ICRAAM 2019 Final Report

Title : International Conference on Recent Advances in Applied Mathematics (ICRAAM 2019)
Dates : February 20 – 22, 2019
Location : COMSATS University Islamabad, Lahore Campus, Lahore (Pakistan)

Summary
The Conference on Recent Advances in Applied Mathematics was held at Department of Mathematics, COMSATS University Islamabad, Lahore Campus, on February 20 – 22, 2019. Dr. Murad Raas Provincial Minister for School Education and Mr. Humayun Sarfraz provincial Minister Higher Education and tourism were honorable chief guest of the event. The Conference was chaired by Prof. Dr. Raheel Qamar (T.I), Co-Chaired (Administrative) by Prof. Dr. Qaisar Abbas, Co-Chaired (Academics) by Prof. Dr. Arshad Saleem Bhatti and Convened by Dr. Moizud Din (Chairman Mathematics CUI Islamabad) and Dr. Sarfraz Ahmad (HoD Mathematics CUI Lahore). In the conference, 8 International speakers gave oral presentation at the conference. The names of the foreign speakers are Prof. Dr. Norihan Md Arifin (Malaysia), Prof. Dr. Naim Bajcinca (Germany), Prof. Dr. Raffaele D'ambrosio (Italy), Prof. Dr.Gholam Reza Hojjati (Iran), Prof. Dr. Adem Kilicman (Malaysia), Prof. Dr. Stefano Luzzatto (Italy), Prof. Dr. Zanariah Abdul Majid (Malaysia) and Prof. Dr. Cemil Tunc (Turkey). More than fifty (50) national speakers from different universities of Pakistan also delivered their talks during this conference. The conference had three parallel sessions. The main session was held at seminar room of science block. The seminar room has 125 fixed chairs, two big white boards, a multimedia projector, sound system and fully air-condition system. The other two sessions were held in the Mathematics department K-block. Each day was divided in two sessions, the morning and the afternoon session. There were tea and lunch breaks in the sessions. The students who came from outside Lahore to participate in the conference were given boarding by the CUI Lahore campus. The transport to all students from Lahore and to those staying in nearby hotels was also provided by CUI Lahore Campus.

Scientific Content
The following are the abstracts of the talks of foreign invited speakers.

Mathematical Model of Boundary Layer Flow in a Porous Medium Filled by a Nanofluid: Stability Analysis
Norihan Md Arifin
Institute for Mathematical Research, Universiti Putra Malaysia.
Several types of mathematical model in a porous medium filled by a nanofluid will be discussed. In the presence of a thermal radiation, the flow is generated due to stretching or shrinking sheet. The problem is formulated for three types of nanoparticles, namely, copper (Cu), alumina (Al2O3) and titania (TiO2). The boundary layer conservation equations are transformed using appropriate similarity variables and the resulting nonlinear boundary value problem is numerically solved using shooting method. It is revealed that the corresponding results possessed two branches of solutions, where we then implemented an analysis of stability on those two non-

unique solutions to evaluate the most realizable solution and the features of the respective solutions have been discussed in details.

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Stability and control of hybrid impulsive and switched dynamical systems
Naim Bajcinca

Technical University of Kaiserslautern, Germany

Hybrid dynamical systems arise whenever continuous and discrete dynamics interact. This is often the case when logic decision making or embedded control actions are combined with continuous physical processes. Indeed, nearly all complex dynamic processes in automation, economy, logistics, production, biology, neuroscience, etc. display such heterogeneity. In the talk we provide an introduction to the analytical approaches and in particular address stability and control of specific classes of hybrid systems including switched systems, impulsive dynamical systems and hybrid Petri nets. Additionally, we discuss applications in cyber physical systems, in particular event-triggered control and briefly discuss the applications in systems biology and neuroscience.

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A Journey through Structure-Preserving Discretization
Raffaele Dambrosio

Department of Engineering, Computer Science and Mathematics, University of L'Aquila, Italy.

