CITY UNIVERSITY
OF SCIENCE AND INFORMATION TECHNOLOGY

DIRECTORATE GENERAL OF SCIENCE & TECHNOLOGY

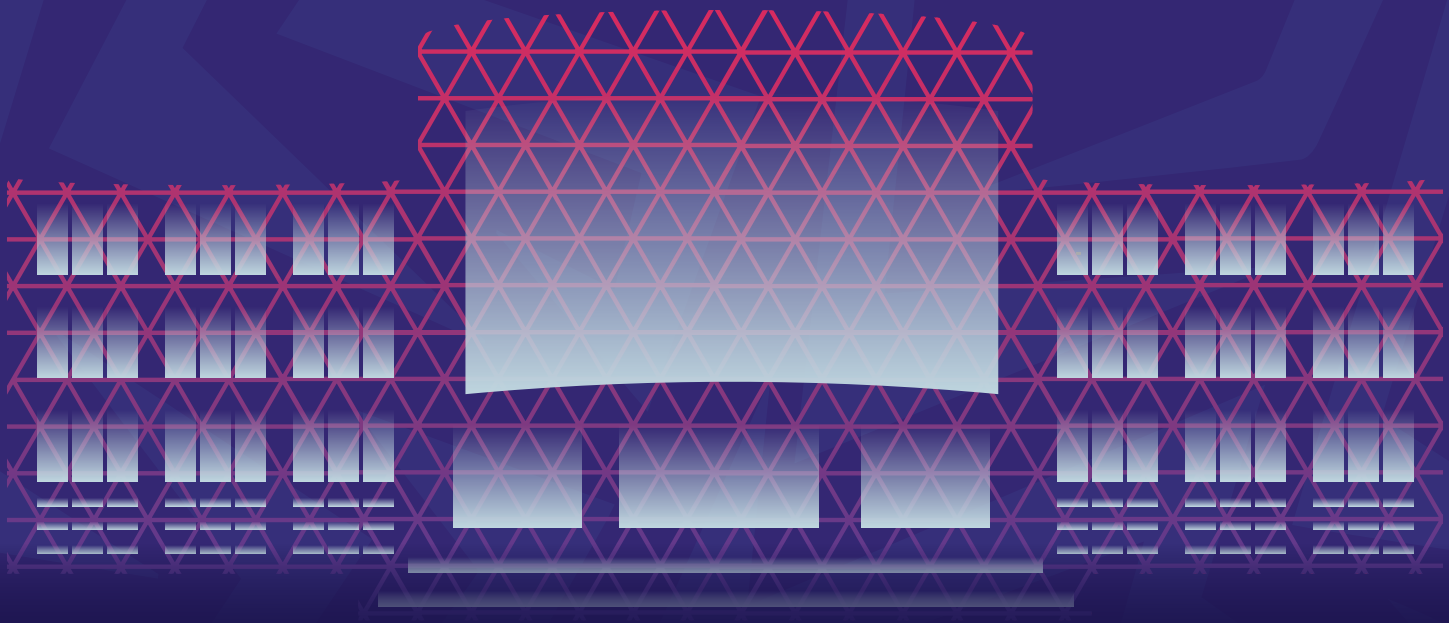
6th International Conference

ON EMERGING TRENDS IN ENGINEERING, MANAGEMENT & SCIENCES (ICETEMS-2025)

Dec 17th–18th, 2025

ABSTRACT BOOK

ISBN: 978-969-23044-6-7



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Chief Editors
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Editors
Prof. Dr. Muhammad Haroon Khan
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icetems@cusit.edu.pk www.cusit.edu.pk /www.icetems.com

Message by the Conference Chairman

Engr. Dr. Nasrullah Khan
Vice Chancellor,
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On behalf of the Executive commitee for 6th International Conference on Emerging Trends in Engineering, Management and Sciences (ICETEMS-2025), organized by City University of Science and Information Technology Peshawar, I am pleased to welcome all the delegates and participants from across the globe. It is a real honor and privilege for me to serve as the Chair of this conference. ICETEMS has really brought together a tremendous and rich diversity of authors and speakers from universities, government and industry around the globe to share ideas and new perspectives on a wide range of communications, engineering and computing research and technologies, addressing new technical and business issues essential to advancing today's advance technologies.

