An International Virtual Workshop

on

"Recent Advancement in Astrophysics and Cosmology"

on 12th Oct-13th Oct 2020

Organized by Postgraduate Department of Physics,

Tata College,Chaibasa,Jharkhand - 833202

PLATFORM

Google Meet YouTube

Virtual Workshop on Recent Advancement on Astrophysics and Cosmology is a plan to nurture the knowledge of the young Students and Researchers and to learn from those who are expert in Various field of Astrophysics and Cosmology. Post Graduate students and Young Researchers would augment their knowledge with the interaction and discussion with the eminent scientist and academician all over the world.

Participants: Any students/Researchers/Faculty members
Registration: Online Registrations mandatory(no registration fee)
Google Meet link and You tube link will be provided to the registered participants
Link for Registration:
https://docs.google.com/forms/d/e/1FAIpQLSdS8QVzoXeLzJdwrF5nHDSmflKHvg7InuowD34emPXIC8y-nw/viewform?usp=pp_url

Eminent Speakers

Dr. Irina Radinschi
Full Professor at
Departmentof Physics,
"Gheorghe Asachi"
Technical University, Iasi
Romania

Dr.El Nabulshi Ahmad Rami
Athens Institute for Education
and Research
Greece

Dr. Pradyumn Kumar Sahoo
Associate Professor
Department of Mathematics
Birla Institute of Technology &
Science, Pilani,Hyderabad
Campus, Hyderabad-500078

Dr. Prabir Rudra
Assistant Professor and Head
of the Department,
Department of Mathematics,
Asutosh College, Kolkata
India

Dr. Koushik Ghosh,
Department of Mathematics,
University Institute of
Technology,
The University of Burdwan
West Bengal, India

Dr. PiyaliBhar
Assistant Professor,
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Prof.G.Panda
ViceChancellor,
Kolhan University,
Chaibasa, Jharkhand
India
Chief Guest

Prof.Arun Kumar Sinha
(Pro-Vice Chancellor)
Kolhan University,
Chaibasa, Jharkhand
India
Chairman

Dr.S.C.Dash
Principal
Tata College,
Chaibasa (KU)
Jharkhand
Patron

Dr. S. K. Gorai
Assistant Professor
Department of Physics
Tata College,
Chaibasa, Jharkhand
Convener

Advisory Committee :-
1.**Dr.P.Mahto**, Professor
2.**Dr.D.N.Mahato**, Associate Professor
3.**Dr. SurajitChattopadhaya**,AssociateProfessor

Organising Committee :-
1.**Dr. N. Chandra**, Associate Professor
2.**Dr.V.S.Sinha**, Assistant Professor
3.**Dr.R.Karn**, Assistant Professor
4.**Dr.Pranita**, Assistant Professor
5. **Prof. R. K. Jaiswal**, Assistant Professor

Dr. ErtanGŰDEKLÍ
Associate Professor,
Head of Department of
Mathematical Physics,
Science Faculty,
Istanbul University,
Turkey

Tentative Programme Schedule

Day 1	Day 1	Day 2
12th Oct 2020	**12th Oct 2020**	**13th Oct 2020**
Welcome Address by Convener (10.30 AM - 10.35 AM)	**Lecture - 1 Prof. Irina Radinschi (11.00 AM - 12.00 PM)**	**Lecture - 1 Dr. Pradyumn Kr. Sahoo (11.00 AM - 12.00 PM)**
Address by Patron (10.35 AM - 10.40 AM)	**Lecture - 2 Dr. Prabir Rudra (12.00 AM - 1.00 PM)**	**Lecture - 2 Prof. El Nabulshi Ahmad Rami (12.00 AM - 1.00 PM)**
Address by Chairman (10.40 AM - 10.45 AM)	**Lecture - 3 Dr. Piyali Bihar (1.00 PM - 2.00 PM)**	**Lecture - 3 Dr. ErtanGűdeklí (1.00 PM - 2.00 PM)**
Address by Chief Guest (10.45 AM - 10.55 AM)	**Lecture - 4 Dr. Koushik Ghosh (2.00 PM - 3.00 PM)**	**Vote of Thanks (2.00 PM - 2.10 PM)**

Irina Radinschi

Title :Energy-Momentum Localization for Several Classes of New Charged Non-Singular Black Hole Solutions

Abstract *:Even though the problem of energy-momentum localization has triggered a plethora of interesting research work, it remains not fully answered for more than a century. The only step one can hope to make forward is to find a more powerful tool to handle this issue of general relativity. The localization of energy-momentum for several classes of new four-dimensional charged, static and spherically symmetric, non-singular black hole solutions is studied. The non-singular character of the metrics is warranted by the coupling of general relativity with non-linear electrodynamics. The energy and momentum distributions are computed by applying the Einstein and Møller energy-momentum complexes. It is found that all the momenta vanish, while the energy distributions depend on the electric charge, the mass, and the radial coordinate. Moreover, the behavior of the energy distributions near the origin, near infinity, as well as in the case of a vanishing electric charge is examined. Both Einstein and Møller energy-momentum complexes are useful tools for energy localization. However, it is interesting to note a specific behavior of the Møller energy-momentum complex that is due to the particularities of these black hole solutions originating in the coupling of the gravitational field to non-linear electrodynamics.*