In this talk we present recent advances in the numerical approximation of various evolutionary problems by means of methods preserving the qualitative behavior of the operator along the discretized dynamics. This approach is applied to both deterministic and stochastic problems, with a rigorous setting matched with a proper experimental one that confirms the effectiveness of the introduced methodologies. As regards deterministic structure-preservation, we mostly deal with Hamiltonian problems, treated by multi-value numerical methods whose long-term properties are highlighted. Concerning stochastic problems, a possible structure-preserving framework is introduced for stochastic Hamiltonian problems (with the aim of retaining the known long-term properties on the expected Hamiltonian) as well as and stochastic oscillators (in order to reproduce the long-term properties of the position and the velocity of the oscillating particle).

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Second Derivative General Linear Methods for the Numerical Solution of Ordinary Differential Equations
Gholam Reza Hojjati

Faculty of Mathematical Sciences, University of Tabriz, Tabriz, Iran.

Traditional numerical methods for the numerical solution of an autonomous system of ordinary differential equation: $Y' = f(y(x))$, where y is a function from R to Rm and f is a function from Rm to Rm. generally fall into two main classes: linear multistep (multi-value) and Runge–Kutta (multistage) methods. In 1966, Butcher introduced general linear methods as a unifying framework for the traditional methods to study the properties of consistency, stability and convergence, and to formulate new methods with clear advantages over these classes. In fact, this class of the methods includes all the first derivative multi-value and multistage methods. On the other hand, to construct methods with higher order and extensive stability region, some efficient second derivative methods within the class of linear multistep methods and Runge–Kutta methods have been introduced. In 2005, Butcher and Hojjati extended GLMs to the case in which second derivatives, as well as first derivatives, can be calculated. These methods, called

SGLMs, were studied more by Abdi and Hojjati. Starting with a discussion on the intrinsic structure of SGLMs, in this talk we will become familiar with the properties of SGLMs and their efficiency in solving of the stiff and non-stiff initial value problems. This is followed by the introducing of some subclasses of SGLMs which preserve qualitative geometrical properties of the flow of the system. Also, some strategies based on SGLMs are given for the numerical solution of conservative problems.

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On Fractional Derivatives and Generalized Functions

Adem Kilicman

Institute for Mathematical Research, Universiti Putra Malaysia.

The fractional calculus is considered as an extension of ordinary derivatives and integrals to arbitrary order possible complex number. The historical development of subject is sufficiently old enough and can go back to the times of Leibnitz and Newton. After the introduction of fractional derivatives idea, almost a three hundred years the fractional calculus was not much popular in science and engineering. However recently become very famous and has been applied broad range of problems in several areas such as engineering, science, finance, as well as bio engineering etc. In fact it was observed that the modelling with fractional order is more natural than the classical calculus. In the literature there are many different types of related definitions due to the properties. In the present study we extend fractional differential calculus to generalized functions also known as distributions by using the infinitely differentiable functions having compact support as test functions. We also define several new distributions by using the fractional derivatives. And provide some examples in applied sciences such as in finance.

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Chaotic Dynamical Systems and the Problem of Prediction.

Stefano Luzzatto

Strada Costiera, Trieste, Italy

Ordinary Differential Equations and Dynamical Systems have been used for hundreds of years to construct models of physical processes. The discovery of the property of "chaos" in real life phenomena and in mathematical models raises significant questions about the extent to which these models can actually help us to understand the evolution of a system. I will discuss, mainly from a mathematical point of view, the notion of chaos and the kinds of systems in which it appears. I will also discuss how recent mathematical developments suggest that a probabilistic and statistical approach might be the best way to handle such chaotic systems.

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Solving Boundary Value Problem for Delay Differential Equation using Multistep Block Method

Zanariah Abdul Majid

Faculty of Science, Universiti Putra, Malaysia

In this study, we propose a multistep block method for the solution of boundary value problem for second order delay differential equations directly. The proposed block method will approximate the solutions at two points simultaneously and will solve the delay differential equations directly without reducing to the system of first order. The shooting technique by using Newton's method will be implemented to compute the guessing values. Some numerical examples are presented to show that the proposed method is capable for solving boundary value problems for delay differential equations.