The popularity of ICETEMS as the premier forum for diverse research has started to grow. The ICETEMS has already become a prominent forum, where researchers and practitioners openly exchange ideas and report progress in the emerging technologies. This year, ICETEMS will deliver a stimulating, informative and delightful program. We greatly value the participations and look forward to the insightful vision and thoughts of the invited speakers. The excellence and success of ICETEMS would not have been possible without the support of our sponsors. We greatly appreciate all our sponsors and well-wishers. I hope that the conference will be stimulating, informative and enjoyable to all who attend it.

Message by the Co-Chairman

Prof. Dr. Muhammad Abid,
Vice President,
City University of Science and IT, Peshawar, Pakistan

On behalf of the 6th International Conference on Emerging Trends in Engineering, Management and Sciences (ICETEMS-2025), jointly organized by City University of Science and Information Technology Peshawar, and Dost Foundation, I am pleased to welcome all the delegates and participants from across the globe. It is a real honor and privilege for me to serve as the Co-Chair of this conference. ICETEMS has really brought together a tremendous and rich di versity of authors and speakers from government, industry and Universities around the globe to share ideas and new perspectives on a wide range of communications, engineering and computing research and technologies, addressing new technical and business issues essential for advancing today's engineering and technological environments.

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MANAGEMENT SCIENCE

Paper ID: ICETEMS-25-180

AN ANALYSIS OF DETERMINANTS OF WAGE RATE OF PRIVATE SCHOOL TEACHERS IN DISTRICT PESHAWAR

Shamsa Fazal

City University of Science & Information Technology, Peshawar

Email: fazalsart@gmail.com

The aim of the present study is to examine the effect of age, gender, teaching experience and trainings on the wages of private school teachers in Peshawar. The main objective of this research is to find out the reasons of wage inequality among male and female teachers of private schools of District Peshawar, Pakistan. Population of the study included all primary and secondary private sector schools of Peshawar. Data for this purpose was collected through structured questionnaire. A sample size of 384 has been drawn by using Morgan's table. The study estimated mincer earning function using discriminant analyses. In this primary study discriminant analyses is used to determine the wage discrimination among the private school teachers of Peshawar Pakistan. The result shows that age has significant effect on wage which shows when age increases than wage also increases. The result further shows that highest education level has also significant impact on wage rate which shows that a well-qualified person always gets handsome income. According to the results experience is a significant determinant of wage in the private sector schools but weaker determinants as compared to age and trainings. Moreover, it is common observation that sometimes there is gender discrimination in the wage rate but the discriminant analysis shows that gender is not a significant determinant of wage rate in Peshawar private sector schools. Training also appeared as a significant determinant of the wage rate in the study area. It is recommended for those who wish to join teaching as a profession to receive trainings and get necessary skills if they wish to fetch good return. It is recommended that those who wish to adopt teaching as profession should stay in the field as with the passage of time they will be experienced and this experience will fetch them good reward.

Keywords: wage, discrimination, teacher

Paper ID: ICETEMS-25-002

ASSESSING RECYCLING INTERMEDIARIES' NETWORKS IN WASTE RESOURCE, RECOVERY CYCLES THROUGH A FRUGAL INNOVATION LENS

Dr. Muhammad Tariq Yousafzai

University of Swat

Email: muhammadtariq@uswat.edu.pk

This study assesses the level of waste volarization achieved by informal sector intermediaries through use of recursive, "Resource-Recovery-Cycles (3Rs)". The study aims to highlights contributions of informal recyclers who employ jugaad oriented frugal innovation through recursive 3Rs (Resource-Recovery-Recycling) practices to volarize (upcycle) and devolarize (downcycle) materials in the waste value chains of industries and municipal solid waste. The study utilizes an inductive qualitative research design (Big Q qualitative research approach) to decipher meaning by way of social construction through interactions with participants in a non-positivist way. The study adheres to the "Standards for reporting qualitative research (SRQR)". Health and safety standards are neglected due to lack of safety equipment and protective gear such as non-woven disposable masks, latex gloves and protective eyewear amidst exposure to Polybrominated diphenyl ethers (PBDEs). However, devolarization (downcycling) is more common than upcycling across the six analyzed categories of E-Waste, Textiles, C&D waste, Agriculture Waste, Eid Al Azha Waste and Plastic Waste. The study calls for formalization of recycling intermediaries through the transfer of technologies used in developed countries to underserved countries. The study contributes to demonstrating how unintentional human agency works in unexpected ways of jugaad improvisation to tackle urgent grand challenges of anthropogenic global warming.

