Abstracts

Speaker: **Ghulam Abbas**
Institution: The Islamia University of Bahawalpur, Bahawalpur, Pakistan
Title: Strong Gravitational Lensing for the Photons Coupled to Weyl tensor in Kiselev Black Hole

Abstract: The ambition of this talk is to highlight the experience of the strong gravitational lensing and deflection angle for the photons coupling with Weyl tensor in a Kiselev black hole spacetime. However, we first present photon equations of motion coupled to Weyl tensor, which brings light cone conditions. We investigate that the gravitational lensing depends not only on the parameter α, but it also depends on the coupled photon polarization directions. We formulate the critical values \alpha_{c1} for PPM and \alpha_{c2} for PPL, for the existence of the photon sphere radius r_{ps} outside the event horizon. This depends on the photon polarization directions and the quintessence parameter \sigma. Furthermore, we find that the polarization directions of coupled photon and the coupling parameter \alpha, both modify the features of the photon sphere, the angle of deflection and co-efficients \bar{a} and \bar{b} in the strong gravitational lensing formula in a Kiselev black hole spacetime.

Speaker: **Jameela Abbas**
Institution: University of Education, Lahore, Pakistan
Title: Deflection of Light for Kerr-Newman-AdS Black Hole with Quintessence

Abstract: The phenomenon of weak gravitational lensing is studied in the background of Kerr-Newman-AdS black hole surrounded by quintessence. In our analysis, we find the deflection angle of light by using Gauss-Bonnet theorem to a suitable osculating Riemannian manifold. Later, for verification of obtained results, the deflection angle is illustrated along with the geodesic formalism for the given black hole.

Speaker: **Maryam Aghaei Abchouyeh**
Institution: Isfahan University of Technology, Iran
Title: Thermodynamics and Geometry of Anyon Black Holes

Abstract: We propose a correspondence between an Anyon Van der Waals fluid and a (2+1) dimensional AdS black hole. A parameter α ($0 < \alpha< 1$) characterizes the intermediate statistics of Anyons. The equation of state for the Anyon Van der Waals fluid shows that it has a quasi Fermi-Dirac statistics for $\alpha > \alpha_c$, but a quasi Bose-Einstein statistics for $\alpha < \alpha_c$. By defining a general form of the metric for the (2+1) dimensional AdS black hole and considering the temperature of the black hole to be equal with that of the Anyon Van der Waals fluid, we construct the exact form of the metric for a (2+1) dimensional AdS black hole. The thermodynamic properties of this black hole is consistent with those of the Anyon Van der Waals fluid. For$\alpha <\alpha_ c$, the solution exhibits a quasi Bose-Einstein statistics. For $\alpha>\alpha_ c$, there is, however, no event horizon so there is no black hole solution.

Speaker: **Jamil Ahmad**
Institution: Quaid-i-Azam University, Islamabad, Pakistan
Title: Quartic Quasi-Topological Gravity

Abstract: In this talk, construction of the quartic version of generalized quasi-topological gravity will be presented. This class of theories includes Lovelock gravity and a known form of quartic quasi-topological gravity as special cases and possess a number of remarkable properties: (i) In vacuum, or in the presence of suitable matter, there is a single independent field equation which is a total derivative. (ii) At the linearized level, the equations of motion on a maximally symmetric background are second order, coinciding with the linearized Einstein equations up to a redefinition of Newtons constant. Therefore, these theories propagate only the massless, transverse graviton on a maximally symmetric background. (iii) While the Lovelock and quasi-topological terms are trivial in four dimensions, there exist four new generalized quasi-topological terms (the quartet) that are nontrivial, leading to interesting higher curvature theories in d greater than or equal to 4 dimensions that appear well suited for holographic study.

Speaker: **Zahid Ahmad**
Institution: COMSATS University, Islamabad, Abbottabad Campus, Pakistan
Title: Gravitational Collapse of Anisotropic Fluid in *f(R)* Gravity

Abstract: The present work investigates the gravitational collapse of anisotropic fluid in *f(R)* gravity. We consider the non-static spherically symmetric and static spherically symmetric spacetimes in the interior and exterior regions of star. We proceed further by deriving the junction's conditions between interior and exterior spacetimes. The field equations in *f(R)* gravity are solved by taking the assumption of constant Ricci scalar. The apparent horizon and their time of formation are also discussed. It is concluded that the constant Ricci scalar term acts as a source of repulsive force and it slows down the collapse of matter. We recover the result of the perfect case for $P_r = P_t = P$.

Speaker: **Bobomurat Ahmedov**
Institution: National University of Uzbekistan, Uzbekistan
Title: Optical Properties of Axially Symmetric Compact Gravitational Objects

Abstract: The shadow of a rotating (i) non-Kerr, (ii) Horava-Lifshitz, (iii) Kerr-Taub-NUT, (iv) five-dimensional rotating Myers-Perry and other black holes in vacuum has been studied, and it has been shown that in addition to the specific angular momentum, (i) the deformation parameter of non-Kerr spacetime, (ii) parameters of Horava-Lifshitz spacetime, (iii) nonvanishing gravitomagnetic charge, and other parameters essentially deform the shape of the black hole shadow.
A comparison of the obtained theoretical results on the polarization angle with the observational data on Faraday rotation measurements provides the upper limit for the dimensionless deformation parameter as $\varepsilon<19$, the upper limit for the Horava-Lifshitz δ parameter as $\delta \leq 2.1\cdot10\text{-}3$ etc.
Then gravitational lensing in the vicinity of a slowly rotating massive object surrounded by plasma has been studied. The obtained deflection angle of the light ray in the presence of plasma depends on (i) the frequency of the electromagnetic wave, due to the dispersion properties of the

plasma; (ii) the gravitational mass M; and (iii) the angular momentum of the gravitational lens. We have studied photon motion around axially symmetric rotating (i) Kerr black hole, (ii) wormhole in the presence of plasma with radial power-law density. It is shown that in the presence of a plasma, the observed shape and size of the shadow of rotating (i) Kerr black hole, (ii) wormhole changes depending on the (i) plasma parameters, (ii) gravitational object spin, and (iii) inclination angle between the observer plane and the axis of rotation of the black hole/wormhole.
Finally, we have developed a general formalism to describe the black hole shadow as an arbitrary polar curve expressed in terms of a Legendre expansion. New developed formalism does not presume any knowledge of the properties of the shadow, e.g., the location of its center, and offers a number of routes to characterize the distortions of the curve with respect to reference circles. These distortions can be implemented in a coordinate independent manner by different teams analyzing the same data. It has been shown that the new formalism provides an accurate and robust description of noisy observational data, with smaller error variances when compared to previous measurements of the distortion.

