

# CERTIFICATE OF PARTICIPATION

This is to certify that

*Bilal Basti*

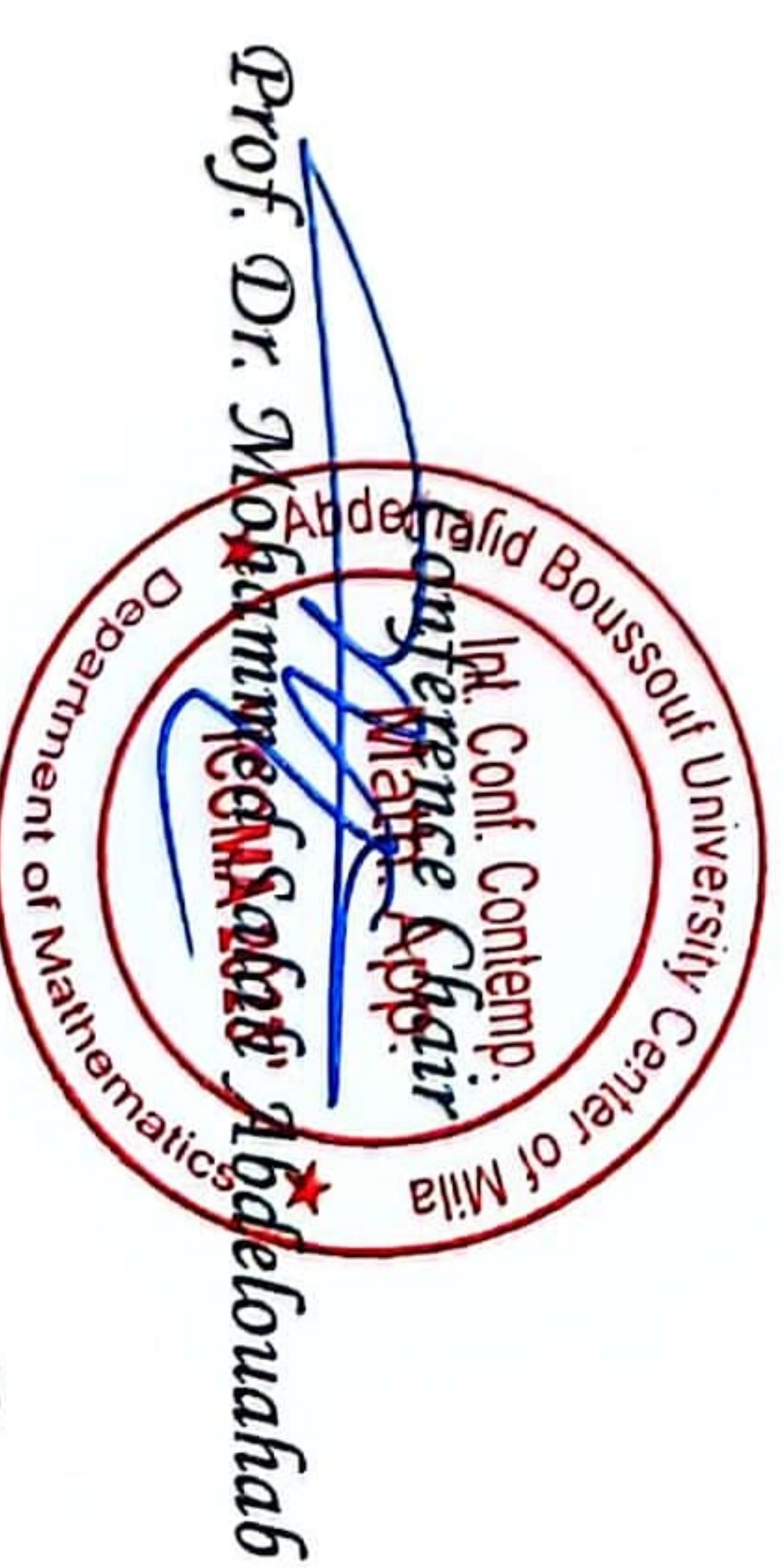
*has presented a poster entitled*

**“Forecast and Analysis on the Spread of COVID-19 with Fractional Operators.”**

*during the*

**International Conference on Contemporary Mathematics and its Applications  
‘ICCMMA 2023’, held on 26-27 November 2023, Abdelhafid Boussouf University  
Center of Mila, Algeria.**

Co-authors : Rabah Djemiat







## Forecast and Analysis on the Spread of COVID-19 with Fractional Operators

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### Abstract

In our present work, we thoroughly examine and provide analytical insights into a mathematical model characterizing the fractional-order SIRD dynamics for COVID-19, employing the Caputo-Katugampola derivative. Numerous stability results are meticulously computed based on well-defined parameters, ensuring compliance with conditions that effectively impede pandemic occurrences. Furthermore, the paper rigorously investigates the critical aspect of the existence and uniqueness of solutions for the SIRD model, leveraging the robust properties inherent in Schauder's and Banach's fixed point theorems. This multifaceted analysis not only enhances our understanding of the intricate dynamics of COVID-19 but also contributes valuable knowledge to the broader field of mathematical epidemiology.

