A report on
National Webinar

On

Differential Equations and Applications

(September 27, 2022)

Organized by

Department of Mathematics

Faculty of Basic Sciences
Rajiv Gandhi University
(A Central University)
Rono Hills, Doimukh
Arunachal Pradesh-791112, India

1. Organizing Committee

Chief Patron   :   **Prof. Saket Kushwaha,** Hon'ble Vice Chancellor, Rajiv Gandhi University.

Patrons   :   **Dr. N. Tadar Rikam**, Registrar, Rajiv Gandhi University.
                        Prof. Sanjeev Kumar, Dean, Faculty of Basic Sciences, Rajiv Gandhi University.

Chairperson   :   **Dr. Nipen Saikia,** Associate Professor & Head, Department of Mathematics, RGU.

Convenor   :   **Dr. Jagdish Prasad Maurya,** Assistant Professor, Department of Mathematics, RGU.

Co-Convenor   :   **Dr. Dipak Barman,** Assistant Professor, Department of Mathematics, RGU.

Organizing
Members   :   **Prof. Sahin Ahmad**, Department of Mathematics, Rajiv Gandhi University.
                        Dr. Nipen Saikia, Associate Professor & Head, Department of Mathematics, RGU.
                        Mrs. **Dakjum Eshi**, Assistant Professor, Department of Mathematics, RGU.
                        Dr. Jagdish Prasad Maurya, Assistant Professor, Dept. of Mathematics, RGU.
                        Dr. Dipak Barman, Assistant Professor, Department of Mathematics, RGU.
                        Dr. Bishnupada Debnath, Assistant Professor, Department of Mathematics, RGU.
                        Dr. Nazeer Ansari, Assistant Professor, Department of Mathematics, RGU.

2. Executive Summary

At the very outset, the organizing chairperson, Dr. Nipen Saikia greeted all the dignitaries present in the online platform. The inaugural session started with blessings and best wishes of Chief Guest Prof. Saket Kushwaha, Hon'ble Vice Chancellor, Rajiv Gandhi University, special guests Dr. N.T. Rikam, Registrar, Rajiv Gandhi University, and Prof. Sanjeev Kumar, Dean of Faculty of Basic Sciences, RGU. Dr. Nipen Saikia expressed his heartfelt thanks to the University administration for the approval of the webinar. Dr. Saikia expressed his heartfelt thanks and welcome to both the resource persons Dr. Dharmendra Tripathi, Associate Professor, Department of Mathematics, NIT Uttarakhand and Dr. Jai Prakash Tripathi, Assistant Professor, Department of Mathematics, Central University of Rajasthan. He warmly welcomed all the participants who participated in the webinar. He also mentioned the use of differential equations and its various applications. Furthermore, he explained in detail about the objectives of the webinar and wished all the participants the best and also said that the webinar will be enjoyable and very beneficial for their future research work. He hearty congratulated the Convenor and Co-Convenor of the webinar.

The Convenor of the webinar Dr. Jagdish Prasad Maurya also greeted all the dignitaries, resource persons and participants and presented the concept note and objectives of the webinar. The first Resource person Dr. Dharmendra Tripathi started his speech by thanking the Department of Mathematics for the invitation. He mentioned that good knowledge of differential equations is very important for researchers working in related fields. He talked about the theme of the webinar also congratulated the Convenor of the webinar. The next resource person Dr. Jai Prakash Tripathi also thanked the Department of Mathematics for the invitation and congratulated the Department of Mathematics for organizing such a wonderful webinar. He mentioned the importance of ordinary differential equations and dynamical systems in his talk.

Due to some parallel programs in the university campus, we have missed listening the important thoughts of our Chief Guest Prof. Saket Kushwaha, Hon'ble Vice Chancellor, Rajiv Gandhi University, Special Guests Dr. N. T. Rikam, Registrar, RGU and Prof. Sanjeev Kumar, Dean of faculty of Basic Sciences, Rajiv Gandhi University. Our Hon'ble Vice Chancellor and other stalwarts of the University always motivated and encouraged faculty members to organize such type of events.

With the blessings of stalwarts of the University, the program had now proceeded towards the technical session. This session of the webinar started with the introduction and achievements of the first Resource person Dr. Jai Prakash Tripathi, Assistant Prof. Dept. of Mathematics, Central University of Rajasthan. Dr. J P Tripathi delivered his lecture on theme of the webinar and he explained about various applications of differential equations in Science and Engineering. The first speaker focused on the fundamentals of ordinary differential equations and dynamical systems.