Qualitative Criteria for Solutions of Various Kind of Integro-Differential and Impulsive Differential Equations

Cemil Tunç
Professor Department of Mathematics, Faculty of Sciences
Van Yuzuncu Yıl University, 65080, Van-Turkey

In this work, a class of non-linear Volterra integro-differential equations, Volterra integro Caputo fractional differential equations with delay and linear periodic impulsive systems with time delay are considered. New criteria are presented on the various qualitative properties of solutions of these equations. The Lyapunov–Krasovskii method, the Razumikhin method and some others methods are used as basic tools. Examples are given to verify the obtained results.

The following are the title of the talks of the national speakers:

Naveed Ahmed
Department of Mathematics, Syed Babar Ali School of Sciences & Engineering, Lahore University of Management Sciences

Title: Numerical comparisons of finite element stabilized metho ds for high Reynolds numb ers vortex dynamics simulations
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Saleem Asghar,
Department of Mathematics, COMSATS University Islamabad, Pakistan.

Title: Hartmann Boundary Layer in Peristaltic Flow for Viscoelastic Fluid
==

Muhmmad Asif Farooq
Dept. Mathematics, National University of Sciences and Technology, Islamabad, Pakistan.

Numerical Computation of Shock Waves by Using Simplified Ghost Point Treatment
==

Muhammad Jamil
Department of Mathematics, NED University of Engineering & Technology, Karachi

Second-Order Slip Effects on Oscillating Fractionalized Maxwell Fluid in Porous Medium
==

Hafiza Rizwana Kausar
University of Central Punjab, Lahore, Pakistan.

Process of Transportation during Gravitational Collapse
==

Samina Mazhar
Dept. Mathematics, LCWU, Lahore, Pakistan.

Trigonometric Hamming Similarity Operators

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Umer Saeed

Department of Mathematics, National University of Sciences and Technology Islamabad

A method for Solving Nonlinear Fractional Partial Differential Equations

Muhammad Sharif (TI)

Department of Mathematics, University of the Punjab, Lahore Pakistan

Gravitational Decoupled Anisotropic Solutions

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Khalid Saifullah Syed

Mathematics Department, BZU, Multan, Pakistan

Numerical Study of Reaction Mechanism of Methane

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Shamsul Qamar

Department of Mathematics, COMSATS University Islamabad,
Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany.

Theoretical Study of Thermal and Radial Effects in Liquid Chromatography

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Amer Rasheed

Mathematics Department, LUMS Lahore.

Numerical Simulations of Fractional Nonlinear Hartmann Flow with Revised Heat Flux Model

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Ali Ashher Zaidi

Mathematics department, LUMS Lahore.

Functional Partial Differential Equations and Cell Division

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Ansar Abbas

Riphah International University, Islamabad, Pakistan.

About Dynamic Behavior of Rational Difference Equation

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Jameela Abbas

University of Education, Lahore

Weak Gravitational Lensing and Gauss-Bonnet Theorem

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Muhammad Arfan Ali

COMSATS University Islamabad, Lahore, Pakistan.

Topological Characterization of the Symmetrical Structure of Bismuth Tri-Iodide

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Ghulam Abbas

Department of Mathematics, The Islamia University of Bahawalpur

Strong Gravitational Lensing for Photon Coupled to Weyl Tensor in Kiselev Black Hole
==

Haseeb Ahmad

Department of Mathematics, COMSATS University Islamabad, Lahore, Pakistan.

Hosoya Polynomial of Graphs
==

Farhad Ali

Department of Mathematics, Kohat University of Science and Technology, Kohat, Pakistan

Plane Symmetric Gravitational Waves Like Spacetimes and the Conservation Laws
==

Muhammad Imran Asjad

Mathematics department, University of Management and Technology, Lahore

Fractional Mechanism of Microwave Radiating Therapy of Breast Cancer
==

Muhammad Asif

Department of Mathematics, COMSATS University Islamabad, Lahore

Molecular Descriptor of Line Graph of Carbon Nano Cones.
==

MHD Influence on Different Water based Nanofluids (TiO2,Al2O3,CuO) in Porous Medium with Chemical Reaction and Newtonian Heating
==

Maryam Aleem

UMT, Lahore, Pakistan.