Keywords*:* Recycling, Upcycling, Downcycling, Recycling Intermediaries, Frugal Innovation, Jugaad Improvisation, Recursive Resource-Recovery-Cycles 3RCs,

Paper ID: ICETEMS-25-019

COMPOSITE RESOURCES AND THE SUCCESS OF WOMEN'S ENTREPRENEURSHIP IN MALAYSIA: AN EMPIRICAL EXAMINATION THROUGH THE RESOURCE-BASED VIEW

Rumugam Muthusamy

Sunway University, Malaysia

Email: arumugamm@sunway.edu.my

This study investigates how composite resources, including entrepreneurial competencies, passion, and innovativeness, influence the success of women-owned small and medium-sized enterprises in Malaysia. It is grounded in the Resource-Based View, which asserts that a firm's sustained competitive advantage results from effectively combining and utilizing its internal resources. Women entrepreneurs in Malaysia often encounter barriers such as limited financial access, restricted networks, and skill constraints. Hence, understanding how these internal resources interact to enhance entrepreneurial success is vital for developing policies and strategies that empower women entrepreneurs. A quantitative and cross-sectional research design was adopted to evaluate the hypothesized relationships among entrepreneurial competencies, passion, innovativeness, and success. These findings indicate that integrating creativity with skill-based and motivational resources enhances long-term business performance and competitive strength. 5. Conclusion This study extends the Resource-Based View by providing empirical evidence that multiple interdependent resources jointly contribute to entrepreneurial success. It emphasizes the importance of innovation-driven training, structured competency development, peer mentoring, and collaborative networks to strengthen resilience and adaptability among women-led enterprises. By focusing on composite resources rather than isolated capabilities, the study offers a holistic framework for empowering women entrepreneurs and fostering sustainable growth within Malaysia's entrepreneurial ecosystem.

Keywords: Women entrepreneurship, composite resources, entrepreneurial competencies, entrepreneurial passion, entrepreneurial innovativeness, Resource-Based View, Malaysia.

Paper ID: ICETEMS-25-030

IMPACT OF COVID-19 CASES ON PAKISTAN'S STOCK MARKET

Taimoor Khan

Islamia College University, Peshawar

Email: taimoorniazi10@gmail.com

The COVID-19 pandemic severely disrupted the global economy and financial markets, posing unprecedented challenges for emerging economies like Pakistan. This study investigates the influence of provincial-level COVID-19 positive cases, specifically in Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan, on the performance of the Pakistan Stock Exchange (PSX). The main objective of this research is to examine how regional pandemic dynamics shaped the market behaviour of the KSE 100 Index, while also assessing the impact of its lagged performance on current market trends. To achieve this, the study applies Principal Component Analysis (PCA) to identify common patterns in provincial COVID-19 case data and employs regression analysis to evaluate their combined effect on the PSX index. The results reveal that the first principal component (PC1) explains 96.03 % of the variance in COVID-19 positive cases and significantly influences the KSE 100 Index. Moreover, the lagged value of the KSE 100 Index emerges as a strong predictor of its current performance, confirming the presence of market momentum effects during the pandemic period. The findings underscore that both pandemic-related variables and past market performance play a vital role in shaping investor expectations and market dynamics. This research concludes that regional health shocks, policy interventions, and investor sentiment collectively drive short-term fluctuations in stock market performance. The study contributes to a deeper understanding of how province-level pandemic data can enhance forecasting models and inform strategic investment decisions in emerging markets.

Keywords: COVID-19, Pakistan Stock Exchange, Principal Component Analysis, KSE 100 Index, Provincial Cases

Paper ID: ICETEMS-25-035

ANALYZING THE INFLUENCE OF FREE CASH FLOW ON FIRM PROFITABILITY: EVIDENCE FROM THE SUGAR INDUSTRY, PAKISTAN

Shah E Yar Qadeem

Qurtaba University of Science & Information Technology, Peshawar

Email: shaheyar605@gmail.com

Cash flow management is a crucial issue that is at the heart of any organization. An organization must closely monitor free cash flows (FCF) to profitability is not affected negatively in any way. They sought to establish the effect of free cash flows on the profitability of listed firms at the Pakistan Stock Exchange (PSX). The study was based on free cash flows theory, modern portfolio theory, and pecking order theory. The target population was 35 listed companies in Sugar Industry out of which 12 firms were selected as a sample on random based sampling technique. The research used secondary data sources. Secondary data was sourced from audited financial statements of the listed firms for a period of five years (2020–2024). Data that was used in the study included detailed Income statements, Cash flow statements, and their Financial position as a whole as reflected in the Annual Financial Statement. The panel data was entered into STATA version 16. Descriptive statistics were being used in the analysis of panel data as well as the correlation and regression analysis. The study established that that free cash flows had a statistically significant effect on the profitability of listed non-financial firms of the Sugar Industry of Pakistan. The study recommends the management of listed firms to take issues of free cash flows seriously by practicing better free cash flows management. The management should identify investment projects where excess free cash flows can be invested to improve the profitability of the listed firms in Pakistan.