Speaker: **Askar Ali**
Institution: Quaid-i-Azam University, Islamabad, Pakistan
Title: Rotating Black Holes and Nonlinear Electrodynamics

Abstract: We considered stationary axisymmetric rotating black hole solutions with the nonlinear electrodynamical source. The class of axially symmetric solutions are obtained for different values of the parameter of nonlinear electromagnetic field. The Misner-Sharp mass, the metric components are calculated and their asymptotic behavior at infinity and at $r = 0$ are also discussed. We also determined the metric functions for the black holes which contain both electric and magnetic charges. Further, the thermal stability of resulting solutions is also studied by calculating various thermodynamical quantities such as Hawking temperature, entropy and heat capacity at constant charge.

Speaker: **Muhammad Jamil Amir**
Institution: Govt. College (B) Taunsa, D.G. Khan, Pakistan
Title: Gravitational Dust Collapse in *f(R,T)* Modified Theory of Gravity

Abstract: This work contains the study of dust gravitational collapse in the frame work of *f(R,T)* modified theory of gravity. For this purpose, Freidman-Robertson-Walker (FRW) metric is taken as the interior and Schwarzschild background in the exterior regions of the star. The junction conditions between exterior and interior regions are offered by matching the exterior and interior regions. The field equations are solved by taking the assumptions that the Ricci scalar as well as the trace of energy-momentum tensor are to be constant, for a particular *f(R, T)* model. The gravitational mass of the collapsing system has been calculated. Also, the apparent horizons and their time formation for different possible cases have been discussed. It is shown that the term *f(R_ {0}, T_{0})* behaves as a source of repulsive force and consequently it slows down the collapsing of matter.

Speaker: **Nisa Amir**
Institution: Quaid-i-Azam University, Islamabad, Pakistan
Title: The Einstein Toolkit

Abstract: The Einstein Toolkit is a mature, open source computational infrastructure for numerical relativity and astrophysical studies based on the Cactus framework. Various researchers across the globe contributed towards the development of this Toolkit and still it is in the advancement phase. This Toolkit comprises of different built-in modules for performing different simulations like binary mergers of black holes, hydrodynamics and study of compact objects etc. Furthermore, these modules can be tailored and executed depending upon the researcher's narratives and requirements.
This presentation provides an initial insight to the Einstein Toolkit for new users. It explains how to obtain, compile and run the Toolkit. In the current study **IDBrillData** module is utilized to construct initial data for time-symmetric Brill waves. Also, the **EinsteinExact** module of the Einstein Toolkit is used to obtain solutions of physical significance for different spacetimes.

Speaker: **Sara Ashraf**
Institution: University of Central Punjab, Lahore, Pakistan
Title: Thermodynamics of Modified Cosmic Chaplygin Gas

Abstract: In this paper, the thermodynamic features of an exotic fluid known as modified cosmic Chaplygin gas in the context of homogeneous isotropic universe model is examined. For this purpose, the behavior of physical parameters is discussed that help to analyze nature of the universe. Using specific heat formalism, the validity of third law of thermodynamics is checked. Furthermore, with the help of thermodynamic entities, the thermal equation of state is also discussed. The thermodynamic stability is explored by means of adiabatic, specific heat and isothermal conditions from classical thermodynamics. It is concluded that the considered fluid configuration is thermodynamically stable and expands adiabatically for an appropriate choice of parameters.

Speaker: **Muhammad Azam**
Institution: University of Education, Lahore, Multan Campus, Multan, Pakistan
Title: Modeling of Compact Objects and Their Stability

Abstract: We found the exact solutions of Einstein-Maxwell equations with generalized polytropic equation of state. For this, we consider spherically symmetric object with charged anisotropic matter distribution. We rewrite the field equations into simple form through transformation introduced by Durgapal and solve these equations analytically. For physically acceptability of these solutions, we plot the physical quantities like energy density, anisotropy, speed of sound, tangential and radial pressure. We found that all solutions fulfill the required physical conditions. It is concluded that all our results are reduced to the case of anisotropic charged matter distribution with linear, quadratic as well as polytropic equation of state.

Speaker: **Muhammad Bilal Azam**
Institution: Lahore University of Management Sciences, Lahore, Pakistan
Title: Dark Energy in Causal Set Theory

Abstract: Observations indicate that universe is dominated by dark energy, with negative pressure. Dark energy is one of the expected candidates for cosmological constant. But it also raises a fundamental question that why cosmological constant is of the order of ambient density today? Answer comes from the marriage of unimodular gravity and causal set theory. Unimodular gravity suggests that cosmological constant needs not to be a constant parameter but a fluctuating one and the theory of discrete spacetime, causal set theory, predicts the magnitude of these fluctuations. Maqbool et al. (2004) showed that, for flat universe, this ansatz provides a cosmological constant which fluctuates about zero and which is comparable to the ambient energy density at all times. Using the same arguments, we aim to find the fluctuations in cosmological constant for a closed universe.

Speaker: **Rimsha Babar**
Institution: University of Education, Lahore, Pakistan
Title: Quantum Tunneling and Corrections for Spin-1 Particles

Abstract: The Hawking radiation process is studied by considering the quantum tunneling phenomenon of massive spin-1 particles. Using Hamilton-Jacobi ansatz, the Proca equation provides the required tunneling rate of emitted particles and corresponding Hawking temperature T_{H}. In order to study the quantum gravity effects, the generalized Proca equation is used, incorporating the generalized uncertainty principle to obtain the quantum corrected temperature, T_{e-H}.

Speaker: **Sebastian Bahamonde**
Institution: University of Tartu, Estonia
Title: New Exact Black holes solutions in $f(R,\phi,X)$ gravity by Noether's symmetry approach

Abstract: The exact solutions of spherically symmetric space-times are discussed by using Noether symmetries in $f(R,\varphi,X)$ gravity with R the scalar curvature, φ a scalar field and X the kinetic term of φ. Some of these solutions could represent new black holes solutions in this extended theory of gravity. The classical Noether approach is particularly applied to acquire the Noether symmetry in $f(R,\varphi,X)$ gravity. Under the classical Noether theorem, it is shown that the Noether symmetry in $f(R,\varphi,X)$ gravity yields the solvable first integral of motion. With the conservation relation obtained from the Noether symmetry, the exact solutions for the field equations can be found. It is also demonstrated that the approach with Noether symmetries can be regarded as a selection rule to determine the potential $V(\varphi)$ for φ, included in some class of the theories of $f(R,\varphi,X)$ gravity.

