATH3403	Some Topics in Functional Analysis
MATH3400	Complex Variables
MATH3401	Introduction to the Theory of Integration
MATH3402A	First Course on Metric Spaces & Topology
MATH3412	Advanced Linear Algebra
MATH3411	Advanced Abstract Algebra
MATH3421	Introduction to Partial Differential Equations
MATH3422	Mathematical Modelling
MATH3424	Numerical Methods
MATH3423	Research Project (Mathematics)
MATH3801	Financial Mathematics II
MATH3802	Constructions & Evaluation of Actuarial Models
MATH3803	Models for Financial Economics
MATH3804	Actuarial Mathematics II
MATH3805	Mathematics of Pension Funds
MATH3806	Topics in General Insurance
MATH3404	Introduction to Differential Geometry with Computer Software
STAT3001	Regression Analysis
STAT3002	Time Series

The Department has continued its collaboration with various departments in the Faculty and continues to offer Mathematics courses to suit their needs such as MATH1185, which was tailored to suit Chemistry & Physics students; COMP1110, which was tailored to suit Computing students; and MATH1180 and MATH2330, which were tailored for Engineering students.

We have received approval from the Academic Quality Assurance Committee (AQAC) for our revised programmes and a new programme

entitled "BSc in Statistical Science" to commence teaching in September 2014. At the next graduation ceremony in November 2014, we will see students graduating with the newly approved majors for the first time.

The department held its first Inaugural Career Fair in November 2013 and it was a success: 8 out of 10 companies who agreed to participate were present. 57 students who registered prior to the event were present. Feedback from participating companies was positive.

In December 2013, the department was approached by the Society of Actuaries and invited to prepare an application to be listed as a Center of Actuarial Excellence. Currently only institutions in North America and China may be designated as such, but the Society is considering extending the scope. The application package is largely complete, and the department awaits confirmation from the Society of Actuaries that Jamaica has been added to the list of eligible countries.

The internship programme expanded this year. Overall 16 positions were offered, of which 10 were paid and 6 unpaid. All 10 paid positions were taken up, as were 2 of the unpaid positions. This is up from 6 positions in 2013, and 2 in 2012. The feedback from employers and interns received to date has been positive.

For the academic year 2013/14 a total of 3,339 students registered for all courses in the department. As long as our staff levels remain flat and the student numbers continue to increase, we remain in a less than desirable position with higher than acceptable students/staff ratios: for preliminary level – 91:1; level 1 – 202:1; level 2 – 56:1; and for level 3 – 62:1. For Summer School, the department offered 28 courses during 2014. We facilitate our final year students by offering exam-only for all level 3 courses.

The Mathematics Bridging Programme ran for Nine (9) weeks with one tutor and Ten (10) registered students. Attendance was low compared to previous years, and the department will embark on intensive advertisement to increase its numbers for the upcoming academic year.

On outreach, this year saw the department continuing with its CAPE workshop due to demand, and expanded its scope to the sixth form

students and teachers of Tarrant High School. Two Mathematical Olympiad programmes were held last year. The Junior Mathematical Olympiad was held in three rounds for students in Grades 4, 5, and 6. The Jamaican Mathematical Olympiad was held in four rounds for students in Grades 7 through 11. The department also took a team of three students to an international mathematics competition, called the Costa Rica, to which they won our first medal and the El Salvador Cup for the most improved team over the last 3 years.

RESEARCH

Conference Participation with Paper/Talk Presented

- **Dr. Conall Kelly** attended the 2nd Austrian Stochastic Day, a satellite of the OMG-DMV Congress 2013, September 27, 2013, University of Innsbruck, Austria, presented an invited talk entitled "Response to low-intensity, stochastic perturbation in non-normal dynamical system", and chaired a session.

- **Dr. Conall Kelly** attended the 2013 International Conference on "Scientific Computation and Differential Equations", September 16-20, 2013, University of Valladolid, Valladolid, Spain, and presented an invited talk "On the use of discrete forms of the Ito formula".

- **Dr. Conall Kelly** attended the CARISCIENCE Conference and AGM, November 14–17, 2013, Grand Bahia Principe, Runaway Bay, Jamaica, and presented a contributed talk entitled "Randomness, stability and transience in mathematical models".

