DEPARTMENT OF MATHEMATICS

Departmental Report August 2020 - July 2021

Dr. Nagarani Ponakala · **Head of Department**
M.Sc, M.Phil & Ph.D (India)

OVERVIEW

The 2020/21 academic year will forever be remembered as the department shifted full gear to remote teaching brought on by the COVID-19 pandemic. Thanks to the hard work of our academics, administrative and support staff, our response to the pandemic was swift and impactful. We reverted to remote teaching and online assessment alternatives as we were forced to work remotely from home. Our administrative team was able to seamlessly offer their support remotely without hampering production and the support staff ensured that the environment was safe to work in, when required. Despite this, we were all able to meet our objectives and continued to do so moving forward. We are happy to report that Dr. Diptiranjan Behera was promoted to the rank of Senior Lecturer, this takes effect on August 1, 2021 and Mrs. Orinthia Fisher-Howe recently earned her Doctorate in Business Administration in Strategic Management as well. We added a new member of staff to the Mathematics family, as we are pleased to announce that Dr. Victor Job will be joining the department as a lecturer effective August 1, 2021. Despite our festive moods two members of staff resigned from the fold: **Omar Forrest**, Assistant Lecturer resigned effective, August 31, 2021; **Howard Hines**, Lecturer specialized in actuarial science and who was the Director of the Actuarial Science Programme has resigned, effective July 31, 2021.

We have also embarked on a refurbishing exercise which is aimed at improving our infrastructure in various ways such as: Expansion of the existing computer room to accommodate more computers - making the total 30 up from 20; Obtaining 30 new computers to facilitate both staff and students alike; Improving our existing customer service through the expansion of that office area.

Staff awards and recognitions

- Our past graduate, **Roxanne Francis** joined with us as a special instructor since August 2020 and also was recognized by FST for her distinction in the MSc Mathematics programme.

- **Nagarani Ponakala** was recognized by the Faculty of Science and Technology (FST) in recognition of the achievement of "Bharat Ratna Indira Gandhi Gold Medal Award" for outstanding individual achievement in Education and Research for 2019, by the Global Economic Progress & Research Association (GEPRA), New Delhi, India in the 2019-2020 academic year.

- **Tamika Royal-Thomas** was recognized by FST for The Principal's award for Best Research Publication for 2019-2020, for the publication as seen below:

Cunningham-Myrie, C.A., Royal-Thomas, T.Y.N., Bailey A.E., Gustat J., Theall K.P., Harrison J.E. and Reid M.E. "Use of a public park for physical activity in the Caribbean: evidence from a mixed methods study in Jamaica." BMC Public Health 19, 894 (2019). https://doi.org/10.1186/s12889-019-7247-6

Department Activities and Outreach

We held our **Industry Advisory Board (IAB)** meetings for this academic year virtually on October 14, 2020 and March 10, 2021, both meetings were chaired by Mr. Howard Hines via Zoom. This is one of our Strategic Objectives to improve the relations between the Department and Industries. It was well supported by the Faculty and participating Industries much as Grace Kennedy, The National Council on Technical and Vocational Education and Training (NCTVET) and Financial Services Commission. Our annual **Career Fair** was held on November 27, 2020, virtually via ZOOM where we observed an increase in the number of companies participating - from 6 to ,9 in comparison to last year's staging.

We also noted that 94 of our students participated in the activity. The companies that participated were: **KRYS Global**; **FLOW**, **Jamaica Public Service**; **National Commercial Bank**; **Scotiabank**; **Symptai**; **Digicel**; **Port Authority of Jamaica and Massy United insurance Ltd**. In anticipation of Career Fair, the department held a Pre-Career Fair Talk via ZOOM with guest speakers Mr. Norbert Fullerton and Mr. Andrew Long - Actuaries and past students of the university. They had a discussion with the students about the Actuarial Science profession and the path for students after graduation. Our annual **internship** programme was launched on June 24th with an orientation session where Dr. Ann-Marie Williams, the Student Services & Development Manager at Placement & Career Services did an exciting presentation on "Business Etiquette" with students, members of staff. Thirteen (13) students received spaces despite the pandemic. A special thanks to the following companies who made it possible:

Massy United

Insurance Ltd

Price water Coopers (PwC)

KrysGlobal

National Commercial Bank(NCB)