Keywords: Free Cash Flow, Firm Profitability, Sugar Industry, Pakistan Stock Exchange

Paper ID: ICETEMS-25-040

EMPIRICAL ASSESSMENT OF DIGITAL BOTTLENECKS AND RETAIL EXCLUSION IN PAKISTAN'S CAPITAL MARKETS

Muhammad Raheem Baig

Qurtaba University of Science & Information Technology, Peshawar

Email: mraheembaig@gmail.com

This paper examines the barriers that prevent retail investors from actively participating in Pakistan's capital markets, focusing on the Pakistan Stock Exchange (PSX) and the Pakistan Mercantile Exchange (PMEX). This study adopts a mixed-methods approach, blending quantitative comparisons with economies like India, Bangladesh, Malaysia, China, and the United States with a qualitative review of Pakistan's financial policies and regulatory landscape. The analysis reveals that while the existing market framework is sound, it is slowed by outdated technology and fragmented operational procedures. The absence of a unified e-Know Your Customer (e-KYC) system, repetitive account-opening requirements, inconsistent taxation policies, and a lack of widespread investor education continue to hinder progress. By comparison, markets that have adopted centralized KYC processes, faster T+1 settlement systems, and fintech integration have seen far greater participation and liquidity. Building on these lessons, the study proposes a practical roadmap for Pakistan's market modernization. This includes introducing a streamlined e-KYC framework, expanding fintech enabled trading platforms, and ensuring better coordination among regulatory bodies. These steps, taken together, could make the capital market more transparent, inclusive, and accessible. In essence, this research highlights how digital readiness and regulatory alignment can reshape investor confidence and participation, offering concrete guidance for policymakers and financial institutions aiming to bring Pakistan's capital markets in line with global standards.

Keywords: Capital markets, financial inclusion, digitization, e-KYC, Pakistan Stock Exchange, retail investors, financial development

Paper ID: ICETEMS-25-042

AN OVERVIEW OF SUSTAINABILITY PERFORMANCE IN AIR INDIA & EMIRATES AIRLINE: EVIDENCE FROM THE AIRLINE INDUSTRY

Omer Younas

City University of Science & Information Technology, Peshawar

Email: omer.younas@cusit.edu.pk

This study has compared the sustainability performance of Air India and Emirates Airlines by analyzing the corporate reports of both airlines from 2014 to 2024 with the help of manual content analysis. The level of sustainability practices in both airlines is also investigated from the perspectives of the Sustainability Phase Model (Benn et al., 2006) & UN Sustainable Development Goals (UNSDGs). The study results highlight that both airlines largely focus on the environmental aspect of sustainability, as most of the sustainability practices adopted by both airlines represent the environmental aspects of the UNSDGs. Furthermore, Emirates Airlines lies in the fifth (proactive) phase, while Air India occupies the third (compliance) phase in the Sustainability Phase Model. This means that Emirates Airlines has adopted a proactive approach towards sustainability, whereas Air India merely complies with the legal requirements of sustainability to avoid potential legislation and strong community action. Therefore, Air India needs to further improve and enhance the extent of its sustainability practices to uplift its position in the Sustainability Phase Model. Additionally, both Airlines must generalize their sustainability approach rather than focusing too narrowly on the environmental aspect of sustainability. This can be achieved by adopting all seventeen UN Sustainable Development Goals (UNSDGs) and incorporating the Triple Bottom Line (TBL) Model of sustainability into the CSR policies of both airlines. Since both the UNSDGs and the TBL model cover the social, environmental, and economic aspects of sustainability, it is necessary to adequately integrate a balanced and wide spectrum of sustainable practices into the sustainability policies of the airline industry.