Stability of Charged PSR J1614-2230

Syed Ali Mardan Azmi

Dept. Mathematics, University of Management and Technology, Lahore, Pakistan.
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Riaz Ahmed

Department of Mathematics, The Islamia University of Bahawalpur Pakistan

Models of Collapsing and Expanding Anisotropic Gravitating Source in f(R,T) Theory of Gravity
==

Nadeem Azhar

Department of Mathematics, The Crescent College, Shadman, Lahore. Pakistan.

Non-flat FRW Universe Version of Tsallis Holographic Dark Energy in Specific Modified Gravity
==

Fiza Batool

University of the Punjab, Lahore, Pakistan

Nonlinear Partial Differential Equations and their Exact Solutions

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Shahid Chudhary
Department of Mathematics, Sharif College of Engineering and Technology, Lahore. Pakistan

Accretion onto Charged Black Holes in Various Theories of Gravity

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Iffat Fayyaz
National University of Computer and Emerging Sciences (FAST), Lahore, Pakistan

Aspects of Cosmic Compact Star in f(R) Gravity.

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Shahzad Faizi
Virtual University of Pakistan

A Multicriteria Decision-Making Approach Based on Fuzzy AHP with Intuitionistic 2-Tuple Linguistic Sets

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Nadeem Ghauri
CUI, Lahore, Pakistan.

Topological Descriptor of 2-Dimensional Silicon Carbons and Their Applications

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Farrukh Ijaz
Department of Mathematics, COMSATS University Islamabad, Lahore

M-Polynomial of Chemical Graphs

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Nimra Irshad
University of Education, Lahore, Pakistan

Analysis of Anisotropic Universe through Dark Energy Model

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Hasib Khan
Department of Mathematics, Shaheed BB University, Sheringal, Dir , Pakistan.

A Fractional Order HIV-TB Co-infection Model with Non-singular Mittag-Leffler Law

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Farzana Kausar
CUI, Lahore

Static Spherically Symmetric Wormholes in Generalized Gravity

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Badar Nawaz
CUI, Lahore

Multiple Complex Soliton for Nonlinear Telegraph Equation

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Hammad Nazar
Department of Mathematics, The Islamia University of Bahawalpur Pakistan

Complexity Factor for Anisotropic Source in Non-minimal Coupling Metric f(R) Gravity

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Iqra Nawazish
Department of Mathematics, University of Education, Township Campus, Lahore. Pakistan.

Existence of Wormholes and Noether Symmetry Approach in f(R, T) Gravity

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Tayyaba Naz
National University of Computer and Emerging Sciences, Lahore

Compact Stars using TOV Equation in Modified Gauss-Bonnet Gravity

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Muhammad Numan
Department of Mathematics, COMSATS University Islamabad, Attock Campus. Pakistan.

High Irregularity Strength for Some Family of Graphs.

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Tasadduq Niaz
Dept. Mathematics, The University of Lahore, Sub-Campus Sargodha, Pakistan.

Estimation of Different Entropies by using Refinement of Jensen's Inequality and their Generalization for Higher Order Convex Function

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Muhammad Mubashar
COMSATS University Lahore Campus, Pakistan.

Vertex Anti-magic Total Labeling

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Muhammad Rafiq
University of Central Punjab Lahore, Pakistan.

Numerical Analysis for Role of Media and Treatment on an Infectious Disease Dynamics

==

Sahfiq Ur Rehman
UET,Lahore. Pakistan

Continuous Approximations for Long-Term Numerical Simulations of the Solar System

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Attique Ur-Rehman
Virtual University of Pakistan

Coupled Orbital-Thermal Evolution of Major Uranian Satellites

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Vertex Anti-magic Total Labeling

Mubashar Riaz
Department of Mathematics, COMSATS University Islamabad, Lahore

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Rana Safdar
University of Sargodha, Sargodha, Pakistan

A Combinatorial Result about Sequential Computation of Function

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Rabia Saleem
Department of Mathematics, COMSATS University Islamabad, Lahore Campus

Solution of Hamilton Jacobi Equations to Constraint a Model with Inflation
==

Dr. Sadia Sattar
Department Mathematics, The University of Lahore, Sub-campus Sargodha, Pakistan.