Scotiabank

The Department participated in various **outreach initiatives** during the period August 2020 to March 2021. One such initiative was to conduct a series of CAPE Workshops. This year, due to the current pandemic our workshops were conducted online and hosted by the Faculty. Different sessions were conducted each day. Dr. Royal-Thomas did a presentation to a selected group of sixth form students of Calabar High School on "Careers in Statistics and Mathematics" Our **Jamaican Mathematical Olympiad 2020/21 Competition** qualifying rounds commenced on March 12, 2021 for the Senior (High School level) competition April 15, 2021 for the Junior (Primary Level). Due to the pandemic, both competitions were reduced to three rounds from four previously utilized. In order to facilitate the hosting of the competitions the department reached out to the Mona Information Technology Services (MITS) to develop a new online platform tailored to the needs of the

competitions. Utilizing this platform, students were able to sit examinations remotely. The final examinations were both held face to face with the junior level being offered at their schools under proctored condition and the senior to appear at The UWI, Mona Campus, or The UWI, Western Jamaica Campus where strict safety protocols were successfully observed. From the senior competition a team consisting of Ms. Shellane Shettleworth of Montego Bay High School and Mr. Aayush Jain of Ardenne High School were selected to participate in the Regional International Competition to be held virtually August 9-14th, 2021. **New Fortress Energy** came on board again as a second year in the row as a title sponsor for both the senior and junior competitions with other key sponsors such as **First Caribbean Intl Bank**, **Caribbean Actuarial Society**, **and KRYS Global**, **Caribbean Actuarial Society**, **Insurance Association of Jamaica and Actman International**. We express our sincere gratitude to all sponsors without whose support we couldn't able to organize the competitions in such a large scale and MITS for providing tremendous support in this transition of paper mode of exams to online due to COVID pandemic. The series of these activities above was 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 that a significant progress has been noted regarding goal establishment from which improvements were seen 'increasing our students' intake, 'improvement in the pass rate of students', 'increasing staff complement and hence the research output', 'improve relationship with industries' and 'increase in outreach activities. 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 was able 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 of deficiencies seen in solving questions. Both strategies were very successful.

Before the beginning of the pandemic, the department embarked on revising two existing programmes – BSc Mathematics & Modelling Processes and the BSc Statistical Science – to meet the needs of the society, however their completion was hampered and will progress once again for the new academic year.

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

Department awards:

- BAKER, Robert - Merville Campbell Prize (Level I)
- HAYNES, Byron - Merville Campbell Prize (Level II)
- LYNCH, Justin – Department of Mathematics Prize (Level I)
- CAMPBELL, Akeem - Henry-Aub Prize (Level II)

External sources

Our Mathematics students were supported by three new scholarships this year: the Massy United Scholarship; The Long actuarial Scholarship; the Norbert Fullerton Scholarship along with other scholars available for our students since several years such as Stephen Alleyne Memorial Scholarship, the Caribbean Actuarial Scholarship.

Name	Category	Value of award
Massy United Scholarship	Scholarship	
• Mark Brown		US$2500
• Antoniquee Aris		US$2500
The Long Actuarial Scholarship	Scholarship	
• Miss. Abihail McFarlane (Level 1)		US$2,125

The Norbert Fullerton Scholarship	Scholarship	
• Mr. Jordan Ashman, Level II,		US$2,125.00
Stephen Alleyne Memorial Scholarship	Scholarship	
• Danielle Morgan		US$2,500.00
Caribbean Actuarial Scholarship	Scholarship	
• Akeem Campbell – Level III		US$3000
• Andre Atkinson – Level III		US$3000
• Kymani Francis – Level II		US$2000

Daneel Nichol, President of the UWI Actuarial Society, has been accepted by the Embassy of Japan for their prestigious Japan Exchange and Teaching Programme. Additionally, some students of MATH3806 Topics in General Insurance have been accepted for the Student Central Summer Program of the Casualty Actuarial Society in the United States. The program is an eight-week virtual interactive professional and educational experience supporting students' career growth in general insurance by providing technical and soft skill development, mentorships and networking opportunities. Participation in the program was facilitated by Britta Hay's membership in the CAS Academic Central Program. The students accepted are Bradley Ximinies, Kimani Allen, Tyler Thomas, Malik East and Saisankeerth Nareddi. 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 progamme offered by the Department. This justification was given from the data seen below. We projected an increase in numbers over the next 2 years. For the year 2020/21 the number of registered undergraduate in the department was as follows:

Preliminary Level - 212

Level 1 - 364

Level II - 275

Level III - <u>148</u>

Total - 999

For the past five years, a total of 393 undergraduate students graduated from the department. This is broken down as follows:

2016	2017	2018	2019	2020
86	60	86	83	78

During the 2020/21 academic year a total of 10 students received First Class Honours. We continue to offer our one-on-one student experience to improve their soft skills to prepare them to transit better in the work world after graduation through our annual Career Fair.

Graduate Programmes and Students

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.

Publications

Journals

1. E. Braverman,C. Kelly, and **A. Rodkina**, "Stabilization of cycles with stochastic prediction based and target-oriented control", Chaos: An Interdisciplinary Journal of Nonlinear Science, 30(9), (2020).pp 093116.

2. **Ausaru**, **A.**, **Nagarani**, **P**. & Sebastian, B.T. Dispersion with wall absorption in non-Newtonian fluid flow subjected to external body acceleration. Eur. Phys. J. Spec. Top. **230**, 1399–1414 (2021). https://doi.org/10.1140/epjs/s11734-021-00051-x.

3. Escalante-Martinez J. E., Morales-Mendoza L. J., Cruz-Orduna C., Rodriguez-Achach M.,**Behera Diptiranjan**, Laguna-Camacho J. R., Lopez-Calderon H. D., Lopez-Cruz V. M., Fractional Differential Equation Modeling of Viscoelastic Fluid in Mass-SpringMagnetorheological Damper Mechanical System, European Physical Journal Plus, Vol. 135, Article No. 847 (2020) DOI: 10.1140/epjp/s13360-020-00802-0

4. Smita Tapaswini, **Diptiranjan Behera**, Imprecisely defined Fractional Order Fok-

ker-Planck Equation Subjected to Fuzzy Uncertainty, Pramana-Journal of Physics, Vol. 95, Article No. 13 (2021) DOI: 10.1007/s12043-020-02033-5

5. **M. Narayana**, M. Shekar, P.G. Siddheshwar, N.V. Anuraj. On the differential transform method of solving boundary eigenvalue problems: An illustration, Z Angew Math Mech. 2020, e202000114. https://doi.org/10.1002/zamm.202000114

Book Chapters

1. **Small A.**, **Nagarani P. (2021)** Fluid Motion in Finite Length Tubes in Peristaltic Pumps. In:Rushi Kumar B., Sivaraj R., Prakash J. (eds) Advances in Fluid Dynamics. Lecture Notes in Mechanical Engineering. Springer, Singapore. https://doi.org/10.1007/978-981-15-4308-1_3

2. **M. Narayana**, P.G. Siddheshwar, S.B. Ashoka, Computer assisted successive linear-ization solution of the Darcy-Forchheimer-Brinkman flow through rectangular chan-nel, Mathematical Fluid Mechanics (Editor B. Mahanthesh), DeGruyter Series on the Applications of Mathematics in Engineering and Information Sciences, 2021. ISBN: 9783110696127

3. **M. Narayana**, R.R. Jackson, Heat transfer in a nanoliquid flow due to a permeable quadratically stretching sheet, chapter in "Energy Systems and Nanotechnology"(ed-itors D. Tripathi, R. K. Sharma, ISBN: 978-981-16-1256-5), Springer, 2021, 307-328. DOI: https://doi.org/10.1007/978-981-16-1256-5_16.

Non-refereed research based publications

1. Trevor S. Ferguson, **Tamika Y. Royal-Thomas**, Lisa Chin-Harty, Minerva M. Thame, Terrence E. Forrester, Clive Osmond, Michael S. Boyne, Rainford. J. Wilks. Effects of Linear Growth Rate and Change in Body Mass Index in Childhood and Adolescence on Blood Pressure in Afro-Caribbean Youth: The Vulnerable Windows Cohort Study. doi: https://doi.org/10.1101/2021.04.17.21255680. This article is a MedRXiv preprint (non-peer-reviewed article).

