



DEPARTMENT OF MATHEMATICS

Dr. Nagarani Ponakala Head Of Department

M.Sc, M.Phil & Ph.D (India)

Overview

For the 2021/22 academic year, the department continued its online teaching due to the pandemic. Our academic, administrative, and support staff continued to work hard in ensuring that our quality and standards are maintained at their highest despite having several challenges due to the COVID pandemic. Our administrative team bravely resumed their presence face-to-face, supporting both our internal and external customers alike. Also, our support staff continued to ensure that the working environment was safe for all. The Department continues to face challenges in terms of the recruiting and retention of academic staff. The Department lost the services of Mr. Howard Hines, who specialized in actuarial science and was the director of the actuarial programme for the past several years. He resigned, effective 31st July, and Mr. Omar Forrest, also resigned effective 31st August. At the same time, we have a new member of staff Dr. Victor Job, who joined as a lecturer, effective 1st August. Despite the challenges due to the pandemic and staffing issues, due to team effort, the Department was able to meet its objectives and continues to do so, moving forward and being able to perform a commendable job.

The Department capitalized on online technology and extended our weekly research seminars internationally and is so able to capitalize on extending invitations to various overseas colleagues to participate and have an increase in the number of weekly Departmental seminars. The Department has commenced the infrastructure renovation exercise and was able to expand our existing computer room by increasing its seating capacity to 30 up from 20. We were able to acquire and install 30 computers for students'

use and equip them with the appropriate software, to enhance teaching and learning. The Department also completed the curriculum revision of two of its programmes - BSc Statistical Science and BSc Mathematics and Modelling Processes to meet the growing demands of a changing world. During this process, we were able to create 2 new courses to be added to the Mathematics and Modelling Processes programme. The Department celebrated the selection of our alumnus Mr. John W. Robinson FSA, FCA, MAA as 2021-2022, as Society of Actuaries (SOA) president-elect.

Department Activities and Outreach

The Department annual Career Fair was held on November 22, 2021, virtually via ZOOM, where a total of 9 industries participated. New industries such as Tax Administration of Jamaica (TAJ), Statistical Science Institute of Jamaica (STATIN), and the Ministry of Health and Wellness also joined this year. The other industries were FLOW, Massy United Insurance, Grace Kennedy Limited, Sagicor, Scotiabank, and KRYG Global, who over the years continue to be an important staple in the event. A total of 30 students participated and were engaged by Mr. John W. Robinson FSA, FCA, MAA, where the discussion was centered around "How to Become an Actuary". The Department held our Industry Advisory Board (IAB) meeting for this academic year through hybrid mode on Friday, 8th April 2022, from the Mathematics Conference Room, chaired by Mr. St. Elmo Whyte. This is one of our strategic objectives to improve the relations between the Department and Industries. The participating companies are Grace Kennedy Ltd, Scotia Bank and National Commercial Bank. Ms. Othandra Dowes, the student representative and members of staff in the department were present at the meeting and well supported by participation from the Faculty. The Department's annual Summer Internship programme orientation was held on June 2, 2022, via Zoom. Our special guest speaker was Dr. Ann Marie Williams from Placement and Career Services on Mona Campus, who gave a very interesting talk entitled "Get Ready for the Adventure!". We had participation from 2 external companies KRYG Global and Port Authority, at this event. Several students were placed in several internship positions and the breakdown of internships by company for 2021/22 is as follows:

Name of Employer	Number of interns taken by each employer
Flow	4
Krys Global	3
PicewaterhouseCoopers	1
Port Authority	3
STATIN	3
Symptai Ltd.	4
Grace Kennedy	1
PIOJ (The Planning Institute of Jamaica)	2
Total	21

It is important to note that this year Jamaica National Commercial Bank (JNCB) offered a job position of Capital Markets Analyst to a final year student through this programme. Commendations must go to our administrative staff who worked tirelessly to contact the employers.