Speaker: **Rashida Bibi**
Institution: International Islamic University, Islamabad, Pakistan
Title: Solution of the Einstein-Maxwell Equations with Anisotropic Negative Pressure

Abstract: We have obtained a new class of solutions for the Einstein-Maxwell field equations for static spherically symmetric space-times by considering the negative anisotropic pressures, which represents a potential model of a dark energy star. We take the equation of state $p_r = \hat{a}^{\wedge}$', where p_r is the radial pressure and is the density. We have also checked that for these solutions' metric coefficients, mass density, radial pressure, transverse pressure, electric field, and current density are well defined for suitable values of the parameters involved in the solution. These exact solutions can be used to develop models of dark energy stellar interiors satisfying all physical constraints except for the causality condition, which cannot be satisfied for the equation of state considered here, and which is arguably not an applicable physical constraint for dark matter-energy.

Speaker: **Allah Ditta**
Institution: The Islamia University of Bahawalpur, Bahawalpur, Pakistan
Title: Matter Accretion onto a Brane-World Black Hole via Hamiltonian Approach

Abstract: One of the most interesting astrophysical phenomena is falling of a dark matter onto a black hole (BH). The work of this paper shows that adopting the Hamiltonian approach, we investigate the accretion process onto a Brane World BH in the presence of cosmological parameter α and the dark matter parameter β. Particularly, in this paper we study the process of matter (fluid) with different models of spacetime such as Schwarzschild-Ads model and the Schwarzschild-XCDM model. Next, we analyze the general solution of the problem which is static and spherically symmetric through equation of state according to the models of BH. The most interesting aspect of this paper is to discuss the effects parameters of BH on the mass accretion rate, which we discussed by the graphical analysis. Finally, it has been shown that the parameters α and β play a dominant role for the maximum accretion rate.

Speaker: **Suhail Zaki Farooqui**
Institution: University of Engineering & Technology, Peshawar, Pakistan
Title: Prospects of Wind and Solar Thermal Energy for Pakistan

Abstract: Pakistan is undergoing an energy crisis since the last two decades. The import of fossil fuel costs the country around US$ 13-14 billion, annually. Insufficient access to energy sources is hindering the economic growth as well as retarding any improvements in the living conditions of the common citizens. Only one-third of the total energy consumption of Pakistan is in the form of electrical energy. While, nearly 11,000 MW of electrical energy installation have been made during the least five years, load shedding has not reduced, due to equal increase in the demand. Pakistan is blessed with abundant renewable energy resource, which is more than sufficient to fulfill all its energy needs for many centuries. However, lack of knowledge, indigenous R&D and sustained political will are depriving the nation from harnessing these free gifts of God. The talk will describe a series of R&D efforts made by the author in different capacities for the promotion of very affordable and technologically mature ideas in Pakistan. The

talk will only focus on efforts made in the fields of wind and solar thermal energy, with emphasis on the recent developments.

Speaker: **Sijie Gao**
Institution: Beijing Normal University, China
Title: First law and Smarr formula of black hole mechanics in nonlinear gauge theories

Abstract: We derive a generalized first law from the Lagrangian of the nonlinear gauge field coupled to gravity. In our treatment, the Lagrangian is a function of the electromagnetic invariant as well as some additional parameters. Consequently, we obtain new terms in the first law. With our formula, we find the correct forms of the first law for Bardeen black holes and Born-Infeld black holes. By scaling arguments, we also derive a general Smarr formula from the first law. Our results apply to a wide class of black holes with nonlinear gauge fields.

Speaker: **Usman Alam Gillani**
Institution: Quaid-i-Azam University, Islamabad, Pakistan
Title: Linear Cosmological Perturbations in almost Scale-Invariant Fourth-Order Gravity

Abstract: In this paper we are going to find out some interesting results in the modified gravity theory by using the perturbation techniques. Here we will study *f(R, G)* gravity theory and then later we will discuss the particular model on this gravity theory which is given as *f(R, G) = Î±R + Î²GlogG*. We are interesting to find out some amazing results in terms of field equations on this specified model at the background and linear order as well for the generalized gauge. Main while we will discuss specified gauges as well and will explore some of the remarkable result in term of Field equation.

Speaker: **Ibrar Hussain**
Institution: National University of Sciences and Technology, Pakistan
Title: A Review of the Applications of Approximate Lie Symmetry Methods to Define the Energy Content of Some Black Hole Spacetimes

Abstract: The energy content of some black holes is investigated using approximate Lie symmetry methods for differential equations. It is mainly done by assuming the parameters of the black hole, such as its mass, charge and spin as small quantities (\epsilon). In the approximate (perturbed) geodesic equations for such black holes we neglect the higher powers of (\epsilon) and only retain its second power. Due to the existence of the trivial second-order approximate Lie symmetries of these second-order approximate geodesic equations, a re-scaling of the geodetic parameter gives us a re-scaling of the energy content of the black holes.

Speaker: **Ayesha Ikram**
Institution: University of Education, Lahore, Pakistan
Title: On the Stability of Einstein Universe

Abstract: This talk analyzes the stability of Einstein universe against homogeneous perturbations in the context of modified Gauss-Bonnet theory coupled with matter configuration commonly known as *f(G,T)* gravity. The static and perturbed field equations in the presence of

perfect fluid are constructed. The stability regions parameterized by equation of state parameter are investigated for conserved as well as non-conserved energy-momentum tensor.

Speaker: **Sehrish Iftikhar**
Institution: Lahore College for Women University, Lahore, Pakistan
Title: Particle Dynamics Near a Black Hole

Abstract: Black holes are the most important predictions of general relativity, which are the end product of gravitational collapse. The study of geodesics reveals geometrical properties of a curved space- time such as stability of orbits, particle acceleration, shadow of a black hole etc. A physical particle follows either null or timelike geodesics.

Speaker: **Muhammad Jawed Iqbal**
Institution: University of Karachi, Karachi, Pakistan
Title: Studying Dark Energy and the Accelerated Expansion of the Universe through Multi-Wave and Multi-Wavelength Observations

Abstract: The discovery of the accelerated expansion of the universe drastically changed our understanding of the structure and evolution of the universe. The very idea that our universe is not only expanding but expanding with an accelerated rate raised some puzzling questions regarding our understanding of gravity and how it behaves at the large scales. The concept of dark energy provided some satisfactory explanation for the issue that not only it is overcoming the gravity and resisting the collapse of our universe but it is also causing our universe to expand at an accelerated rate. However, there are still some burning issues related to the rate of this expansion and precise constraints on the dark energy density parameter. Observational data from the various observational signatures of the dark energy do not seem to provide a unified set of parameter measurements. In this study we will discuss how new observations through upcoming surveys through electromagnetic and gravitational waves can help us in solving these issues.