N-dimensional Non-vacuum Plane Symmetric Solutions in $f(R,T)$ Gravity
==

Muhammad Umer Saleem
Department of Mathematics, University of Education Lahore, Pakistan.

Effects of Thermal Fluctuations on Non-minimal Regular Magnetic Black Hole Fractional Order Derivative Model for Artificial Pancreas
==

Wardat us Salam
Department Mathematics, University of Education, Lahore

Ternary Non-stationary Subdivision Schemes in Hyperbolic Forms
==

Aqila Shaheen
Department of Mathematics, CUI Lahore, Pakistan.

Peristaltic flow of Jeffrey Six Constant Nanofluid Flow in an Endoscope with Non-uniform Vertical Tube
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Syed Munawar Shah
Department of Mathematics, The Islamia University of Bahawalpur, Pakistan.

Dynamics of Charged Viscous Dissipative Spherical Collapse with Perturbation Approach

Funding Bodies for ICRAAM 2019

1. Higher Education Commission (HEC) of Pakistan
2. Commission for Developing Countries, International Mathematical Union
3. COMSATS University Islamabad, Lahore Campus

Some pictures from the Event

Welcome of Chief Guest Mr. Humayun Sarfraz Provincial Minister HEC Punjab

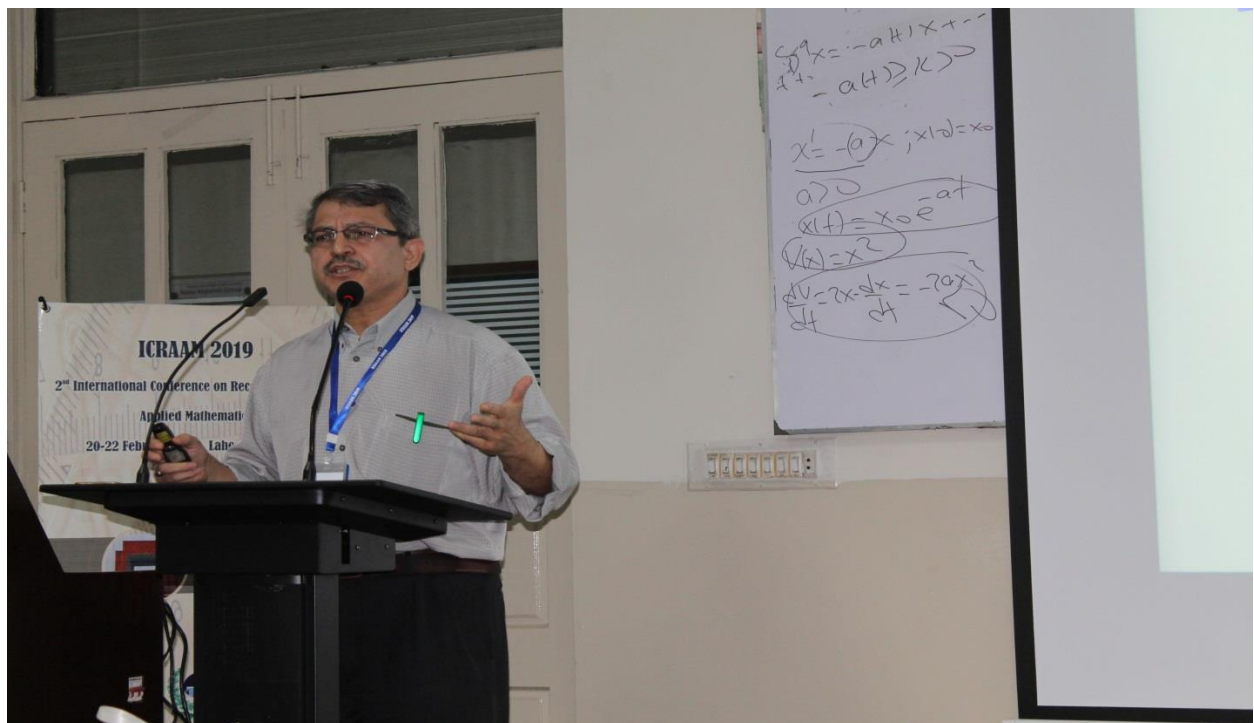**Chief Guest addressing at the opening ceremony of ICRAAM 2019**