### References

- [1] B. Basti and Y. Arioua, *Existence study of solutions for a system of  $n$ -nonlinear fractional differential equations with integral conditions*, J. Math. Phys. Anal. Geom., **18**(3) (2022), 350–367.
- [2] B. Basti, Y. Arioua, and N. Benhamidouche, *Existence and uniqueness of solutions for nonlinear Katugampola fractional differential equations*, J. Math. Appl., **42** (2019), 35–61.
- [3] B. Basti, Y. Arioua, and N. Benhamidouche, *Existence results for nonlinear Katugampola fractional differential equations with an integral condition*, Acta Math. Univ. Comenian., **89**(2) (2020), 243–260.
- [4] B. Basti, R. Djemiat, and N. Benhamidouche, *Theoretical studies on the existence and uniqueness of solutions for a multidimensional nonlinear time and space-fractional reaction-diffusion/wave equation*, Mem. Differ. Equ. Math. Phys., **89** (2023), 1–16.
- [5] B. Basti, N. Hammami, I. Berrabah, F. Nouioua, R. Djemiat, and N. Benhamidouche, *Stability analysis and existence of solutions for a modified SIRD model of COVID-19 with fractional derivatives*, Symmetry, **13**(8) (2021), 1431.



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PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA  
وزارة التعليم العالي والبحث العلمي  
MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH  
المركز الجامعي عبد الحفيظ بوالصوف - ميله  
ABDELHAFID BOUSSOUF UNIVERSITY CENTER OF MILA  
معهد الرياضيات والإعلام الآلي  
INSTITUTE OF MATHEMATICS AND COMPUTER SCIENCE



Laboratory of Mathematics and  
their Interactions

*International Conference on Contemporary Mathematics and its Applications  
(ICCMA 2023) 26-27 November 2023, Mila - Algeria*

## **Conference Program (Face-to-face)**

**Sunday, November 26, 2023:**

### Opening Ceremony



08:30 - 09:00

***The director of the Abdelhafid Boussouf University Center of Mila***

***Prof. BOUCHELAGHEM Amirouche***

**Welcome word**

### ***Plenary Conference***

09:00 - 10:00

***Prof. René Lozi*** (Université Côte d'Aur, Nice, France)

**Conference title:** *Are chaotic dynamical systems useful for the advancement  
of science?*

10:00 - 10:30  
**coffee break**

Google Meet Link: <https://meet.google.com/qkg-ukcm-cqo>

**November 26, 2023 (Face to Face)**

**Session: A (Control, Opt + Game Theo, Economic + Prob +Stat)**

**Chairmen: Boukhetala kamal - Dalah Mohamed**

Hour	Speaker	Presentation Title
10:30 - 10:50	Saffidine Rebiha	Sub-finsler geodesics on the grushin plane
10:50 - 11:10	Redjil Amel	On optimal control and temporal regularity of g- stochastic differential equations
11:10 - 11:30	Hamimes Ahmed	Inference for binomial change point data using the bayesian approach
11:30 - 11:50	Kraria Aicha	Primal-dual interior-point algorithm for linear programming based on a new search direction
11:50 - 12:10	Billel Zaoui	Complexity analysis and numerical implementation of a new interior point method for convex quadratic optimization
12:10 - 12:30	Bencherif Abdelatif	On the local time of a reflecting brownian motion
12:30 - 12:50	Madi Meriem	Rate of complete second-order moment convergence of kernel density function
13:00 - 14:00	Lunch break	
14:00 - 15:00	Plenary Conference Prof. Saber Elaydi (Trinity University, USA) “A Journey into Global Stability: From Monotone to Mixed Monotone and from autonomous to nonautonomous”	
15:00 – 15:20	Manel Elbatoul Merai	Uniform almost complete convergence of a family of recursive kernel estimators
15:20 – 15:40	Aissaoui Faris	Quasi maximum likelihood estimation for tvgarch processes
15:40 – 16:00		