The Department participated in various outreach/in-reach initiatives during the period from August 2021 to April 2022. As part of our in-reach initiative, the Department conducted online internal marketing with students at the preliminary level, level I and II, aimed at promoting the existing programmes in the Department, particularly the non-actuarial science programmes. This was well received by the students. One of our outreach initiative was to conduct a series of CAPE Workshops which took place virtually from January 3-7, 2022, keeping with the pandemic mode. A Total of 7 schools participated with 32 students over the duration. The department also held a Teachers' workshop from January 7-8, 2022, as part of a new initiative by the Faculty from which a total of 18 teachers participated in Mathematics workshops. Special thanks to Drs. Kirk Morgan, Victor Job, Ms. Roxanne Francis and Messers Ramone Jackson and Andrew McCartney for their contributions to its success. Additionally, Dr. Diptiranjana Behera and Dr. Victor Job also attended a meeting with a team from Kingston Cre-

ative on Friday, February 25th, 2022, hosted by the Faculty of Science and Technology to discuss their App-development idea for improving the teaching of Mathematics to young children, and the implementation of this idea, with support and guidance from the Faculty of Science and Technology.

Another external engagement was conducted by Ms. Roxanne Francis on March 12, 2022, where she spearheaded and executed an initiative themed '10 Things We Wish We Knew 10 Years Ago' as part of the Westwood High School Class of 2012, 10th Year Anniversary celebration. There, she engaged the class of 2012 in riveting conversations about finance, planning for tertiary education, managing relationships, unconventional careers, and so much more. The students benefited tremendously from the engagement. Dr. Fisher-Howe gave a talk under the theme "FST – the right choice to make" at the Mona High School's 3rd Form Career Day exercise. The talk was well received. The Department hosted a Mentorship Lyme in recognition of International Day for Women and Girls in Science on February 11, 2022. The seminar was hosted under the theme Science Bridges: Building Connections for Equality in Science, Through Mentorship and Advocacy. Three female mathematics professionals engaged students of the faculty and from neighbouring high school communities in conversations about the importance of women's involvement in mathematics and interesting facts about their respective fields. The presenters were Dr. Nagarani Ponakala, Head of the Mathematics Department; Dr. Tamika Royal-Thomas; Senior Lecturer and Statistician; and Justine Powell, Associate of the Society of Actuaries. The initiative was organized by Roxanne Francis, Special instructor in the department, who has responsibility for student engagement. The Jamaican Mathematical Olympiad selected a team that competed in the XXIII Central American and Caribbean Mathematical Olympiad (OMCC) held from August 9-14, 2021. It was organized by the Colombian Mathematical Olympiad and was held online for the second time. The team members were Shellane Shettlesworth from Montego Bay High School and Aayush Jain from Ardenne High School. Aayush Jain, received a Bronze Medal. This was only Jamaica's fourth medal since 2010 and first since 2016. A total of 12 countries from Central America and the Caribbean participated in the XXIII OMCC: Columbia, Costa Rica, The Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Puerto Rico, and Venezuela. Jamaica has participated in the OMCC continuously since 2010, and continues to be the only English-speaking country in this event.

The series of these activities above were part of our initiative pinpointed to serve as the emphasis for our activities. These activities were aligned to three pillars – Access, Alignment and Agility based on University's main Triple 'A' Strategy. We observed a significant progress regarding goal establishment despite a decline seen in our students' intake. We noted that there were, 'improvements in the pass rate of students', 'increase in Department seminars and research output', and 'improvement in our relationship with industries'. In the sections to follow, we will align our other activities utilizing the three pillars indicated.

ACCESS

Student Matters

Undergraduate Programmes and Students

In an effort to improve our quality of teaching and learning, for some of our specialized courses that were streamed, the Department continued to utilize one lecturer for their delivery to ensure consistencies in teaching. We also utilized the service of tutors to be markers of problem papers of tutorials conducted by them with a hope to give both the tutors as well as the students more insight into the deficiencies seen in solving questions. Both strategies continue to be a success.