Keywords: CSR; Sustainability; Airline Industry; UNSDGs; Triple Bottom Line Model

Paper ID: ICETEMS-25-045

GREEN MARKETING: A STUDY OF CONSUMER PERCEPTION AND PREFERENCES, A CASE STUDY OF KPK, PAKISTAN

Muhammad Omer Farooq Khan

Qurtaba University of Science & Information Technology, Peshawar

Email: muhammadomer.k@gmail.com

In today's world the Consumers are mostly concerned about environmental pollution. The consumers also concerned about the negative impact of environmental pollution and degradation. For the reduction of environmental degradation most of the businesses use green marketing. Green Marketing is the opportunity to reduce the environmental pollutions. Green Marketing provides a competitive advantage to the companies and they can make strong consumer base. Objectives of the study are to investigate the awareness and understanding of green marketing concepts among consumers and businesses in KP, to identify the factors influencing consumer attitudes and behaviors towards eco-friendly products and services in KP, and to determine the effectiveness of green marketing strategies in influencing consumer behavior and purchasing decision in KP. A total of 100 individuals were selected to participate in this study. The sample size was determined based on the need to gather a representative group of consumers to assess their attitudes towards eco-friendly products. Our results show that that overall perception regarding the green marking is one of the main factors behind green marketing. Our results are significant at the 5 percent level regarding perception of the green marketing. Therefore, perception about green marketing needs to be developed and encouraged among individuals. Similarly, we also found that experience is positively and significantly correlated with green marketing. It means that green marketing is positively dependent on the experience level of the consumers in the KPK region. Further, we found that gender is also an important variable as far as the green marketing is concerned in KPK.

Keywords: Green Marketing, Price, Academic, Consumer behavior, Awareness of green marketing.

Paper ID: ICETEMS-25-048

IMPACT OF CORPORATE SOCIAL RESPONSBILITY AND FINANCIAL PERFORMANCE. (A CASE STUDY OF ISLAMIC BANKS IN PAKISTAN)

Abbas Ahmad

Qurtaba University of Science & Information Technology, Peshawar

Email: abbas111rose@gmail.com

This research paper clarifies corporate social responsibility (CSR) and its shared connection among CSR and corporate profitability. This thesis incorporates literature review which laid foundation of (corporate social responsibilities) CSR. The thesis is a short time later investigate the connection between financial Performance and CSR as clarify by the similar boundaries. Return on Assets was used as a proxy for performance while corporate social responsibility and firm size were used as independent variables. Data was collected from annual reports from 2019 to 2024 for 6 years. Panel diagnostic test was used to identify the data and pooled OLS was used to test hypotheses. Results shows that both independent variables were found significant towards performance.

Keywords: Corporate Social Responsibility, Return on Assets, Firm Size, Islamic Banks

Paper ID: ICETEMS-25-052

LEVERAGING BAYESIAN BELIEF NETWORKS TO MODEL DIGITAL TRANSFORMATION AND PROJECT SUCCESS INTERDEPENDENCIES

Abroon Qazi

American University of Sharjah

Email: aeroactuary@gmail.com

Digital Transformation (DT) is reshaping project management through advanced technologies, data-driven decision-making, and new forms of collaboration. Although its strategic potential is widely recognized, the interconnections among DT enablers, challenges, competencies, and project success are not yet fully understood. This study investigates the multifaceted impact of DT on project outcomes using a probabilistic modeling approach that captures complex relationships among these factors. Data were collected from 501 project professionals across the United Kingdom, representing diverse industries and organizational contexts. Supported by the Association for Project Management, the survey explored practitioners' perceptions of digital adoption, skill requirements, and success factors. It assessed the benefits of DT for communication and efficiency, challenges related to knowledge gaps and technological reliance, and key success dimensions such as quality, timeliness, stakeholder satisfaction, and sustainability. Digital and managerial skills play a central role in strengthening the link between DT implementation and project performance. Competencies in data interpretation, agile adaptation, sustainability, and continuous learning are particularly influential in maximizing DT benefits. This research advances understanding of DT in project management by introducing a probabilistic perspective that captures nonlinear and interdependent dynamics. The results provide both theoretical and practical insights, emphasizing the need to align technological innovation with human capability development and adaptive management practices to achieve sustainable project success.

Keywords: Digital Transformation, Project Management, Bayesian Belief Networks, Data-Driven Decision Making.

Paper ID: ICETEMS-25-073

EFFECT OF DESPOTIC LEADERSHIP ON WORKPLACE INCIVILITY: THE MEDIATING EFFECT OF EMOTIONAL EXHAUSTION AND POWER DISTANCE AS A MODERATOR IN HIGHER EDUCATIONAL INTUITIONS OF AZAD KASHMIR.