- **Dr. Conall Kelly** attended the AIM SQuaRE "Stochastic stabilization of limit cycle dynamics in ecology and neuroscience", February 10–14, 2014, AIM Headquarters, Palo Alto, California, and presented a talk "Some examples of stochastic stabilization".

- **Professor Girija Jayaraman** attended the EGU (European Geosciences Union) General Assembly 2014, April 27–May 2, 2014, Vienna, Austria, and her PhD student Vijay Kumar presented a talk on "Numerical modelling of the seasonal variability of plankton and forage fish", in the Gulf of Khambhat".

- **Dr. Dmitry Malinin** attended the ISCHIA GROUP THEORY 2014, at Naples, Italy, March 31–April 6, 2014.

- **Dr. Dmitry Malinin** attended the Conference "Algebraic Geometry and Number Theory" on the occasion of M.A. Tsfasman's and S.G. Vladuts' 60th birthday, Moscow, Russia, June 23–27, 2014.

- **Dr. Dmitry Malinin** attended The International Algebraic Conference dedicated to the 100th anniversary of L.A.Kaluzhnin held in Taras Shevchenko National University of Kyiv. on July 7–12, 2014, and presented a paper on "Integral irreducible representations of finite groups".

- **Professor Alexandra Rodkina** attended the AIM SQuaRE Stochastic stabilization of limit cycle dynamics in ecology and neuroscience, February 10–14, 2014, AIM Headquarters, Palo Alto, California, and presented a talk entitled "Some problems in developing a discrete Ito formula".

- **Professor Alexandra Rodkina** attended the "ICNPAA 2014 Congress: Mathematical Problems in Engineering, Aerospace and Science", Narvik University, Norway, July 2014, and presented a talk entitled "Discrete Ito Formula and its Applications"

- **Dr. Nagarani Ponakala** and **Ms Binil Sebastian** attended the International Conference on Applied Mathematics, Modeling and Computational Science (AMMCS2013), August 26–30, Waterloo, Ontario, Canada, and Ms Sebastian gave a talk entitled "Effect of boundary absorption on dispersion of solute in a pulsatile Casson fluid".

CONFERENCES ATTENDED WITHOUT PRESENTATION

- **Mr. Kirk Morgan** attended the 29th Summer Conference on Topology and its Applications, July 23–26, 2014, CUNY - College of Staten Island, New York, USA.

- **Ms. Yvette Johns** attended the 4th Doctoral Business Administration (DBA) Academic Conference, June 2014, UWI Regional Headquarters, and participated by invitation in a discussion "New Business Growth – the Nexus of Theory and Practice".

INVITED VISITS AND SEMINARS

- Dr. Conall Kelly visited the Institute for Stochastics, Johannes Kepler University, Linz, Austria, May 12–30, 2014, on a JKU research fellowship to pursue collaborative research with Dr. Evelyn Buckwar in the area of stochastic numerical analysis

- Dr. Conall Kelly visited Prof. Sergei Fedotov at the School of Mathematics, The University of Manchester, Manchester, UK. June 1–6, 2014 and gave a seminar entitled "Stochastic systems with nonnormal drift".

- Dr. Conall Kelly visited Prof. Mikhail Tretyakov at the School of Mathematical Sciences, University of Nottingham, Nottingham UK, June 9–11, 2014, and gave a seminar entitled "Almost sure properties of some discrete-time stochastic systems".

- Dr. Conall Kelly visited Dr. Tony Shardlow at the Departmental of Mathematical Sciences, The University of Bath, Bath UK, June 12-13, 2014, and gave a seminar entitled "Almost sure properties of some discrete-time stochastic systems".

- Dr. Conall Kelly visited the group of Professor Peter Imkeller at the Institute for Mathematics, Humboldt University Berlin, Berlin Germany, June 15–20, 2014, and gave a talk entitled "Stochastic systems with nonnormal drift".

- Dr. Davide Batic visited the Department of Mathematics and Statistics, UWI St. Augustine, Trinidad and Tobago, August 2013, and gave a talk entitled "Potentials of the Heun class" and assisted in the defense of the thesis of this student Anand Rampadarath entitled "A Geometric Analysis of the Casimir Effect".