This academic year many of our students received awards and recognition from both internal and external sources as follows:

Department awards

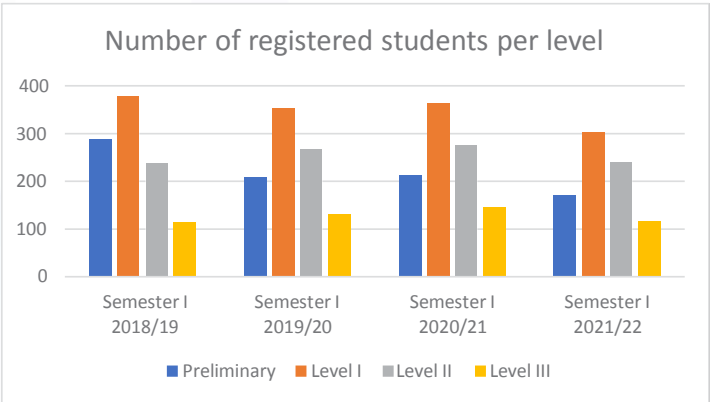
BLAIR, Ruth-ann Merville Campbell Prize (Level I) and
Department of Mathematics Prize (Level I)
LYNCH, Justin Merville Campbell Prize (Level II)
Henry-Aub Prize (Level II)
REDWOOD, Neikoy Henry-Aub Prize (Level II)

External sources

The following actuarial students are the recipients of the Caribbean Actuarial Scholarship for 2021-22. This Scholarship was established in 2008 by Mr. S. Michael McLaughlin, FFSA, FIA, MAAA, CERA, an actuary who graduated from the University of the West Indies:
Michael Samuels, Level III (3000 USD)
Ruth-Ann Blair, Level II (2000 USD)

Our Mathematics students selected for the IFOA Foundation Fullerton-Long Caribbean Scholarship Fund for the 2021-22 are:
 Kevon Kidd, Level II, US \$2,125
 Stuart Powell, Level III, US \$2,125
 Michel Spence, Level III, US \$2,125

The Long Actuarial Scholarship was extended to Abigail McFarlane, level II (USD 2,000) for 2021-22. She was a recipient of the same award in 2020-21. As part of our strategic objective the Department saw the need to include a retention component that would focus on optimizing the number of students being promoted successfully throughout the three years programme offered by the Department. Despite our best efforts we note that there has been a decline over the past 4 years as seen below:

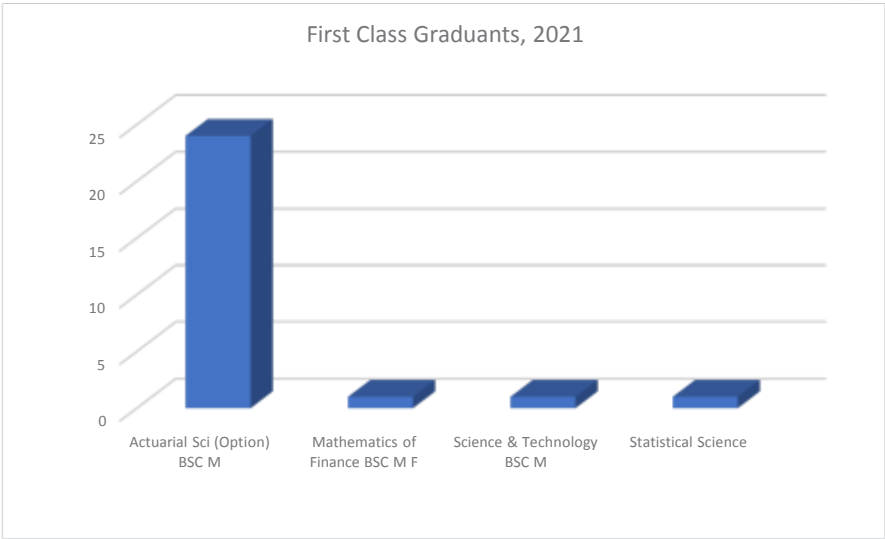


For the past five years, a total of 412 undergraduate students graduated from the department. This is broken down as follows:

	2017	2018	2019	2020
2021	60	86	83	78
105				

In November 2021, a total of 27 students graduated with First Class Honours broken down as follows:
 We continue to offer our one-on-one student experience through our annual Career Fair to improve their soft skills to prepare them to transit bet-

ter to the work world after graduation.