Speaker: **Muhammad Ilyas**
Institution: University of Karachi, Karachi, Pakistan
Title: Killing Symmetry of Specific Non-static Spherically Symmetric Space-times in Presence of Torsion Fields

Abstract: Einstein's general theory of relativity (GTR) assumes torsion-free field has revisited by Einstein-Cartan theory by introducing the concept of torsion fields. Literatures focusing torsion-free fields have studied Killing symmetry of both static and non-static space times and have classified space-times according to the number of Killing vector fields. Available literatures focusing on torsion fields are found studying symmetry of static space times only. In this discourse, we find Killing vector fields of specific non-static spherically symmetric space-times in the presence of torsion fields. We hope this will help in understanding the dynamics of large astronomical objects such as our galaxy.

Speaker: **Nimra Irshad**
Institution: University of Education, Lahore, Pakistan
Title: Analysis of Anisotropic Universe via Interacting Dark Energy Model

Abstract: In order to examine the current accelerated expansion of universe, we consider a generalized anisotropic universe model in the framework of general relativity. In the presence of interacting dark energy model, the behavior of cosmological parameters is investigated for different values of interacting parameter. The graphical behavior of these parameters provides consistency with current observations. The state-finder parameters identifies the compatibility of reconstructed models with standard cosmological models while the trajectories of speed of sound ensures the stability of reconstructed anisotropic models.

Speaker: **Wajiha Javed**
Institution: University of Education, Lahore, Pakistan
Title: Hawking Radiation Phenomenon

Abstract: The Hawking radiation phenomenon is explored as tunneling process of charged spin particles through event horizons of some particular black holes. Applying the semi-classical WKB approximation to the general covariant wave equations of charged particles, the tunneling probabilities are evaluated for outgoing charged particles. The corresponding Hawking temperatures are recovered. By considering the back-reaction effects of the emitted spin particles, the quantum corrections of radiation spectrum can be observed. It is found that the radiation spectrum is not purely thermal due to energy and charge conservation but has some corrections.

Speaker: **Abdul Jawad**
Institution: COMSATS University, Islamabad, Lahore Campus, Pakistan
Title: Cosmological Implications of Scalar Field Models

Abstract: Cosmic acceleration will be studied by assuming the interacting scenario of scalar field models with cold dark matter. In this scenario, different cosmological parameters, the validity of thermodynamic laws and thermal equilibrium will be analyzed.

Speaker: **Hafiza Rizwana Kausar**
Institution: University of Central Punjab, Lahore, Pakistan
Title: Mathematical and Physical Overview of Gravitational Waves

Abstract: The discovery of gravitational waves is a striking news of the 21st century. In this talk, we present an overview of the gravitational waves starting from its prediction by Einstein 100 years back to its detections in 1915 by LIGO and VIRGO collaborations. We also, present mathematics of the gravitational waves in general relativity as well as in modified theories and solve its equation to find polarization states.

Speaker: **Suhail Khan**
Institution: University of Peshawar, Peshawar, Pakistan
Title: Classification of LRS Bianchi Type I Spacetime Through its Conformal Killing Vector Fields

Abstract: In this paper, we investigate conformal Killing vector fields (CKVFs) of locally rotationally symmetric (LRS) Bianchi type I spacetime. Ten conformal Killing equations and the CKVFs components having unknown functions of integration are derived. Specific solutions of these conformal Killing equations are subject to the twelve integrability conditions. Integrability conditions are solved completely in different cases and conformal vector fields of dimensions four, five and six are obtained along with their conformal factors. In each case the exact form of the metric which admit CKVFs is obtained. The inheriting conformal Killing vector fields are obtained and it is also shown that a particular vacuum solution of LRS Bianchi type-I spacetime do not admit proper homothetic or proper conformal Killing vector fields.

Speaker: **Farzana Kousar**
Institution: COMSATS University Islamabad, Lahore Campus, Pakistan
Title: Static Spherically Symmetric Wormholes in Generalized $f(R,\varphi)$ Gravity

Abstract: We have examined static spherically symmetric wormhole solutions in generalized $f(R,\varphi)$ gravity. To do this, we consider three different kind of fluids: anisotropic, barotropic and isotropic. We explore different $f(R,\varphi)$ models and inspect the energy conditions for all of those three fluids. It is found that under some models in this theory, it is possible to obtain wormhole solutions without requiring exotic matter. From our results and for our cases, we conclude that for anisotropic and isotropic fluids, realistic wormhole geometries satisfying the energy conditions can be constructed.

Speaker: **Hyung Won Lee**
Institution: Inje University, Korea
Title: Gravitational Wave Detection and Multimessenger Astrophysics

Abstract: The gravitational wave itself was predicted by Einstein in 1916 but only detected recently by LIGO collaboration in 2015. This historical event opened a new window of observing the universe. Observation using the gravitational wave is completely different from conventional electro-magnetic wave observations. Most astrophysical events generate gravity perturbation and electro-magnetic wave follows after. Therefore, gravitational wave detection can be a precursor to EM wave observations. This can give us the opportunity to detect the very early stages of astrophysical phenomena and gain insight of the mechanisms underlying various astrophysical events. Furthermore, some astrophysical events only generate gravitational wave without any accompanying electro-magnetic waves and these events can not be detected using the conventional way. In this talk, I want to give a general introduction for gravitational wave including its generation and detection. Basic introduction for gravitational wave will be given. Then I will outline various efforts put in to detect them, focusing on the large laser interferometer and parameter estimation. Finally, I will explain important events detected until now

Speaker: **Malcolm A. H. MacCallum**
Title: Spacetimes with Local Isotropy Groups
Institution: Queen Mary University of London, UK

Abstract: Spacetimes with local isotropy (i.e. the same isotropy group at every point) have been investigated systematically since the 1960s. Ellis, and Ellis and Stewart, discussed cases with local rotational symmetry (invariance under a continuous group of spatial rotations). I gave the group structure and metrics of hypersurface-homogeneous spacetimes with local continuous isotropies. Schmidt noted that spatially-homogeneous spacetimes in general admit a discrete group of reflections at every point. More recent work has improved the Ellis and Stewart theorems and Filipe Mena and I have proved a converse of the Schmidt result in the most symmetric case, where local discrete isotropy implies spatial homogeneity (work on the more general cases is ongoing). This talk will review the known results and report on what remains to be studied.

Speaker: **Rubab Manzoor**
Institution: University of Management and Technology, Lahore, Pakistan
Title: Stellar Evolution in Modified Gravity

Abstract: We discuss stellar evolution with the help of self-gravitating fluid in modified gravity. For this, we explain dynamics of different phases of evolving self-gravitating fluid models in alternative approach to general relativity. This study provides discrimination among general relativity and modified gravitational framework.