**November 26, 2023 (Face to Face)**

**Session: B (Math Phys)**

**Chairmen: Merad Mahmoud – Boudjedaa Tahar**

Hour	Speaker	Presentation Title
10:30 - 10:50	Nadjiba Moures	Solution of the dirac-graphene equation in the combination of a volkov plane wave and a constant magnetic field
10:50 - 11:10	Bouchefra Djahida	Exact solutions of the dirac equation with the modified double ring-shaped generalized cornell potential
11:10 - 11:30	Hallous Ahlam	Path integral for spinning particle in external gravitation and torsion fields
11:30 - 11:50	Boukhrouf Hadjer	Su(4)/sp(4) composite higgs and its implications at colliders
11:50 - 12:10	Chouchane Lamia	A history-dependent sliding contact problem for electro-viscoelastic materials
12:10 – 12:30	Chahrazed Messikh	Exponential decay for a timoshenko problem with fractional time delays.
12:30 – 12:50		
13:00 - 14:00	<b>Lunch break</b>	
14:00 - 15:00	<b>Plenary Conference</b> <b>Prof. Saber Elaydi</b> (Trinity University, USA) “A Journey into Global Stability: From Monotone to Mixed Monotone and from autonomous to nonautonomous”	
15:00 – 15:20		
15:20 – 15:40		
15:40 – 16:00		

**November 26, 2023 (Face to Face)**

**Session: C (Chaos + Dyn Syst +Fract + Int Equ)**

**Chairmen: Tidjani Menacer - Houmor Tarek**

Hour	Speaker	Presentation Title
10:30 - 10:50	Belattar Meryem	Integrability and solvability of a planar differential system with an algebraic limit cycle
10:50 - 11:10	Saoudi Bilal	Dynamical systems of the p-adic (4,1)-rational functions with two fixed points
11:10 - 11:30	Arab Zineb	Sobolev-Hölder regularity for stochastic non-linear heat equation of fractional order
11:30 - 11:50	Beddani Hamid	An Existence Study for a Triple System with p-Laplacian Involving $\mathbb{I}^\alpha$ -Caputo Derivatives
11:50 - 12:10	Benguessoum Adel	Some fractional integrals inequalities for h-strongly convex functions
12:10 - 12:30	Samia Ghalia	First-order iterative differential inclusion with almost convex right-hand sides
12:30 - 12:50	Bouziane Aboubaker El-saddik	On the singular Caputo-fractional problem with integral boundary condition
13:00 - 14:00	Lunch break	
14:00 - 15:00	Plenary Conference Prof. Saber Elaydi (Trinity University, USA) “A Journey into Global Stability: From Monotone to Mixed Monotone and from autonomous to nonautonomous”	
15:00 - 15:20	Amira Rami	Synchronization of a new fractional order system using adaptive control
15:20 - 15:40	Bensimessaoud Soumia	Unified chaotic systems: a compound difference complete synchronization study
15:40 - 16:00	Mechekef Manal	Control of chaotic systems using the ogy method
16:00 - 16:20	Salah Seghir Leboukh	Finding the chaos in a fractional chaotic map

**November 26, 2023 (Face to Face)**

**Session: D (Equa Diff + Op Theo+ Num Anal)**

**Chairmen: Bellour Azzeddine – Hamri Nasreddine**

Hour	Speaker	Presentation Title
10:30 - 10:50	Boudjeriou Tahir	On the asymptotic behavior of solutions to fractional parabolic equations in cylinders becoming unbounded
10:50 - 11:10	Benarabi Soumia	Global stability of an si_1 i_2 r reaction-diffusion model with bilinear incidence rate
11:10 - 11:30	Benchouk Mayassa	On the Adomian Decomposition Method via Bell Polynomials of the Second Kind
11:30 - 11:50	Chemseddine Arroud	Necessary conditions for optimality for an evolution differential inclusions
11:50 - 12:10	Benrabah Sakina	Stabilization of fractional order Liu chaotic system using a sliding mode control strategy
12:10 – 12:30	Rouibah Khaoula	Iterative Collocation Method for fractional Volterra integro-differential equations in the sense of Caputo
12:30 – 12:50	Laouar Zineb	A Highly Accurate Numerical Method Using Compact Combination Basis and Kronecker Product to Solve Partial Differential Equations
13:00 - 14:00	Lunch break	
14:00 - 15:00	Plenary Conference Prof. Saber Elaydi (Trinity University, USA) “A Journey into Global Stability: From Monotone to Mixed Monotone and from autonomous to nonautonomous”	
15:00 – 15:20	Khennaoui Cheima	Collocation method for Solving Hyperbolic Partial Volterra Integro-Differential Equations: A numerical Study
15:20 – 15:40	Daas Khadidja	Coexistence of chaotic and non-chaotic attractors in a slow-fast system with three species
15:40 – 16:00	Talbi Ibtissem	Efficient Image Encryption Design based on Chaotic Maps