Graduate Programmes and Students

MSc Enterprise Risk Management

Our Master of Science programme, Enterprise Risk Management, run in partnership with MSBM was included as one of eight graduate programmes ranked among the top masters programmes in Latin America. The Enterprise in Risk Management Masters programme received a Top 100 - Global Ranking; being ranked No. 42 in the Insurance, Risk & Actuarial Sciences, Worldwide. For the 2021/22 academic year, 11 students joined cohort 11, 14 students from cohort 9 moved on to their second year while 5 students graduated from cohort 8.

MSc Mathematics

As this programme is normally offered bi-annually, we continued with our existing cohort to year 2. Mr. Andrew McCartney received the MSc Mathematics Bursary for the second year due to his consistent excellent grades. The value of the 2021/22 academic year award was J\$243,023 to cover the cost of tuition and miscellaneous expenses.

MPhil/PhD Mathematics

As at July 31st, 2022, the department has the following research students on its books.

5 MPhil students (3 new, 2 returning)

2 PhD students (returning)

Publications

Journal Articles

- Ausaru, A*, Nagarani. P., Effect of External Body Acceleration on Solute Dispersion in Unsteady Non-Newtonian Fluid Flow-the Generalized Dispersion Model Approach. *Int. J. Appl. Comput. Math* 8, 13 (2022).
- Delmar Sherriffe*, Diptiranjana Behera and P. Nagarani, Analytical new soliton wave solutions of the nonlinear conformable time-fractional coupled Whitham–Broer–Kaup equations, *Modern Physics Letters B*, 2150492 (2021).
- Sherriffe, D.*, Behera, D. , Analytical approach for traveling wave solution of non-linear fifth order time-fractional Korteweg-De Vries equation, *Pramana- J Phy* 96, 64 (2022).
- Diptiranjana Behera, Konor Peters, S. A. Edalatpanah, Alternative methods for linear programming problem under triangular fuzzy uncertainty, *Journal of Statistics and Management Systems*, Vol. 25 (3) 521-539 (2022).
- Job, V.M., Sankar, A., Gunakala, S.R. et al. Numerical Study of Two-Phase Peristaltic MHD Nanofluid Flows in a Flexible Tube with a Porous Peripheral Layer and Thermal Radiation. *Int. J. Appl. Comput. Math* 8, 76 (2022).
- Victor Job, V.M., Gunakala, S.R. & Chamkha, A.J. "Numerical investigation of unsteady MHD mixed convective flow of hybrid nanofluid in a corrugated trapezoidal cavity with internal rotating heat-generating solid cylinder" *Eur. Phys. J. Spec. Top.* 231, 2661-2668 (2022).
- .P.G. Siddheshwar, Mahesha Narayana, R. Saha, S.S. Nagouda, A Comparative Study of Thermoconvective Flows of a Newtonian Fluid Over Three Horizontal Undulated Surfaces in a Porous Medium, *Journal of Heat Transfer* 144(9), 092701(2022).
- B.A. Pasha, Mahesha Narayana, G. Sowmya, V. Ramachandramurthy, Flow and heat transfer analysis of a thin film ferromagnetic liquid over an unsteady stretching sheet, *Biointerface Research in Applied Chem-*

istry 13(3), 284, (2023).

- B. Azghar Pasha, M. Narayana, G. Sowmya, V. Ramachandramurthy, Numerical investigation of ferromagnetic liquid film flow over an unsteady stretching surface in the presence of radiation and aligned magnetic field, *Heat transfer*, 51(5), 4268-4285 (2022).
- Thompson, Debbie S., Royal-Thomas, Tamika Y.N., Tennant, Ingrid A., Soares, Deanne P., Byrne, Christopher D., Forrester, Terrence E., Gluckman, Peter D. and Boyne, Michael S. (2022) Liver fat in adult survivors of severe acute malnutrition. *Scientific Reports*, 12 (1), [3690]. (doi:10.1038/s41598-022-07749-5).