Speaker: **Andrew Miller**
Institution: Sapienza University of Rome, Rome, Italy
Title: Results of a Search for a Postmerger Remnant of Binary Neutron Merger GW170817

Abstract: From electromagnetic and gravitational wave observations of binary neutron star merger GW170817, we have been able to constrain many properties of the progenitors, e.g. the masses, spins, positions, and the tidal deformities. However, electromagnetic observations are insufficient to conclude anything about the nature of the remnant, since the x-ray, optical and UV emission can be fit to many physical models, which include emission powered by a long-lived neutron star and fallback accretion from a black hole. Here I present four independent searches- both modeled and unmodelled- for the gravitational wave signal of a long-lived (>1 hour, <9 days) remnant of this BNS merger on real LIGO data, exploring for the first time this -long-lived- parameter space. Though we did not expect to see a remnant from this merger, this study serves to prepare us for future BNS mergers in the advanced and third generation detector eras.

Speaker: **Seyed Mohammad Sadegh Movahed**
Institution: Shahid Beheshti University, Tehran, Iran
Title: Statistical self-similarity of Pulsar Timing Residuals: A robust pipeline for searching Stochastic Gravitational Wave

Abstract: Complexity is ubiquitous behavior in the nature. In cosmology and astronomy, due to initial conditions and internal degree of freedom of underlying processes mainly and mostly

because of other relevant phenomena such as foreground effects, stochasticity can be clarified. Mentioned property is widely experienced in cosmological and astrophysical fields in 1,2 and 3 dimensions. Among various astrophysical processes, Millisecond pulsars is highly stable and the predictability of their rotational behavior leading to be an almost proper tool to elucidate various physical phenomena ranging from early universe to late time.
In this talk, inspired by self-similarity of a typical stochastic field, we propose a robust pipeline in order to examine the footprint of stochastic gravitational waves superimposed on the pulsar timing residuals (PTRs). We introduce a new algorithm, the so-called Irregular-Multi-Fractal-Detrended-Cross Correlation-Analysis (Irregular MF-DXA), to deal with irregular data sampling. According to the quadrupolar nature of the spatial cross-correlation function of a gravitational wave background, a new cross-correlation function, derived from Irregular-MF-DXA will be introduced. We propose four strategies based on results derived by MF-DXA to determine the dimensionless amplitude and power-law exponent of the characteristic strain spectrum for stochastic GWB. Using the value of Hurst exponent, one can clarify the type of GWs. The flexibility in the algorithm enables us to manipulate the contribution of noises and trends in PTRs. We apply our pipeline to explore 20 millisecond pulsars observed by Parkes Pulsar Timing Array (PPTA) project. Finally, some upper bounds on the dimensionless amplitude of GWs background, will be reported.

Speaker: **Qanitah Ama-Tul-Mughani**
Institution: University of the Punjab, Lahore, Pakistan
Title: Study of String Cloud with Minimal Geometric Deformation

Abstract: We explore exact charged solutions in a cloud of strings through minimal geometric deformation technique in three-dimensional gravity. For this purpose, we first evaluate the exact charged isotropic solution for static circular symmetry using Takabayashi equation of state and extend it to obtain two concrete anisotropic charged models. We investigate energy conditions as well as speed of sound constraint to check the viability of the respective solutions.

Speaker: **Saadia Mumtaz**
Institution: University of Engineering and Technology, Lahore, Pakistan
Title: Dynamical Analysis of Oscillating Gaseous System

Abstract: In this work, we study the dynamical instability of gaseous collapsing system under radial oscillations. For this purpose, we derive linearized perturbed equation of motion following the Eulerian and Lagrangian approaches. We formulate perturbed pressure in terms of adiabatic index by employing the conservation of baryon numbers. A variational principle is established to evaluate characteristic frequencies of oscillations which leads to the criteria for dynamical stability. We conclude that dynamical instability occurs if the gaseous mass contracts to the limiting radius.

Speaker: **Jameel-Un-Nabi**
Institution: Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Topi, Pakistan
Title: Accelerating the r-process: allowed and forbidden beta decay rates of waiting point nuclei.

Abstract: β-decay rates for crucial waiting point species having neutron closed magic shells 50 and 82 are calculated in this work under terrestrial as well as stellar conditions. The calculations are microscopic in nature and include both allowed and forbidden contributions. Contrary to previous findings it is reported that inclusion of first-forbidden transitions significantly decrease the calculated β-decay half-lives of waiting point nuclei. The calculations satisfy the model-independent Ikeda sum rule for even-even nuclei. For odd-A cases the rule is violated up to 15%. The calculations reproduce well the experimental data and are also compared with previous results. The increased β-decay rates of waiting point nuclei bear astrophysical significance and might contribute in accelerating the r-process.

Speaker: **Iqra Nawazish**
Institution: University of Education, Lahore, Pakistan
Title: Existence of Physically Viable Wormholes in *f(R,T)* Gravity

Abstract: The aim of this work is to investigate wormhole solutions of spherically symmetric spacetime via Noether symmetry approach in *f(R,T)* gravity. For this purpose, the *f(R, T)* models appreciating in-direct curvature-matter coupling are chosen and examine symmetry generators, corresponding conserved quantities and possible existence of realistic wormhole solutions for both dust as well as non-dust distributions. For both models, the wormhole solutions are constructed through constant and variable forms of red-shift and shape functions. Through graphical analysis of these solutions, the physical existence of wormhole solutions is analyzed which helps to study the behavior of energy conditions like null/weak relative to ordinary matter and effective energy-momentum tensors.

Speaker: **Hammad Nazar**
Institution: The Islamia University of Bahawalpur, Bahawalpur, Pakistan
Title: Complexity Factor for Anisotropic Source in Non-minimal Coupling Metric *f(R)* Gravity

Abstract: In this outline we recognize the idea of complexity factor for static anisotropic self-gravitating source with generalized *f(R)* metric gravity theory. In present consideration, we express the Einstein field equations, hydrostatic equilibrium equation, the mass function and physical behavior of *f(R)* model by using some observational data of well-known compact stars like 4U 1820 âˆ’ 30, SAX J1808.4 âˆ’ 3658 and Her X âˆ’ 1. We define the scalar functions through the orthogonal splitting of the Reimann-Christofell tensor and then find the vanishing complexity condition for self-gravitating system with the help of these scalars. It has been found that the vanishing condition for the complexity are pressure anisotropy and energy density inhomogeneity must cancel each other. Moreover, we study the momentous results of an astral object for the vanishing of complexity factor. Finally, these solutions reduced to previous investigation about complexity factor in General Relativity by taking Î» = 0.