Adeeba Khan

University of Poonch, Rawalakot, Azad Kashmir

Email: universityuni97@gmail.com

The current research examined the effects of despotic leadership on workplace incivility, with emotional exhaustion serving as a mediator and power distance as a moderator variable in higher education institutions within Azad Kashmir. A sample of 400 faculty members was administered a structured survey questionnaire. The data was analyzed through sophisticated statistical techniques, including structural equation modeling, to assess the relationships in the hypotheses. Findings from the study indicated that despotic leadership directly increased workplace incivility and demonstrated that authoritarian, self-serving leader behaviors led to disrespect, rudeness, and low quality of interactions among employees. Furthermore, the results show that emotional exhaustion fully mediated the relationship, which indicates that despotic leaders draw on the employees psychological resources, creating an environment that leads to uncivil behaviors. Significant moderating findings for power distance showed that the relationship strengthened among employees with high power distance orientation. All five hypotheses were accepted, emphasizing the important need to respond to destructive leadership within higher education settings. This study contributes to the leadership and organizational behavior literature by incorporating emotional and cultural mechanisms and provides practical implications for higher education administrators and policymakers through calls for ethical work leadership practices as a means to reduce toxic behaviors and to promote a healthier academic workplace.

Keywords: Despotic Leadership, workplace incivility, emotional exhaustion, power distance

Paper ID: ICETEMS-25-074

ASSESSING INSTITUTIONAL READINESS AND CRITICAL SUCCESS FACTORS FOR DIGITAL TRANSFORMATION THROUGH SAP-ERP IMPLEMENTATION IN UNIVERSITIES

Asmaa Mudassir

City University of Science & Information Technology, Peshawar

Email: asmaa.mudassir@gmail.com

Digital transformation has become crucial for those higher education institutions that are looking for the enhancement of operational efficiency, strengthening of governance, and to be responsive to the increasing expectations from students, regulators, and stakeholders. In Pakistan, the universities are adopting Enterprise Resource Planning (ERP) system especially Systems Applications & Products (SAP) solutions via support of the Higher Education Commission that has started initiative of digital transformation to improve integration across academic and administrative functions. The study further explores the effect of ERP partner support throughout the implementation phase. A mixed methods approach is used that includes a structured survey distributed among administrative and academic staff directly involved in ERP implementation processes, along with semi-structured interviews with key position holders of the ERP system. Quantitative data is analyzed through descriptive statistics, and regression-based mediation tests, while qualitative data were analyzed using thematic analysis. The findings reveal that institutional readiness in terms of top management support, IT infrastructure, digital literacy and user training, organizational culture, and project management has significant impact on digital transformation success. The study contributes to the understanding of ERP adoption in the universities during implementation phase and offers practical recommendations for policymakers, university administrations, and implementation teams. This study also highlights areas that require longitudinal investigation of post implementation adoption and sustainability of the ERP systems.

Keywords: Enterprise Resource Planning (ERP), Systems Applications Products (SAP), Digital Transformation, Organizational Readiness, Critical Success Factors, Perceived Organizational Support, Higher Education Commission (HEC).

Paper ID: ICETEMS-25-075

THE IMPACT OF FINANCIAL LITERACY ON FINANCIAL INCLUSION

Ayesha Sadeeqa

City University of Science & Information Technology, Peshawar

Email: ayeshasadeeqa711@gmail.com

This research examines the role of financial literacy in the financial inclusion process of developing countries, which are characterized by the presence of a large unbanked or underbanked population. The study is based on the theories of financial capability and inclusive finance and investigates the relation between financial knowledge, digital financial literacy, and financial skills on the one hand and the overall usage and access of individuals to the formal financial services on the other. A quantitative cross-sectional approach was applied, where a structured questionnaire was administered via purposive sampling. Data collection was completed with 300 adults from chosen areas, and high ethical standards were observed throughout the process. The collected data were analyzed by the use of Structural Equation Modeling (SEM-PLS), which was done to assess the measurement and structural relationships. It was found that enhanced financial literacy leads to a higher degree of financial inclusion, and digital financial literacy is a dominant factor in the financial areas that are taking advantage of technology. The results of the study emphasize the need for the combination of various measures to encourage the economic participation of all, such as the provision of financial education, the establishment of supportive regulatory frameworks that are supportive, and the upgrading of the digital financial infrastructure to the required level. The study, although facing certain limitations related to the nature of the data (self-reported), sampling constraints, and differences between financial systems, still offers important empirical insights for policymakers, financial institutions, and development organizations that are advocates of financial inclusion and resilience enhancement in the less developed economies.