* graduate student

Conference Proceedings

- Sreedhara Rao Gunakala, Victor M. Job, Two-phase model of intravenous magnetic nanoparticle hyperthermia in muscle and prostate tumours, *Materials Today: Proceedings*, 57 (2), 781-785 (2022).
- Book Chapters
- Smita Tapaswini and Diptiranjana Behera, Successive approximation method based uncertain dynamic responses of fractionally damped beam, *Modeling and Computation in Vibration Problems*, Vol. 2 (Soft Computing and Uncertainty), Editors: S. Chakraverty, Francesco Tornabene, J. N. Reddy, IOP Science, Chapter 14, 14(1)-14(11), 2021, DOI:10.1088/978-0-7503-3487-7ch14.

ALIGNMENT

As part of our efforts to improve the quality, quantity and impact of research, the Department encouraged research visits, conference participations and other professional activities for academics as seen below. We hope that these exposures would bring about various overseas collaboration for colleagues.

Invited Talks /Keynote lectures

Alexandra Rodkina gave talk "Stochastically perturbed control in Difference Equations" at the International workshop celebrating the 100-th anniversary of Mark A. Krasnosel'skii's, UT Dallas, May 3-5, 2022, TEXAS.

Britta Hay presented as the lead trainer for IAIS Insurance Core Principles 14 (Valuation) on September 1, 2021, as part of the virtual training programme "Capacity Building for Insurance Supervisors - Leveraging Actuarial Skills" organised by the International Actuarial Association, the International Association of Insurance Supervisors (IAIS), and the Access to Insurance Initiative.

Diptranjan Behera delivered a talk as a guest speaker on the topic entitled "Uncertainty analysis of imprecisely defined structures using fuzzy and interval based approach" at Department of Mathematics, College of Basic Science and Humanities, Odisha University of Agriculture and Technology (OUAT), Bhubaneswar, Odisha, India (08th July, 2022);

Diptranjan Behera delivered a talk entitled "A new method for solving epistemic uncertainty based linear programming problem" at Department of Mathematics, National Institute of Technology Rourkela, Odisha, India (21st July, 2022);

Mahesha Narayana delivered a lecture on "Differential Transforms" at the Faculty Development Programme organized by the Centre for Mathematical Needs, Department of Mathematics, Christ University, India during 25 - 29 October 2022.

Mahesha Narayana delivered an expert lecture on "Computer-assisted analytical methods of solving Non-linear Fluid Dynamical Problem" at an international webinar "Non-Linear Differential Equations & Fluid dynamics Applications in Engineering Sciences" organized by CVR College of Engineering, Telangana, India, during 12 - 14 May 2022.

Mahesha Narayana delivered an expert lecture on "Use of spectral methods together with linearization technique for problems arising in fluid dynamics" at the workshop "Advanced Numerical Techniques for Differential Equations" (ANTDE) organized by MNIT, Jaipur, India, during 6-10 June 2022

Nagarani Ponakala gave a talk on "Convection -Diffusion in Physiological fluid flows", 27th July 2022, at the Department of Mathematics, IIT, Kharapur.

Conference Presentations

Ajani Ausaru, Nagarani Ponakala, Andre Small and Victor Job "Dispersion of a solute in non-Newtonian fluid flow in a catheterized artery with mild stenosis", International Conference on Advances in Transport Phenomena (ICATP 2022) in virtual mode during July 16-18, 2022 organised by VIT-AP University, India.

Tamika Royal-Thomas, Tatyana McLean and Tymeia Richards "A Story about Deviant Behaviour and Epilepsy": A Longitudinal Data Analysis Application", Oral presentation at the Joint Statistical Meetings 2021.

Tamika Royal-Thomas, "Longitudinal Data Analysis and its significance in modern day research". Oral presentation at the 2021 Women in Statistics and Data Science Conference. October 6-8, 2021.

Victor Job delivered a virtual presentation on the topic "Numerical Study of Unsteady MHD Poiseuille Flow with Temperature-Dependent Viscosity through a Porous Channel under an Oscillating Pressure Gradient" on October 9, 2021 at the International Conference on Mathematical Sciences. S.V. National Institute of Technology, Surat, India.