Other Publications

1. **Tamika Royal-Thomas** et al. "UWI SCIENCE: The Science of Emancipation Park – More than Meets the Eye".

https://www.mona.uwi.edu/fst/uwi-science-science-emancipation-park-more-meets-eye

2. Gleaner article, "UWI lecturer presents solution to overcoming 'math phobia' based on the The research article **M. Narayana**, M. Shekar, P.G. Siddheshwar, N.V. Anuraj. On the differential transform method of solving boundary eigenvalue problems: An illustration, Z Angew Math Mech. 2020, e202000114. https://jamaica-gleaner.com/article/news/20210325/uwi-lecturer-presents-solution- overcoming-math-phobia

ALIGNMENT

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

Invited Talks /Keynote lectures

Alexandra Rodkina

- Delivered a Plenary talk '' Stabilization of Cycles with Stochastic Control Functions". at the 14th Chaotic Modeling & Simulation International Conference CHAOS-2021, Athens, Greece, 8-11 June, 2021.(Virtual)
- delivered an invited talk '' On Local stability of Stochastic Delay Equations" at Mathematical Congress of the Americas 2021 (MCA2021), July 9-23, Buenos Aires, Argentina(Virtual)
- delivered an Invited talk: ''Stabilizing multiple equilibria with stochastic prediction-based control"

International Conference on Difference Equations and Applications 2021(IC-DEA) 2021, Sarajevo, Bosnia and Hercegovina, 26-30 July 2021(Virtual)

Britta Hay,

– delivered a talk in the International Actuarial Association's webinar series Risk-Based Financial Management and Supervision, presenting on the topic "Using Actuarial Reports – Getting the Added Value" on January 19, 2021.
– delivered presentations on the IAIS Core Principles and led breakout groups for the training programme's case study sessions
– presented on the topic "Using Actuarial Reports – Getting the Added Value" on February 11, 2021 at the invitation of the International Actuarial Association (IAA), part of an IAA series of webinars covering Risk-Based Financial Management and Supervision.

Mahesha Narayana,

– delivered a special talk on "Taylor series solution of boundary eigenvalue problems arising from fluid flow instabilities" at the virtual faculty development program Recent trends in Fluid dynamics organized by Sapthagiri College of Engineering, India during November 17-21, 2020.
– delivered an expert lecture entitled "On the differential transform method of solving boundary eigenvalue problems arising from fluid mechanics - An illustration" at the international winter school (online mode) Fluid dynamics, Heat Transfer and Applications organized by NIT Uttarakhand, India during January 18-29, 2021.
– delivered an online guest lecture entitled "Series solution of Falkner-Skan-type equations using functions that decay exponentially" on 14 July 2021 at the Department of Mathematics and Numera (Math Club), Ramaiah Institute of Technology, Bengaluru, India.

Nagarani Ponakala,

– delivered an invite on "On the dispersion of a solute in a non-Newtonian fluid flow in a tube under the influence of external body acceleration using the generalized dispersion method" at the 5th International Conference on Applications of Fluid Dynamics (Virtual mode), School of Mechanical Engineering, VIT-AP University, India, December 13-15, 2020.

Department Seminars

– **Britta Hay**, "Real Options" on May 14, 2021.

– **W. St. Elmo Whyte** presented on "Pension Plans" March 5th, 2021

– **Dr. Rishi Nash**, Associate Professor from Department of Mathematics York College, City University of New York (CUNY), presented on "An Introduction to Core Partitions" on Friday, April 30th

Department's club Activities (University of the West Indies Actuarial Society [UWIAS]) seminars

– November 5, 2020, Sarayyah Baksh, Senior Pricing Actuary - Casualty, Chubb Continental Europe, France. Topic: "Becoming an Actuary"

– November 29, 2020 Michael Frank , President, Aquarius Capital, USA Octavio Rojas, Consulting Actuary,Venezuela, Topic: "Overview of the Actuarial Profession and Career Opportunities"

– February 18, 2021: The Honourable Mrs. Daisy McFarlane-Coke, O.J., C.D.,Topic: "My Career Path, and the Importance of Being Open to Opportunities".

– February 25, 2021: Ms. Caroline Grégoire, an actuary, business coach and trainer for the compulsory "communication for actuaries" course of the German Actuarial Association. Topic "What Skills do You Need to Succeed as an Actuary?"