Speaker: **Gonzalo J. Olmo**
Institution: University of Valencia, Spain
Title: Using General Relativity to Explore Modified Gravity Effects

Abstract: I will show that in a large family of metric-affine theories of gravity it is possible to generate solutions of the field equations by mapping them into general relativity coupled to a modified matter source. This means that numerical methods developed for GR can be implemented in these theories with little extra effort, opening a new window to systematically explore new gravitational dynamics in a variety of scenarios, including binary systems and the generation of gravitational waves. For concreteness, I will focus on scalar fields and anisotropic fluids to discuss some examples.

Speaker: **Francesco De Paolis**
Institution: University of Salento, Italy
Title: Probing the Dark Matter Nature by Gravitational Microlensing

Abstract: The nature of the dark matter in galactic halos is still an open issue. It has been suggested that it may be composed by primordial black holes with mass ranging from 10^(-15) to 10^5 solar masses. It will be shown how and why gravitational microlensing and pixel-lensing constitute the best way to study and constrain this dark matter component.

Speaker: **Asghar Qadir**
Institution: National University of Sciences and Technology, Pakistan
Title: A Tribute to Stephen Hawking

Abstract: It is nearly a year since Stephen Hawking died. He lived for nearly 50 years beyond the time the doctors had given for him. Throughout, he suffered progressive degeneration of the nerves, but continued to produce a large number of new ideas and profound work. Throughout he maintained his sense of humor and joy in life. In this talk his indomitable spirit and his work are honored.
Speaker: **Naveed Rafiq**
Institution: National Textile University, Faisalabad, Pakistan
Title: Energy Momentum Prescriptions of Ruban Spacetime

Abstract: This study is aimed to calculate the energy momentum prescriptions of Ruban spacetime. This would be done using prescriptions of Einstein and Bergman Thomson. The results would be calculated for both the theories of general relativity and teleparallel gravity.

Speaker: **Sabbir Rahman**
Institution: Strategy & Market Analysis Division, Kingdom of Saudi Arabia
Title: On the Existence of Exotic Matter in Classical Newtonian Mechanics and General Relativity

Abstract: According to Newton's law of gravitation the force between two particles depends upon their inertial, as well as their active and passive gravitational masses. For ordinary matter all three of these are equal and positive. We consider here the more general case where these

quantities are equal in magnitude for a given particle but can differ in sign. The resulting set of possible interactions allows each particle type to be assigned to one of precisely four different classes, and the results of N-body simulations show that the corresponding dynamics can give rise to a fairly rich spectrum of possible outcomes, many of which are familiar from nature at various scales, including in particular certain aspects of dark matter and dark energy. Total energy and momentum are conserved by all of these interactions if the definitions of momentum and kinetic and potential energy are suitably generalized. Although the weak principle of equivalence holds for only two of the four particle classes, we show that all of them as well as their interparticle interactions and associated many-body configurations can nevertheless arise in the general relativistic context, and in particular that mutually anti-gravitation particles do appear naturally in the theory.

Speaker: **Umer Rehman**
Institution: University of Science and Technology, China
Title: Theoretical Investigation of Possible Prevention of Gravitational Collapse of Extremely Dense Magneto-Plasma Astrophysical Environment

Abstract: Using quantum magneto-hydrodynamic (Q-MHD) model, a modify set of governing equations is presented for electrostatic drift type modes in extremely dense plasma environment. In this regard, a local dispersion relation for coupled quantum electron drift-acoustic mode in a nonuniform magnetized plasma with stationary ions and moving electrons is derived, considering equilibrium Fermi pressure gradients and effect of exchange and correlation for electrons which prevents further gravitational collapse of dead star. The dispersion relation is then analyzed both analytically as well as numerically. It is found that Fermi pressure along with other quantum effects like Bohm Potential and exchange and correlation effects may possible cause which prevent further gravitational collapse. Our result demonstrates new insight into the previous published work on drift modes. The results should be useful in the interpretation of electrostatic fluctuations in dense nonuniform magneto-plasmas on natural phenomena like astrophysical compact object such as white dwarfs or neutron stars.

Speaker: **Sobia Sadiq**
Institution: University of the Punjab, Lahore, Pakistan
Title: Stability of Charged Anisotropic Polytropes

Abstract: We investigate the electromagnetic effects on stability of spherically symmetric anisotropic fluid distribution via cracking/overturning. For this purpose, we consider polytropic equation of state and construct the corresponding generalized Tolman-Oppenheimer-Volkoff equation. In order to observe cracking/overturning, we apply perturbations on matter variables via polytropic constant as well as polytropic index and formulate the force distribution function. Finally, the stability of charged anisotropic fluid is analyzed graphically.

Speaker: **Rabia Saleem**
Institution: COMSATS University, Islamabad, Lahore Campus, Pakistan
Title: A Study of Warm Tachyon Inflation Using Hamilton's Jacobian Method

Abstract: In this paper, an elegant mathematical approach is introduced to solve the equations of warm inflationary model without using extra approximations other than slow-roll. This important inflationary method known as Hamilton-Jacobian formalism. Here tachyon field and the imperfect fluid are considered to be the cosmic ingredients to create inflation. A detailed analysis of the model is presented for three different choices of bulk and dissipative coefficients taking constant as well as variable. In each case, the involved model parameters are constrained to plot the physical acceptable range of scalar spectral index and tensor to scalar ratio. The parametric trajectories proved that the acquired results for all the three cases are compatible with Planck astrophysical data.

Speaker: **Sadia Sattar**
Institution: The University of Lahore, Sargodha Campus, Sargodha, Pakistan
Title: An Effect of Electromagnetic on Gravitational Collapse in *f(R,T)* Theory of Gravity

Abstract: This work contains the study of effect of electromagnetic field on the gravitational collapse in f*(R, T)* modified theories of gravity by taking spherically symmetric metric in the interior region and Reissner-Nordström metric in the exterior region. The issue of apparent horizons is also discussed. It is concluded that the end state of a star, in the presence of electromagnetic fields in the *f(R, T)* gravity framework, is a black hole. It is shown that the collapse is slower in the region $\rho_c < p_c$ and faster in the region$\rho_c > p_c$. Moreover, for λ=0, our results correspond to those of GR found previously.

Speaker: **Ghulam Shabbir**
Institution: Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Topi, Khyber Pakhtunkhwa, Pakistan
Title: How to Find the Proper Curvature Collineations

Abstract: In this talk we use algebraic, the rank of the 6 x 6 Riemann tensor and direct integration techniques to find the proper curvature collineations.

Speaker: **Hasrat Hussain Shah**
Institution: University of Science and Technology, China
Title: Electromagnetic Counterpart of Gravitational Waves from the Coalescence of Black Hole Binaries

Abstract: Announcement of LIGO and VIRGO of first gravitational waves source GW150904 opened new window in the field of gravitational waves astronomy. Coalescence of stellar mass black hole binaries produces gravitational waves signal which has been observed by two ground-based detectors. Electromagnetic counterpart of gravitational waves is also an important phenomenon. In this talk, I will provide the brief review that how electromagnetic counterpart can be produced by the coalescence of two stellar mass black hole and from the NS binaries coalescence.