**November 26, 2023**

# POSTERS

Name	Poster Title
<b>Khaoula aidi</b>	<b>Estimation and tests for new two parameters distribution with right censoring</b>
<b>Gharbi ouahiba</b>	<b>Resolution of a resonance elliptic systems</b>
<b>Kimouche selma</b>	<b>Thin layer quantization method for charged particle on a cone</b>
<b>Hameurlaine meriem</b>	<b>Slepton decay at the large hadron collider</b>
<b>Nabila boufelgha</b>	<b>A limit theorem for boundary local time</b>
<b>Bougherara saliha</b>	<b>Stochastic control problems</b>
<b>Bouزيد houari</b>	<b>The existence and uniqueness of solutions for the nonlinear caputo fractional q-differential equations</b>
<b>Bouredji hind</b>	<b>Simple bias correction in nonparametric density estimation for multivariate bounded data</b>



*International Conference on Contemporary Mathematics and its Applications  
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**Monday, November 27, 2023:**

**Plenary Conferences**

**08:30 - 09:15**

**Prof. *Pedro Lima*** (Instituto Superior Técnico, University of Lisbon, Portugal)

**Conference title:**

***Numerical solution of the stochastic neural field equation and  
applications to working memory***

**09:15 – 10:00**

**Prof. *Ali Moussaoui*** (University of Tlemcen, Tlemcen, Algeria)

**Conference title:**

***On some Bioeconomic Models in Fisheries***

**10:00 - 10:30**

**Coffee break**

**Google Meet Link: <https://meet.google.com/qkg-ukcm-cqo>**

**November 27, 2023 (Face to Face)**

**Session: A (Control, Opt + Game Theo, Economic + Prob +Stat)**

**Chairmen: Zaidi Ali, Mourad Azi**

Hour	Speaker	Presentation Title
10:30 - 10:50	Zaidi Ali	A genetics algorithms for optimizing a function over the integer efficient set
10:50 - 11:10	Larbi Asli	Eda algorithm for optimizing function over the efficient set for a multi-objective combinatorial auction problem
11:10 - 11:30	Ouaoua Mohamed Lamine	Comparative study between different variants of fletcher reeves's conjugate gradient method for unconstrained optimization problems
11:30 - 11:50	Mourad Azi	Optimal cash management with free intermediate phase constraints
11:50 - 12:10	Hemici Youcef Elhamam	Comparative numerical study on fletcher-reeves and hestenes-steifel hybridization method
12:10 - 12:30	Saouli Mostapha Abdelouahab	Reflected backward doubly stochachastic differential equations with left continuous and stochastic linear growth generators
12:30 - 12:50	Megraoui Fatima Zohra	Reliability limites of circular consecutive k-out-of- n: g systems
12:50 - 13:30	Lunch break	
13:30 - 13:50		
13:50 - 14:10		
14:10 - 14:30		



**November 27, 2023 (Face to Face)**

**Session: B (Math Phys + Int Equ)**

**Chairmen: Haouat Salah – Boudjedaa Tahar**

<b>Hour</b>	<b>Speaker</b>	<b>Presentation Title</b>
<b>10:30 - 10:50</b>	<b>Bousafsaf Issam</b>	<b>Solutions of the schrödinger equation extended cornell potential plus modified double ring-shaped potential.</b>
<b>10:50 - 11:10</b>	<b>Madjour Bilel</b>	<b>General stability result for a nonlinear viscoelastic wave equation with boundary dissipation</b>
<b>11:10 - 11:30</b>	<b>Sahraoui Asma</b>	<b>Quasi-exactly solvable schrödinger equation for a generalized cornell potential plus a ring-shaped-like potential</b>
<b>11:30 - 11:50</b>	<b>Ketfi Roufaida</b>	<b>Variational study of a thermo-mechanical problem</b>
<b>11:50 - 12:10</b>	<b>Hafirassou Zineb</b>	<b>Time-frequency analysis associated with the stockwell transform in the hankel setting</b>
<b>12:10 - 12:30</b>	<b>Benzahi Ahlem</b>	<b>On the existence results for fractional-integro differential equations with non-instantaneous impulses</b>
<b>12:30 - 13:30</b>	<b>Lunch break</b>	
<b>13:30 - 13:50</b>		
<b>13:50 - 14:10</b>		
<b>14:10 - 14:30</b>		