In the next talk, Dr. Dharmendra Tripathi has delivered his lecture. The Convenor of the webinar introduced and shared the achievements of next notable resource person Dr. Dharmendra Tripathi. Dr. D Tripathi delivered his lecture on the objectives of the webinar and he explained the role of differential equations in understanding science and engineering related research problems. The main focus of his talk was based on applications of partial differential equations. He also explained the applications of partial differential equations in bone mechanics.

The concluding note of the webinar was presented by Professor Sahin Ahmed (Professor, Department of Mathematics, Rajiv Gandhi University). Finally, Dr. Dipak Barman, Co-Convenor of the webinar, expressed his vote of thanks and concluded the webinar. A total of 412 participants including faculty members, Research Scholars, and students from several states of India have registered for this webinar and 353 participants attended in this webinar. The webinar ended around 2:00 pm.

3. Resource Persons

3.1. Dr. Dharmendra Tripathi, Associate Professor

Department of Mathematics, National Institute of Technology**,** Uttarakhand, India.

Dr. Dharmendra Tripathi is working as Associate Professor in the Department of Mathematics, National Institute of Technology, Uttarakhand. He completed his PhD in Applied Mathematics (Mathematical Modelling of Physiological flows) in 2009 from Indian Institute of Technology BHU and MSc in Mathematics from Banaras Hindu University. He has supervised 07 PhD students and 04 are working under his supervision. He has published more than 200 papers in reputed international journals, 03 edited Books in Springer, 01 edited Book in CRC, 10 book chapters and presented more than 40 papers in International and National Conferences. **His research h-index is 54 and i-10 index is 163 and his papers have more than 7886 citations as per google scholar.** He has received the best faculty award in 2022 from NIT Uttarakhand for outstanding contribution in teaching, research and administration. He has been listed in top 2% researchers/scientists across the World as per Updated science-wide author databases of standardized citation indicators in the year 2020, year-2021 and year-2022. His research work is focused on the **mathematical modelling and simulation of biological flows in deformable domains, Peristaltic flow of Newtonian and non-Newtonian fluids, Dynamics of various infectious diseases; microfluidics; CFD, Biomechanics; Heat Transfer; Nanofluids; Energy Systems; Numerical methods; etc.** For more information, please visit his personal

homepage: https://portfolios.nituk.ac.in/419/dharmendra-tripathi/personal-details .

3.2. Dr. Jai Prakash Tripathi, Assistant Professor

Department of Mathematics, Central University of Rajasthan, India.

Dr. Jai Prakash Tripathi is working as an Assistant Professor in the Department of Mathematics at the Central University of Rajasthan, India. He completed his Ph.D. in Applied Mathematics (Bio-Mathematics) in 2015 from the Indian Institute of Technology, Mandi and MSc in Mathematics from Dr. RML Awadh University, Faizabad. He has published more than 47 papers in reputed international journals, 04 conference proceedings/book chapters, and presented more than 36 papers in International and National Conferences. **His research h-index is 17 and i-10 index is 22 and his papers have more than 894 citations as per Google Scholar.** His research work is focused on **mathematical ecology: epidemiological models**. He received the Young Scientist Award, VIFFA-2015. Till now, he has completed two research projects, and one is ongoing. For more information, please visit his personal homepage: http://www.curaj.ac.in/faculty/jai-prakash-tripathi

4. About the Webinar

The main objective of this one-day National webinar was to provide a forum for students/researchers in the field of Differential Equations and its various Applications. The application areas of differential equations are diverse and multidisciplinary, covering areas of applied science and engineering that include physics, chemistry, biology, fluid mechanics, finance, industrial mathematics, and more, in the form of modeling, computations, and simulation. Mathematical modeling through differential equations plays an important role in analyzing the physical behavior of real-life problems. Therefore, the differential equations always attract the scientific communities and researchers. The recent developments in the area of Ordinary and Partial Differential Equations, Fluid Mechanics, Numerical Methods, Dynamical Systems, Initial and Boundary Value Problems, Integral Differential Equations, etc. has been discussed. It provided the participants with the necessary fundamental knowledge of Differential Equations, mathematical modeling and its applications in different areas of Science and Engineering. This national webinar was therefore organized to discuss some important application of differential equations.