Speaker: **Fatima Shahid**
Institution: University of Education, Lahore, Pakistan
Title: Some Reconstructed *f(R)* Models and Current Cosmos

Abstract: The cosmic evolution and current expansion is studied in the background of FRW universe. In order to meet the cause, different *f(R)* models are reconstructed. The power-law scale factor is considered to discuss cosmological outcomes of that model in terms of red-shift parameter z. The graphical behavior of speed of sound interprets model's stability/instability. The analysis of ω-$\acute{\omega}$ plane, EoS, deceleration and statefinder parameters is also observed. It is interesting to mention that results are consistent with the current observational data.

Speaker: **Muhammad Rizwan Shahzad**
Institution: The Islamia University of Bahawalpur, Bahawalpur, Pakistan
Title: A New Model of Quintessence Compact Stars in Rastall Theory of Gravity

Abstract: In the present work, we study a new model of anisotropic compact stars in the regime of Rastall theory. To solve the Rastall field equations we have used the Karori and Barua (KB) ansatz along with the quintessence dark energy aracterized by a parameter Wq with âˆ’1 < Wq < âˆ’1 /3 . We present a comparative study to demonstrate the physical acceptance of our proposed model. We mpare the numerical values of physical parameters obtained from our model with those of general relativity (GR) model given by Bhar [1] and observe that our model is more compatible (for some chosen values of Rastall dimensionless parameter $\gamma=\kappa\lambda$) with observational data than GR model. For this analysis we have consider four different compact stars, SAXJ1808 âˆ’ 3658(SSI), 4U1820 âˆ’ 30, V elaX âˆ’ 12 and PSRJ1416 âˆ’ 2230 with radii 7:07km, 10km, 9:99km and 10:3km, respectively. In this investigation we also present some physical aspects of the proposed model necessary to check the validity of the model and inferred that our model is acceptable physically and geometrically.

Speaker: **Umber Sheikh**
Institution: National Textile University, Faisalabad, Pakistan
Title: Rainbow Gravity: A Bridge between General Relativity and Quantum Theory

Abstract: This talk is devoted to explain the theory of Rainbow gravity as an emerging theory of gravity. This theory aims to fill in the gap between the theories of general relativity and quantum gravity. This theory is good to explain the collapse and thermodynamics of black holes. We have considered the gravitational collapse of a string cloud in theory of rainbow gravity. The location of event horizon as well as the time taken by the observer to reach event horizon are calculated. These results contain the same physical effects as in the dust collapse case. The theory of rainbow gravity predicts that there cannot be an information lost in the scenario depending upon the energies of observers.

Speaker: **Vikram Soni**
Institution: Jamia Millia Islamia, India
Title: Mysterious Magnetars: Maximum Stars

Abstract: Magnetars are exceptional neutron stars with the highest magnetic fields (10^15 gauss) in the universe, an unusual quasi steady X radiation (10^35 ergs/sec) and also produce flares which are some of the brightest events (10^46 ergs in one fifth of a second) to be recorded. There is no satisfactory model of magnetars. The talk will cover neutron stars and a new model for the origin of the magnetic fields in which magnetars arise from a high baryon density (phase transition) magnetized core which forms when they are born. The core magnetic field is initially shielded by the ambient high conductivity plasma. With time the shielding currents dissipate transporting the core field out, first to the crust and then breaking through the crust to the surface of the star. Recent observations provide support for this model which accounts for several properties of magnetars and also enables us to identify new magnetars. The somewhat sudden cessation of quasi steady X ray emission and rising polar magnetic fields is a characteristic of such models.

Speaker: **Cosimo Stornaiolo**
Institution: INFN, Naples, Italy
Title: Tomographic Analysis of the De Sitter Model in Quantum Cosmology

Abstract: After showing the properties of quantum tomograms. I show how they can be applied to analyze the quantum cosmological solutions proposed for the initial conditions in order to determine which can of solutions can evolve to a classical universe.

Speaker: **Muhammad Tahir**
Institution: The Islamia University of Bahawalpur, Bahawalpur, Pakistan
Title: Gravitational Perfect Fluid Collapse in Gauss-Bonnet Gravity

Abstract: The Einstein Gauss-Bonnet theory of gravity is the low energy limit of heterotic super-symmetric string theory. This paper deals gravitational collapse of perfect fluid in Einstein Gauss-Bonnet gravity by considering the Lemaitre - Tolman - Bondi metric. For this purpose, the closed form of exact solution of equations of motion has been determined by using the conservation of stress-energy tensor and the condition of marginally bound shells. It has been investigated that the presence of Gauss-Bonnet coupling term $\hat{I}\pm > 0$ and pressure of the fluid modifies the structure and time formation of singularity. In this analysis singularity form earlier than horizon, so end state of the collapse is a naked singularity depending on the initial data. But this singularity is weak and timelike that goes against the investigation of general relativity. Some future research directions are mentioned at the end of the paper.

Speaker: **Muhammad Usman**
Institution: National University of Science and Technology, Islamabad, Pakistan
Title: The Cosmological Constant and the Vacuum Energy of the Quintessential Dark Energy Higgs Potential

Abstract: We propose a model in which the accelerated expansion of the Universe occurs because of dynamical cause as well as non-dynamical reason. The dynamical dark energy is due to the inclusion of the extra Higgs doublet in the standard model of Particle Physics whereas the non-dynamical part is the combination of both the integration constant of the EFEs and the vacuum energy of the Higgs potential. Here the very famous problem of fine tuning becomes natural and we get the accelerated expansion of the Universe.

Speaker: **Arfa Waseem**
Institution: University of the Punjab, Lahore, Pakistan
Title: Study of Stellar Structures in Curvature-Matter Coupling Gravity

Abstract: This seminar is devoted to study stellar evolution of compact objects whose fluid pressure and energy density are computed through MIT bag model and realistic polytropic equation of state in the scenario of f(R, T, Q) gravity, where $Q = R_{ab}T^{ab}$. We derive the field equations as well as hydrostatic equilibrium equation and analyze their solutions numerically for $R+\alpha Q$ functional form with α being a coupling parameter. We discuss the dependence of various physical properties such as pressure, energy density, total mass and surface redshift on the chosen values of model parameter. The physical acceptability of proposed model is examined by checking the validity of energy conditions, causality condition and adiabatic index.