Victor Job delivered a virtual presentation on the topic "MHD Slip Flow and Heat Transfer with Ohmic Heating between a Rotating Solid Disk and Stationary Permeable Disk" on November 27, 2021 at the 1st International Conference on Applied Research and Engineering (ICARAE2021). Cape Town, Western Cape, South Africa.

Victor Job delivered a virtual presentation on the topic "Influence of Heat Transfer, Chemical Reaction and Variable Fluid Properties on Oscillatory MHD Couette Flow through a Partially-Porous Channel" on January 6th, 2022 at the 8th International Conference on Mathematics and Computing (ICMC 2022). Vellore Institute of Technology, Vellore, India.

Victor Job delivered a virtual presentation on the topic "Two-Phase Model of Intravenous Magnetic Nanoparticle Hyperthermia in Muscle and Prostate Tumours" on March 5th, 2022 at the 3rd International Conference on Aspects of Materials Science and Engineering (ICAMSE 2022). Organized by Panjab University, Chandigarh, India.

Conferences/Seminars/Meetings Participation

attended sessions of the International Conference on Inclusive Insurance 2021 - Digital Edition, October 25-29, 2021 hosted online by the Munich Re Foundation and the Microinsurance Network, including sessions hosted by the Insurance Association of Jamaica discussing the landscape of inclusive insurance in Jamaica.

attended sessions of the Society of Actuaries' 2021 Annual Conference, October 25-29, 2021 hosted online by the Society of Actuaries, USA covering topics including Climate Risk, Enterprise Risk Management, Data Analytics, Ethics and Professionalism, and Diversity, Equity and Inclusion in Insurance.

attended the Casualty Actuarial Society's Academic Central Webinar, October 26, 2021 hosted by the Casualty Actuarial Society, USA. Professors from Worcester Polytechnic Institute and DePauw University presented on How to Incorporate CAS Materials to Develop Property & Casualty Course Curriculum.

attended the Access to Insurance Initiative/International Association of Insurance webinar "How to Raise Insurance Awareness – Lessons from the 2nd Inclusive Insurance Innovation Lab", on February 10, 2022.

attended the International Actuarial Association Health Section webinar "Closing the Financial Gap in Colombia's Health Sector: A new methodology for calculating the UPC" on April 20, 2022.

participated in a consultation session on September 10, 2021, with the Planning Institute of Jamaica regarding the feasibility of the Unemployment Insurance scheme proposed by the Government of Jamaica.

Participated on April 12, 2022 in a meeting of the Caribbean Actuarial Association's Actuaries Climate Index Committee, supporting the development of a climate index for the region.

Participated in a stakeholder meeting with the International Labour Organization to discuss the Government of Jamaica's proposed Unemployment Insurance Plan on April 21, 2022.

Participated in meetings on April 25 and April 28, 2022 of the Actuaries in Jamaica to discuss and present comments on the changes proposed by the Financial Services Commission to legislation governing insurance companies.

Participated as a member of the Caribbean Actuarial Association's Technical Steering Committee in their meeting on April 29, 2022.

Participated in a meeting of the Unemployment Insurance Technical Oversight Committee hosted online by the Planning Institute of Jamaica on October 6, 2021, to discuss the parameters and actuarial analysis of the proposed unemployment insurance scheme.

At the invitation of the President of the Jamaica Employers' Federation participated in a consultation session on September 10, 2021, with the Planning Institute of Jamaica regarding the feasibility of the Unemployment Insurance scheme proposed by the Government of Jamaica.

Nagarani Ponakala

attended the International Conference on Advances in Transport Phenomena (ICATP 2022) in virtual mode during July 16-18, 2022 organised by VIT-AP University, India

Other Professional activities

Appointed to the Risk Book Editorial Board (RBEB) of the International Actuarial Association.

Named Chair of the General Insurance Committee of the Caribbean Actuarial Association.

Department Seminars

Conall Kelly, Director of MSc and Computational Mathematics University College Cork, Ireland, presented on, "A novel splitting method for the Cox-Ingersoll-Ross model". Friday, October 8, 2021 at 11:00 via Zoom.

Victor Job presented on, "Mathematical Modelling Approaches for Nanofluid Flow and Heat Transfer". Friday, October 15, 2021 via Zoom.