Keywords: Financial Literacy, Digital Financial Literacy, Financial Education, Financial Inclusion, Financial Knowledge, Financial Skills, Developing Economies

Paper ID: ICETEMS-25-076

IMPACT OF GREEN HRM ON ORGANIZATION PERFORMANCE

Bibi Savaira

City University of Science & Information Technology, Peshawar

Email: savairaawkum6@gmail.com

This study mainly intends to investigate the degree to which Green Human Resource Management (GHRM) affects organizational performance and the resulting impact on the environment, economy, and society. The introduction sets the basic terms for the research and outlines the problem, objectives, significance, and questions which all revolve around the soon future of HR sustainable practices. A complete literature review is the focus of chapter two, which deals with GHRM traits, theoretical models, employee involvement, corporate culture, and previous empirical results. The third chapter outlines the research method which incorporates a mixed-methods explanatory sequential design. The sample selection for the quantitative survey was 300-350 and the data from these were analyzed through PLS-SEM, while 15-20 in-depth interviews were conducted to investigate GHRM implementation processes, challenges, and contextual factors. The sampling technique was purposive to guarantee that only those organizations with the required characteristics would be included, and the use of validated measurement instruments was along with assessments of reliability and validity. The discussion includes ethical issues, data quality assurance, and limitations of research. The results show a mix of statistical correlations and qualitative perceptions, leading to a deep understanding of the influence of GHRM on performance. Thus, the study not only contributes to the theory-building but also to the organizational and sustainable HRM policy development.

Keywords: Green Human Resource Management (GHRM), Organizational Performance, Environmental Performance, Economic Performance, Social Performance, Sustainable HRM

Paper ID: ICETEMS-25-098

IMPACT OF CAPITAL STRUCTURE ON THE FIRM FINANCIAL PERFORMANCE (A STUDY OF PAKISTAN FOOD AND BEVERAGES MANUFACTURING SECTOR)

Ayesha Malik

City University of Science & Information Technology, Peshawar

Email: am2083298@gmail.com

The purpose of this research is to provide evidence on the Impact of Capital Structure on the firm financial performance of food and beverage manufacturing sector companies in Pakistan categorized under large tax payer in Pakistan. The study applied explanatory research design and panel data regression analysis. In order to answer the research question, secondary data was collected from the sample of thirteen large tax payer food and beverage manufacturing companies covering Six years period (2019-2024). In the present study, to examine the effect of capital structure variables with two financial performance measuring variables (ROA and ROE) and long term debt and short term debt as a capital structure variables and also growth, firm size, asset tangibility from firm specific and inflation from macroeconomic factors are included as a control variable. E-Views software package is used to make regression analysis. The finding from capital structure variables indicates: long term debt has a significant negative effect on financial performance of FBMCs but short term debt has insignificant positive effect, and from control variables growth and firm size has a significant positive relation, asset tangibility has also a significant but negative effect. However, inflation rate has no significant effect on financial performance of Pakistani Food and Beverage Manufacturing Companies (FBMCs). Finally, the researcher makes recommendations for financial managers to do not use excessive amount of debt in their capital structure and to finance their projects with retained earnings first and take long term debt as a last option.

Keywords: Capital Structure, Return on Asset, Return on Equity, Long Term Debt, Short Term Debt

Paper ID: ICETEMS-25-044

WITHDRAWAL OF NATO FROM AFGHANISTAN: SOCIOECONOMIC MANAGEMENT AND POLITICAL IMPLICATIONS

Dr. Abdullah Tariq

Qurtaba University of Science & Information Technology, Peshawar

Email: dr.abdullahtariq@qurtuba.edu.pk

The political, diplomatic, economic, security, and developmental fabric of Afghanistan and the surrounding regions will be significantly and permanently altered by the US, NATO, and ISAF's exit. Some of these implications are investigated in this work. With emphasis on its transition, current deadlock, and potential outcomes, an attempt has been made to identify and analyses Afghanistan's political, diplomatic, economic, and security difficulties. In the context of Afghanistan's historical perspective, which led to the current situation, the study assesses the impact of the U.S. The study also examines Afghan variables while suggesting potential outcomes. Strategic uncertainty can be used to describe the current and emerging global strategic environment. Despite the ongoing worldwide recession brought on by the "Corona Pandemic," Pakistan's economy remains steady compared to other countries in the region. This paper is based on the assumption that the regional scenario in the post-US withdrawal from Afghanistan will include governance, power structure, and power balance while highlighting the role of regional actors, peace prospects, security, and economic concerns. The study also identifies potential obstacles for Afghanistan as well as regional power struggles and regional interests in the context of a post-US withdrawal from Afghanistan and the creation of workable regional peace and consensus. The paper also identifies steps that the Afghan government, the Taliban, the US, the Russian Federation, China, the CARs, Pakistan, Iran, and India can do to reach a peace settlement agreement.