Speaker: **Naeem Yousaf**
Institution: The Islamia University of Bahawalpur, Bahawalpur, Pakistan
Title: Dynamical Behavior of Particles Near Brane-World Black Hole

Abstract: In this outline, we explore the behavior of dynamics of neutral test particles near the Brane-World black hole (BH). We also discuss the stability or unstability near the event horizon of the circular orbit with the help of extremal and none-extremal BH. In this consideration, we investigate the last stable circular orbit (rLSCO) that decreases with the increase of gama parameter and concluded that the circular orbit is stable at r > rLSCO. The effective potential vanishes at horizon in extremal black hole but in case of non-extremal black hole the angular momentum decreases against the increase of energy as well as parameter beta. Moreover, we find the conditions of the naked singularity and also express the effective potential that increases with the increase of angular momentum. Finally, the center of mass energy (CME) is constructed by the collision of particles in the vicinity of Brane-World black hole (BH) and observed that, the CME decreases with the increase of parameter gama.

Speaker: **Ayub Khan YousafZai**
Institution: University of Karachi, Karachi, Pakistan
Title: Wavelet Analysis of Interaction of Radio Wave with the Ionosphere

Abstract: In this study we are in a position to recognize the property of ionized upper atmospheric region ranging up to 600 Km, the ionosphere the part of upper atmosphere interferes high frequency radio signals. The fluctuation in electron-ion concentration is function of temperature, solar radiation and altitude in the ionosphere region. The data sets obtained from local and global sources that contain the periods mentioned as Karachi Ionosphere station (KIS) 1996, 2000, 2006, Islamabad Ionosphere station (IIS) 2005, 2006 and Wakanai (WK) 545-2005. This work also counts the parametric variability of the ionosphere. The local data has been acquired from the space agency of Pakistan (SUPARCO) using Digisonde-256. The implementations of exploratory data analysis provided insight into the ionosphere.
We have performed wavelet analysis. This approach has been utilized both in space and frequency components of ionospheric variables. The principal so far it is known as 1-Dimentional Haar wavelet transform one-to-five level. It has been implemented and functionalized with discontinuities. The ionospheric variables have been decomposed using this technique. Another aspect of wavelet has been considered as de-noising process that can fractionate the noisy signals. The evaluation of signal construction is carried out by analyzing the coefficient and detail approximation. The data patterns and trends for Pakistan and Japan ionosphere regions are found comparable.
It has been observed that all the estimations and forecasts values are of international standard and useful for public and private organizations dealing with ionosphere communication research & development. This research work appraises results for Pakistan and Japan ionosphere and revealed physical behavior of ionosphere at Pakistan and Japan regions.

Speaker: **Saeeda Zia**
Institution: National University of Computer and Emerging Sciences (FAST), Lahore, Pakistan
Title: Physiognomies of Cosmic Compact Objects through Modified Theory of Gravity

Abstract: The *f(R;G)* theory is one of the significant modified theories of gravity which has been developed by combining Ricci scalar *R* and Gauss Bonnet term *G*. The current work deals with the physical attributes and dynamics of anisotropic compact stars in the background of this theory within spherically symmetric time-space. In this context, the energy density, radial and tangential pressures are calculated for anisotropic compact star namely, SMCX ô€€€ 1. The *f(R;G)* gravity model has been splitted into a Starobinsky like *f1(R*) model and a power law f2(G) model. The prominent feature of this study is the solution of highly non- linear differential equations with some specific physical assumption and 2D graphical analysis including anisotropic measurements, stability features and energy conditions of the subject star are ascertained within aforementioned space-time. It is also determined that this star acts as usual in *f(R;G)* gravity and the results match with other two modified theories, namely *f(G)* gravity and *f(R)* gravity.

Speaker: **Muhammad Zubair**
Institution: COMSATS University Islamabad, Lahore Campus, Pakistan
Title: Some Cosmic Aspects in Modified Teleparallel Theories

Abstract: In this paper, we investigate the cosmological evolution in a new modified teleparallel gravity that connects both *f(T)* and *f(R)* theories with a boundary term *B*, called *f(T,B)* gravity. To this purpose, we assume flat Friedmann-Robertson-Walker (FRW) geometry filled with perfect fluid matter contents. We formulate the general energy constraints for two cases in this gravity: one is for a general function of *f(T,B)*, and the other is for a particular form of it given by *âˆ’T + F(B)*. Further, we explore the validity of these energy bounds by specifying different forms of *f(T,B)* and *F(B)* functions obtained by the reconstruction scheme for de Sitter, power-law, Î›CDM and phantom cosmological models. In order to constrain the free model parameters, we examine these energy bounds with the help of region graphs. We also explore the evolution of the effective equation of state (EoS) Ï‰eff for both cases and compare theoretical results with the observational data. It is found that the effective EoS represents the phantom phase or the quintessence state of accelerating universe in all cases, which is consistent with observational data.

Speaker: **Iqra Shahid (Poster)**
Institution: COMSATS University, Islamabad, Lahore Campus, Pakistan
Title: A Study of DINKIC Inflationary Dynamics Coupled with Imperfect Fluid

Abstract: This paper is keen to study the effects of bulk viscous pressure on generalized DBI inspired non-minimal kinetic coupling inflationary model in the framework of FRW universe. This is a newly proposed model with an interesting feature of having a correction term k^4 in the perturbed equation of motion due to the non-linearity of the kinetic term. The power spectrum remains scale invariant both in large-k and small-k limits. In order to discuss inflationary dynamics, the inflaton and imperfect fluid including bulk viscosity are considered to be the cosmic matter contents. We consider two models of potential: large field and small field potentials and derived the exact solution of inflaton and perturbed parameters in both cases. Further, we investigate the nature of the perturbed parameters in detail, specifically on the Potential driven case, and compare the consequences to the current PLANCK/BICEP observational data. We also analyze the corresponding tensor spectrum, which will be tested by the future observations on primordial gravitational waves.

Speaker: **Nadeem Azhar (Poster)**
Institution: COMSATS University Islamabad, Lahore Campus, Pakistan
Title: Cosmological Implications of Entropy Corrected Holographic Dark Energy Models

Abstract: We consider the power law and the entropy-corrected holographic dark energy models with Hubble horizon in the dynamical Chern-Simons modified gravity. We explore various cosmological parameters and planes in this framework. The Hubble parameter lies within the consistent range at the present and later epoch for both entropy corrected models. The deceleration parameter explains the accelerated expansion of the universe. The equation of state parameter corresponds to quintessence and \Lambda CDM limit. The w-w' approaches to \Lambda CDM limit and freezing region in both entropy corrected models. The statefinder

parameters consistent with \Lambda CDM limit and dark energy models. The generalized second law of thermodynamics remains valid in all cases of interacting parameter.