Dr. EI-Nabulshi Ahmad Rami

Title: Phase Transitions in the Early Universe, Cosmological Constant and Supergravity

Abstract*: We discuss the implications of an effective cosmological constant obtained from conformal coupling supergravity arguments in early universe. We present its effects on spontaneous symmetry breaking with the presence of a Higgs potential and a higher-order loops Coleman-Weinberg potential with Weinberg/Landau gauge. The implications of the present model on dark energy and dark matter are discussed accordingly.*

Dr.P.K. Sahoo

Title: ***Wormholes in f(R; T) gravity and general relativity***

Abstract*: Wormholes (WHs) are asymptotically at tube-like structures. They are said to be useful for interstellar travel as they could connect two different points in the same universe or two points in different universe. Wormholes arise from the solutions of General Relativity (GR). Schwarzschild's WH was the first WH- like solution to be obtained. It was later discovered that it would collapse very quickly, preventing it to be traversable. Here, we discuss a new exponential shape function in wormhole geometry within modified gravity and will compare the results with GR. The energy conditions and equation of state parameter are obtained. The radial and tangential null energy conditions are validated, as well as the weak energy condition, which indicates the absence of exotic matter due to modified gravity allied with such a new proposal.*

Dr. Prabir Rudra

Title :Gravitational Collapse: An Overview and some recent developments

Abstarct*:Gravitational collapse is a key astrophysical phenomenon that helps us to understand various aspects of the universe such as structure formation, properties of stars, formation of black holes, white dwarfs, neutron stars, etc. A star undergoes a gravitational collapse due to its own mass at the end of its lifecycle, when it has exhausted all its nuclear fuel. During its collapse journey there are various stages at which the collapse may stop, depending on the initial mass of the collapsing star. If the star is massive i.e. Mass>20$M_{\odot}$($M_{\odot}$ represents solar mass), then the collapse does not come to a halt at any of the intermediate stages (such as white dwarf or neutron star), but directly proceeds to form a singularity such as a black hole. The study of gravitational collapse started with Oppenheimer and Snyder in 1939 when they explored the gravitational collapse of a dust cloud modelled by a static Schwarzschild exterior and Friedmann interior. Following this, Tolman and Bondi studied the collapse of spherically symmetric inhomogeneous distribution of dust. Subsequently a lot of interest was generated in this subject and numerous work related to this can be found in literature. The quest for the nature of singularity (black hole or naked singularity) formed as a result of gravitational collapse is an important*

topic of discussion in connection with the cosmic censorship hypothesis proposed by Roger Penrose in 1969.

Dr. Piyali Bhar

Title of the talk: Some basic ideas about wormhole

***Abstract**: A typical stationary spherically symmetric wormhole is a two-mouthed tunnel (also called a tube, throat, or handle) in a multiply connected spacetime that joins two remote asymptotically flat regions of the same spacetime or two different spacetimes altogether. The concept of "traversable wormhole" was suggested by Morris and Thorne with the idea of using a wormhole for interstellar travel or even as a time machine. Wormhole solution can be obtained by solving the Einstein's field equation but one has to tolerate the violation of energy condition. The matter which is reasonable for the violation of energy condition is called the "exotic matter" which is threated at the throat of the wormhole. Due to the unnatural behavior of "exotic matter", it is useful to minimize its usage. In the context of modified theories of gravity, it is important to note that it is the effective stress-energy tensor that violates the null energy condition, and one may in principle allow the normal matter threading the wormhole to satisfy the energy conditions. Böhmer et al. found a wide range of exact solutions, where the normal matter threading the wormhole satisfies the energy conditions.In present talk, I am interested to discuss about some basic ideas about wormhole.*

Dr. Koushik Ghosh

Title of the Talk: Story of Brown Dwarfs peeping between Stars and Planets

***Theme**: Brown dwarfs originate from clouds of gas that do not have enough mass to form a star, and therefore not enough density and pressure to trigger hydrogen fusion in their core. Although they can be as hot as stars at the bottom of the main sequence when formed and during their young age (<10^8 years) but as they age, they cool rapidly due to the shortage of fusion process at their core. These objects are often coined as 'failed stars'. Old brown dwarfs can be cool enough to support atmospheres with methane and water vapour. Brown dwarfs are not really brown, they can take a large variety of colours depending on their ages, masses and compositions. They are so small that as per the latest observation the biggest brown dwarf is only about 84 times the mass of the planet Jupiter and the smallest one is only about 13 times of the same. In this talk a theoretical profile of brown dwarf objects will be demonstrated starting from hydrostatic balance equation and*

considering their internal rotation depending on both radial distance and latitude. Results will be validated over some already detected brown dwarfs.

Dr. Ertan GŰDEKLÍ

Title of the Talk : Dynamical System Analysis of FLRW Models

***Abstract**:We investigate Friedmann-Lamaitre-Robertson-Walker (FLRW) models with a positive cosmological constant, using dynamical system methods. We assume a perfect-fluid matter source with* $p=(\gamma-1)\mu$ *as equation of state where* μ *is the matter-energy density, p is the pressure, and* γ *is a constant as well as draw the state spaces for different values of* γ *. We analyze the nature of the singularity at the beginning and the fate of the universe in the far future. In particular, we address the question whether there is a solution which is stable for all the cases.*