- Dr. Davide Batic visited Dr. Piero Bicolini at the Frankfurt Institute for Advanced Studies, Frankfurt, Germany, January 2014, and gave a talk on "Potentials of the Heun class".

- Dr. Davide Batic visited Dr. Piero Bicolini at Frankfurt Institute for Advanced Studies, Frankfurt, Germany, July 2014, and gave a talk entitled "Noncommutative Geometry inspired wave equation".

PUBLICATIONS: PUBLISHED PAPERS

- Evelyn Buckwar and Conall Kelly, "Asymptotic and transient mean-square properties of stochastic systems arising in ecology, fluid dynamics and system control". *SIAM Journal on Applied Mathematics,* 72(2):411–433, 2014.

- Conall Kelly, Peter Palmer and Alexandra Rodkina, "Almost sure instability of the equilibrium solution of a Milstein-type stochastic difference equation". *Computers & Mathematics with Applications,* 66(11): 2220–2230, 2013. (Previously appeared in online form in June 2013).

- Gregory Berkolaiko, Evelyn Buckwar, Conall Kelly and Alexandra Rodkina, on the use of a discrete form of the Ito formula in the article "Almost sure asymptotic stability analysis of the Theta-Maruyama method applied to a test with stabilizing and destabilizing perturbations" (Corrigendum). *LMS Journal of Computation and Mathematics,* 16:366-372, 2013.

- E. Braverman, A. Rodkina," Difference equations of Ricker and logistic types under bounded stochastic perturbations with positive mean", *Computers and Mathematics with Applications*, 66(2013), 2281–2294.

- N. Dokuchaev, A. Rodkina, "Instability and stability of solutions of systems of nonlinear stochastic difference equations with diagonal noise", *Journal of Difference Equations and Applications*, 2014, 20:5 5-6, 744–764.

- N. Dokuchaev and Alexandra Rodkina, "On limit periodicity of discrete time stochastic, 2014. *Stochastics and Dynamics*, Vol. 14, No. 4 (2014) 1450011 (8 pages), World Scientific Publishing Company, DOI: 10.1142/SO219493714500117.

- Kaushik N, Tyagi B and G. Jayaraman 2013, "Modelling Biochemical Oxygen Demand in a River with Scattered Storage Zones". *Applied Mathematical Sciences*, Vol. 7, No 29, pp. 1429–1437.

- S. Kumari, G. Jayaraman and C. Ghosh, 2013, "Analysis of long

term ozone trend over Delhi and its meteorological adjustment", *Int. J. of Environmental Science and Technology*, 10, 1325–1336, DOI 10. 1007/ s 13762-012-0162-3.

- C. Nelson, Posada Aguirre and D. Batic, "Electrovac universes with a cosmological constant", *Central European Journal of Physics* 12(5), 297 (2014).

- D. Batic, R. Williams and M. Nowakowski, "Potentials of the Heun class", *Journal of Physics A: Mathematical and Theoretical* 46, 245204 (2013).

- Dmitry Malinin, "On finite nilpotent matrix groups over integral domains", ISRN Algebra, Volume 2013 (2013), Article ID 638623 http://dx.doi.org/10.1155/2013/638623

- Dmitry Malinin."On finite arithmetic groups". *International Journal of Group Theory*, Vol.2 (2013), p. 199–227.

- J. Jaraden and Dmitry Malinin, "On S-quasinormal subgroups of finite groups". *Wulfenia Journal*, Vol. 21, nr. 5 (2014), p. 150–160.

- Dmitry Malinin, Nor Muhainiah Mohd Ali, Nor Haniza Sarmin, "Representations of some groups and Galois stability", *Bulletin of the Malaysian Mathematical Sciences Society*, Vol. 37 (2014).

- Dmitry Malinin, "On integral representations of finite groups and some applications", International congress of mathematicians 2014, August 13–21, ICM2014, Seoul, *Short communications*, P02-19, p. 49.