**November 27, 2023 (Face to Face)**

**Session: C (Chaos + Dyn Syst + Fract )**

**Chairmen: René Lozi - Hamri Nasreddine**

<b>Hour</b>	<b>Speaker</b>	<b>Presentation Title</b>
<b>10:30 - 10:50</b>	<b>Benkara Mostefa Mohamed Cherif</b>	<b>Nonlinear dynamics of a generalized differential-algebraic biological economic system with the hybrid functional response</b>
<b>10:50 - 11:10</b>	<b>Diab Zouhair</b>	<b>The number of limit cycles for planar discontinuous generalized kukles systems</b>
<b>11:10 - 11:30</b>	<b>Nasri Abdeslam</b>	<b>Synchronization and stability of a three-dimensional fractional chaotic financial model</b>
<b>11:30 - 11:50</b>	<b>Derbouche Assia</b>	<b>Control of the seasonally forced sir epidemic model</b>
<b>11:50 - 12:10</b>	<b>Allam Asma</b>	<b>Convergence of solutions of a system of recurrence equations</b>
<b>12:10 - 12:30</b>	<b>Bendouma Bouharket</b>	<b>Existence of solutions for nabla conformable fractional problems on time scales</b>
<b>12:30 - 13:30</b>	<b>Lunch break</b>	
<b>13:30 - 13:50</b>	<b>Redjam Ibtissem</b>	<b>Qualitative analysis of higher-order fuzzy difference equation</b>
<b>13:50 - 14:10</b>	<b>Boucherma Rayane</b>	<b>Vseitr fractional model for tuberculosis in algeria using caputo derivatives</b>
<b>14:10 - 14:30</b>	<b>Azioune Mourad</b>	<b>Complexity analysis and chaos control of a bertrand duopoly game with homogeneous expectations and quadratic cost functions</b>
<b>14:30 – 14:50</b>	<b>Naas Youcef</b>	<b>Approximate viability for fractional differential equation in finite dimensional spaces</b>



**November 27, 2023 (Face to Face)**

**Session: D (Number Theo + Num Anal)**

**Chairmen: Kechkar Nasserline - Haiour Mohamed**

Hour	Speaker	Presentation Title
10:30 - 10:50	Boudelloua Mohamed Salah	Application of the quillen-suslin theorem to the computation of the smith form of a multivariate polynomial matrix
10:50 - 11:10	Taane Abdelhak	Nested sums involving q-fibonacci numbers
11:10 - 11:30	Hassina Zerroug	The new generating functions of the products of gaussian tetranacci numbers and some gaussian number
11:30 - 11:50	Mokhtari Soufyane	Inertia groups of ramified prime ideals of the splitting field of the trinomial $x^n + ax + a$
11:50 - 12:10	Rezaiguia Lokmane	On the wagstaff prime numbers in k-fibonacci sequences
12:10 - 12:30	Birem Fouzia	An Algorithm for Solving Three-Dimentional Linear Volterra Integral Equation
12:30 - 13:30	Lunch break	
13:30 - 13:50	Saidane Sara	An algorithm for solving two dimensional Volterra integral equations with time delay
13:50 - 14:10	Boutiba Malika	Numeric FEM's Solution for Space-Time Diffusion Partial Differential Equations with Caputo-Fabrizio and Riemann-Liouville Fractional Order's Derivative
14:10 - 14:30		

**November 27, 2023**

# POSTERS

Name	Poster Title
<b>Zaamoune faiza</b>	<b>Design a bifurcations and hiddin bifurcation in multispiral new chaotic attractor via saturated function series</b>
<b>Basti bilal</b>	<b>Forecast and analysis on the spread of covid-19 with fractional operators</b>
<b>Mihoubi hamza</b>	<b>Numerical study of natural convection in horizontal centrality annuli using nanofluid</b>
<b>Benhabiles hanane</b>	<b>A primal-dual interior-point method for linear programming based on a new kernel function with a trigonometric barrier term</b>
<b>Bellout aida</b>	<b>On the dynamic of a new piecewice linear map</b>
<b>Hammoumi ibtissem</b>	<b>The existence of mild solution for hilfer impulsive fractional differential inclusions in banach spaces</b>
<b>Zerari amel</b>	<b>PAP-GARCH model's L2 structure</b>
<b>Boustila ranya</b>	<b>Rate of uniform consistency of a nonparametric estimator of a functional conditional distribution based on right-censored data</b>

***Closing Ceremony***

**15:00 - 15:30**