5. Technical Session

At the very outset of the technical session, the first notable speaker Dr. Jai Prakash Tripathi expressed his heartfelt thanks to the Department of Mathematics, RGU for inviting him to this very extremely valuable webinar. He emphasized on the relevance of the theme of the webinar and how the topic of the webinar is beneficial in understanding complex problems in science and engineering. Dr. J P Tripathi delivered a PowerPoint presentation on the topic entitled "Different Applications of Differential Equations". In this talk, he discussed the basics of differential equations and formulations of mathematical models through differential equations. He also discussed how differential equations with certain scientific rules, mathematical and numerical evaluation techniques may provide insights about dynamical properties, stability, survival, persistence, permanence, and prediction of the associated model systems. Furthermore, he explained the clear ideas about the mathematical modelling of real-life problems through differential equations. He also congratulated the organizing committee for organizing such a valuable webinar. During the interaction session, the participants were actively involved in question-and-answer. Many participants showed great satisfaction with the response of the resource person.

The next talk of the webinar was delivered by the eminent resource person Dr. Dharmendra Tripathi. He presented a talk on the topic "Applications of Partial Differential in Bone Mechanics". At the beginning of the talk, he first congratulated the Mathematics Department for organizing such a webinar. In this talk, he mainly covered the basic concepts of partial differential equations and their applications in Science and Engineering. He also discussed the application of partial differential equations in bone mechanics, where the role of electroosmosis mechanism, magnetohydrodynamics, cantilever bending loading induced fluid flow in bone remodeling by controlling the fluid motion in Lacunar-Canalicular system of bone. Furthermore, he also explained about the animal loading models; i) Trapezoidal loading, ii) Sawtooth loading and iii) triangular loadings on the bone adaption, signalling molecules (ATP, PGE2 and NO) transport under the effect of loading frequency, as well as computational results, exhibiting how electromagnetic fields enhance the osteogenic response to prevent and mitigate irreversible bone loss occurred due to the microgravity and disuse. In addition to the above important results, he also discussed the limitations and future direction of the model in the field of bone mechanism as well solutions to orthopedic issues and disorders. He concluded his talk with the best wishes to the Convenor of the webinar. The participants were actively involved in the question-and-answer session. Many participants showed great satisfaction with the response of the resource person.

6. Interactive session

In the interactive session, both the resource persons encouraged the participants with new ideas and techniques. The participants were also actively involved in the question-and-answer session. Many participants showed great satisfaction with the response of the resource persons, which shows that the intention of organizing the webinar was successful. Both resource persons also encouraged the participants to work hard and do productive research work.

7. Closing Remarks

The concluding note of the webinar was presented by Professor Sahin Ahmed (Professor, Department of Mathematics, Rajiv Gandhi University). Prof. Ahmed first thanked both the resource persons for the enlightening lectures. He also congratulated the organizing members of the webinar for organizing such a knowledgeable national webinar. He also shared his views on the topic of the webinar and explained the importance of differential equation and its applications in science and engineering. Finally, the Co-Convenor of the webinar Dr. Dipak Barman extended the vote of thanks and concludes the webinar. The webinar ended around 2:00 pm.