Conference /Seminars/meeting attended

Britta Hay,

– attended Caribbean Actuarial Association 30th Annual Conference, November 30 –December 4

– attended the Drake Risk and Insurance Workshop on Catastrophe Risk on February 19, 2021, hosted virtually by Drake University, USA.

– attended the Casualty Actuarial Society's 2021 Virtual CAS Ratemaking, Product, and Modeling Seminar March 15 – March 17, 2021, representing the UWI through the CAS Academic Central programme.

– attended a seminar hosted by the Access to Insurance Initiative and the International Association of Insurance Supervisors on the topic of Insurance and the Sustainable Development Goals, April 22, 2021.

– attended the Casualty Actuarial Society's 2021 Virtual Spring Meeting, May 24-27, 2021 hosted by the Casualty Actuarial Society, USA, participating in the roundtable discussion Enterprise Risk Management – A COVID-19 Discussion on Herd Immunity, the Future Economy, and Future Emerging Risks.
– attended the virtual CERA Global Risk Conference, June 14-17, 2021, presented by the CERA Global Association.

Diptiranjan Behera,

– participated in an International online workshop on "New Trends inFuzzy and Rough Set Theory and its Applications (FRSTA-2020)" from 25-29 September, 2020 organized by Department of Mathematics and Statistics, School of Basic Sciences, Manipal University, Jaipur, India.

Nagarani Ponakala,

– attended an open distinguished virtual lecture "Accelerating the Transformation of Traditional Enterprises with Artificial Intelligence (AI)" by Dr. Nicholas C.M. Fuller, Director, Hybrid Cloud Services, IBM T.J. Watson Research Center, New York, USA on May 20, 2021.

Public Service

For the 2020/21 academic year. Members of Department provided the following public services to impact the society as follows:

Britta Hay,

– completed the Predictive Analytics program for actuaries offered by the Society of Actuaries, USA.
– worked in collaboration with the International Actuarial Association (IAA) and Actuaries Without Borders (AWB) to host sessions for the UWI Actuarial Society.
– arranged speakers to present at UWIAS Club meetings, with the assistance of the international organization Actuaires du Monde (formerly Actuaries Without Borders):

Diptiranjan Behera,

– Joined as an Editorial board member for Applications and Applied Mathematics: An International Journal (AAM) published by Prairie View A and M University, Texas, USA (ESCI).
– Joined as an Editorial board member for Journal of Fuzzy Extension and Applications published by Ayandegan Institute of Higher Education, Iran (New Journal).
– joined as a technical program committee member for the 7th International Conference on Fuzzy Systems and Data Mining (FSDM 2021), October 26-29, 2021, Seoul, South Korea.
– joined as a program committee member for the 7th International Conference on Artificial Intelligence (ARIN 2021) May 22 -23, 2021, Zurich, Switzerland.
– appointed as review editor for Frontiers in Artificial Intelligence Journal (Section: Fuzzy Systems) published by Frontiers.
– appointed as External Examiner for Department of Mathematics, The Mico University College, Jamaica for three years from January 2020 to December 2022.
– reviewed papers for Mathematical Problems in Engineering Journal (Hindawi), Materials & Design Journal (Elsevier), for European Journal of Mechanics / B Fluids (Elsevier)Applications and Applied Mathematics: An International Journal (AAM)

Nagarani Ponakala,

– became a life Member in Indian Mathematical Society, India since December 2020.
– appointed as External Examiner for Department of Mathematics, The Mico University College, Jamaica for three years from January 2020 to December 2022

– reviewed articles for the journals: Malaysian Journal of Fundamental and Applied Sciences, Asia-Pacific Journal of Chemical Engineering Indian Journal of Physics, Springer Journal Scientific reports, Lecture Notes in Mechanical Engineering-book series of Springer Publishers.

AGILITY

Income Generation

Despite the pandemic, the Department agreed to offer Summer School this year to assist with our students' transition. Sixteen courses ranging from preliminary to final year courses were offered by the Department from which over J$5 million was earned. The students expressed their sincere thanks to the Department for the assistance given to their transition. The Department has on its books a self-financed programme – MSc Enterprise Risk Management which is administered jointly with MSBM. We anticipate a profit for the current academic year, however a delay was seen once again in its receipt, brought on by the pandemic. We anticipate a figure report for the next academic year.