INCOME GENERATION

Dr. Conall Kelly was awarded the following grants and fellowships:

- American Institute of Mathematics: Sequestered Quartet Research Ensemble (SQuaRE): Stochastic stabilization of limit cycle dynamics in ecology and neuroscience. The first meeting of this activity was held at AIM, Palo Alto, California, USA, February 10-14, 2014, bringing together five researchers from four countries (Jamaica, USA,

Canada, Austria) to investigate problems in mathematical biology. Two further meetings will be held in 2015 and 2016. The grant covers travel and subsistence for all members over the period of the project, and we estimate a total value of USD 25,000 over 3 years.

- Johannes Kepler University: Research Fellowship. To pursue collaborative research with Dr. Evelyn Buckwar from May 12–30, 2014 in the area of stochastic numerical analysis at the Institute for Stochastics, Johannes Kepler University, Linz, Austria. EUR 2292.20.

- London Mathematical Society: Scheme 2 Visitor's Grant. To visit and deliver invited seminars at: the University of Manchester, the University of Nottingham, and the University of Bath, UK, from June 1–15, 2014. GBP 1281.59.

PUBLIC SERVICE

- **Dr. Ponakala Nagarani** acted as the Independent External Examiner for PhD thesis of Curtis Boodoo, May, 2013, UWI, St. Augustine.

- **Professor Jayaraman** acted as the External Examiner for the PhD thesis "Modelling Crime" in the Department of Mathematics, St. Augustine on May, 2013.

- **Prof. Jayaraman** served as a member of the reviewing committee (as an Internal Academic) for "Quality Assurance Review of Mathematics & Statistics, The UWI, St Augustine Campus" November 18–22, 2013.

- **Dr. Samuel McDaniel** acted as the external examiner to Mathematics courses at Mico Teachers College and College of Agriculture & Science Education (CASE).

- **Ms. Sekayi Campbell** served as a member of the Universal Services Fund board for the academic year 2012/13.

- **Mr. Richard Plummer** acted as a presenter at the Graduate Thesis Writing Workshop-Data Analysis held, March 6, 2013.

– **Mr. Richard Plummer** was a member of the planning committee – Scientific Committee for the Jamaica Statistics Symposium held October 30–November 1, 2013.

– **Members of the department** also regularly act as peer reviewers for international journals.

STUDENTS

The department has graduated an average of 88 B.Sc. students per year with a major or minor in Mathematics, Actuarial Science Option, Mathematics with Education Option, Mathematics with Economics and most recently double major in Mathematics & Modelling Processes. Since 2009 to 2013 a total of 335 students graduated from the department as follows:

Year	Math	Actuarial Sci.	Math/Ed	Math/Econ	Math/ Modelling	Total
2009/10	20	21	–	7	–	48
2010/11	7	35	1	9	–	52
2011/12	18	33	2	15	–	68
2012/13	18	26	6	10	2	62
2013/14	19	38	18	26	4	105

For the 2013/14 academic year there were 652 Preliminary Level students, 303 Level I students, 83 Level II students, and 96 Level III students registered in Mathematics programmes. This year a total of eleven students graduated with First Class Honours degree.

Awards: Former Actuarial Sciences student Mr. Timar Jackson was awarded the Rhodes Scholarship in 2014, and will pursue a DPhil in Mathematical and Computational Finance at Oxford University from next year. In April 2014 another former Actuarial Sciences student, Mr. Everett Moseley, received a Prime Minister's Youth Award for Excellence for 2013.

GRADUATE PROGRAMMES

MSc Enterprise Risk Management: This year we received our second cohort of students. Although only six (6) persons took up the offer, we chose to offer the programme nonetheless as the best long-term decision. All 16 Cohort 1 students are due to graduate in November 2014.

MSc Mathematics Programme: This year we saw an increase in the number of students accepted. 15 students entered as qualifying students in Semester 1, and overall 23 students commenced the programme in Semester 2. The department has now introduced an MSc Mathematics Bursary, which provides financial support to one student, selected by academic performance and financial need. As of July 31, four students have applied.

MPhil and PhD Research Students: During the 2013/14 academic year there were 3 MPhil students and 2 PhD students registered in the department. Runako Williams and Dujon Dunn completed the requirement for the award of their MPhil degrees (Mr. Williams with High Commendation) and are expected to graduate in November 2014. Mr. Peter Palmer defended his PhD thesis and has completed his requirement for this award of his degree to be acknowledged in the November 2014 graduation ceremony.