8. Appendices and Annexure
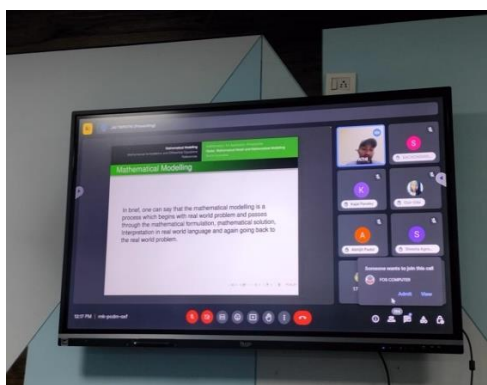
8.1. Annexure 1- Programme Schedule

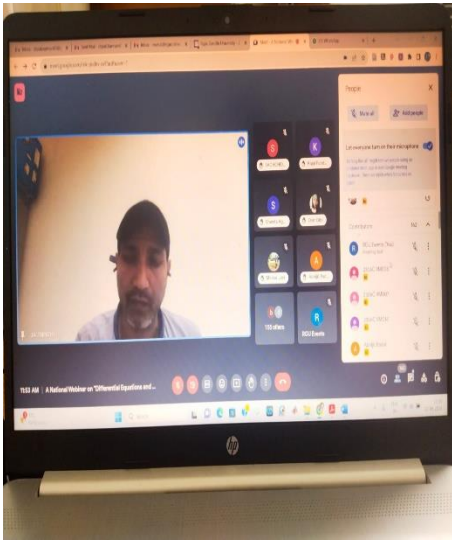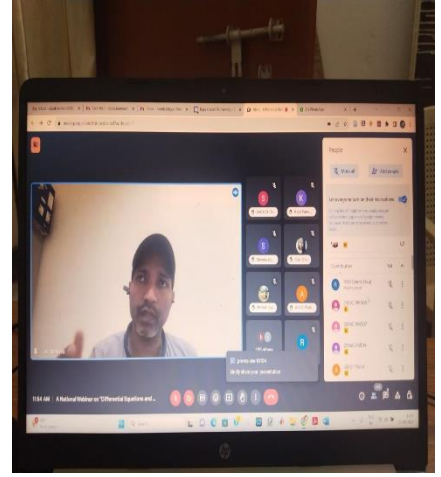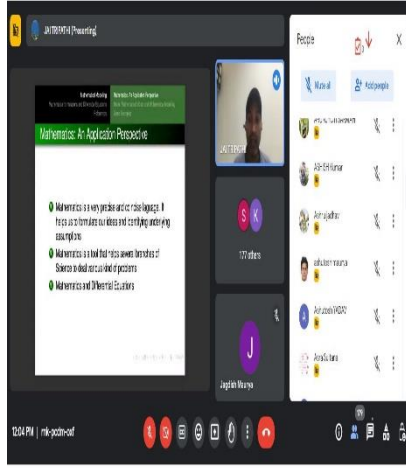| Inaugural Session	
11.30 AM to 11.35 AM	Welcome Address by **Dr. Nipen Saikia**, Head, Department of Mathematics, Rajiv Gandhi University.
11.35 AM to 11.40 AM	About the Webinar by **Dr. Jagdish Prasad Maurya**, Convenor, Assistant Professor, Dept. of Mathematics, Rajiv Gandhi University.
11.40 AM to 11.45 AM	Address by **Prof. Sanjeev Kumar,** Dean, Faculty of Basic Sciences**,** Rajiv Gandhi University
11.45 AM to 11.50 AM	Address by **Dr. Dharmendra Tripathi**, Resource Person, Associate Professor, Dept. of Mathematics, NIT Uttarakhand.

11.50 AM to 11.55 AM	Address by **Dr. Jai Prakash Tripathi,** Resource Person, Assistant Professor, Dept. of Mathematics, Central University of Rajasthan.
11.55 AM to 12.00 PM	Address by **Dr. Nabam Tadar Rikam,** Registrar, Rajiv Gandhi University.
12.00 PM to 12.05 PM	Address by **Prof. Saket Kushwaha**, Hon'ble **Vice Chancellor,** Rajiv Gandhi University.
12.05 PM to 12.10 PM	Vote of Thanks by **Dr. Dipak Barman**, Assistant Professor, Dept. of Mathematics, Rajiv Gandhi University.
Technical Session	
12.10 PM to 12.55 PM	Webinar Talk by Resource Person **Dr. Jai Prakash Tripathi,** Assistant Professor, Dept. of Mathematics, Central University of Rajasthan.
12.55 PM to 01.40 PM	Webinar Talk by Resource Person **Dr. Dharmendra Tripathi**, Associate Professor, Dept. of Mathematics, NIT Uttarakhand.
01.40 PM to 01.45 PM	Closing Remarks by **Prof. Sahin Ahmed,** Professor, Dept. of Mathematics, Rajiv Gandhi University.

8.2. Annexure 2- Number of participants

. A total of 412 participants including faculty members, Research Scholars, and students from several states of India have registered for this webinar and 353 participants actively participated in this webinar.

8.3. Annexure 3 – Photographs

Dr. Nipen Saikia
Head & Chairperson

Dr. Dipak Barman
Co-Convenor

Dr. Jagdish Prasad Maurya
Convenor