Group photo

Prof. Dr. Cemil Tunc from Turkey

Prof. Dr. Dr. Zanariah Abdul Majid from Malaysia

Prof. Dr. Adem Kilicman from Malaysia

Prof. Dr. Raffaele Dambrosio from Italy

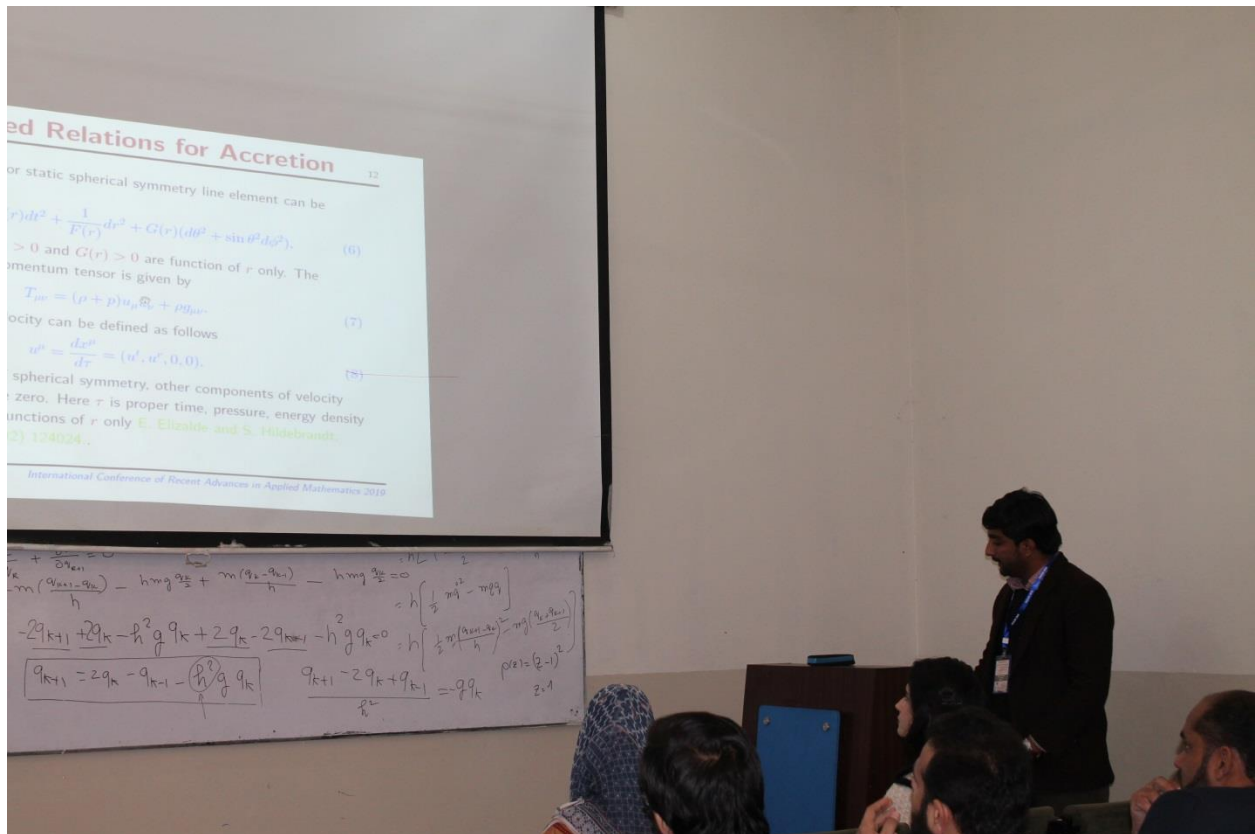

Prof. Dr. Stefano Luzzato from Italy

Prof. Dr. Gholam Reza Hojjati from Iran

Main Session: (L-R) Dr. Zanariah, Dr. Norihan, Dr. Raffaele, Dr. Hojjati, Dr. Haseeb, Dr. Yousaf Habib.

Parallel session 1

Parallel session 2

Director COMSATS Lahore Campus addressing at closing ceremony
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Distribution of certificates