Keywords: Key words: NATO, Taliban, Islamization, geopolitics, Muslim Umaa, CPEC

Paper ID: ICETEMS-25-105

THE IMPACT OF KNOWLEDGE SHARING ON ORGANIZATIONAL INNOVATION PERFORMACE

Omama Idrees

City University of Science & Information Technology, Peshawar

Email: omamakhan460@gmail.com

This study explores the relationship between tacit and explicit knowledge sharing, absorptive capacity, and individual creativity in relation to the performance of innovation in knowledge intensive organizations. It discusses the role played by each of the factors in innovation and gives a better insight into the key determinants of innovation performance. The quantitative approach was employed and the data was gathered in the form of a structured survey of 160 academic personnel in an institution of higher learning. The questionnaire contained validated Likert scale items, and Data analysis was performed with the help of the SPSS which transited to descriptive and correlational analysis to multiple regression analysis which would test the effect of the factors on the performance of innovation. The findings indicate that knowledge sharing in its own right produces a very insignificant impact on innovation. There is no significant effect of explicit knowledge sharing and slight negative effect with tacit knowledge sharing. But, individual creativity and absorptive capacity are strongly positive related to the performance of innovation. These results mean that mere presence of knowledge did not produce innovation unless there was ability to absorb and put it in practice and they are also motivated to come up with new ideas in the organization. On the whole, the research paper points out that innovation relies more on the internal resources and creative activities than on knowledge sharing alone. It implies that companies ought to concentrate on building learning ability and facilitating creativity as opposed to solely the reliance on the practice of knowledge sharing to enhance the level of innovation.

Keywords: Knowledge sharing, Absorptive capacity, individual creativity, innovation performance

Paper ID: ICETEMS-25-109

ROLE OF AUDIT COMMITTEE IN REDUCING FRAUD

Ayesha Aqeel

City University of Science & Information Technology, Peshawar

Email: ashh.shakhan@gmail.com

This study synthesizes the latest 2025 research to examine how audit committees contribute to reducing financial-statement fraud in modern organizations. The aim is to integrate evidence on audit-committee independence, expertise, composition, and interaction with internal governance systems to better understand their effectiveness in fraud prevention and detection. Using a qualitative systematic-review approach, the study analyses five recent peer-reviewed papers that employ methods such as empirical regression analysis, comparative governance evaluation, and conceptual review frameworks across different contexts, including Malaysia, Indonesia, and public companies more broadly. A comprehensive 2025 review supports these results by demonstrating that frequent committee meetings, transparent communication with auditors, and committee autonomy are reliable predictors of improved fraud prevention. These findings imply that organizations should strengthen audit-committee structures through independence requirements, enhanced training, and integrated reporting mechanisms, while policymakers can use this evidence to refine corporate-governance guidelines and fraud-risk regulations. The originality of this synthesis lies in its focus on newly published 2025 studies, offering a contemporary and cross-context understanding of audit-committee effectiveness that reflects post-pandemic governance challenges, emerging fraud schemes, and evolving oversight responsibilities. By combining the most recent evidence, the study contributes a modern perspective on how audit committees shape financial transparency, accountability, and organizational integrity.

Keywords: Audit committees; Financial-statement fraud; Corporate governance; Independence; Financial expertise; Fraud detection; Internal controls.

Paper ID: ICETEMS-25-114

FINANCIAL LITERACY AND PERSONAL INVESTMENT DECISIONS

Zainab Usman

City University of Science & Information Technology, Peshawar

Email: zainabakhunzada13@gmail.com

Financial literacy has become an essential component of personal financial well-being, particularly in developing economies such as Pakistan where individuals increasingly face complex financial choices. Despite the rapid emergence of digital banking and accessible investment platforms, a large portion of young adults still lacks sufficient financial knowledge to make sound investment decisions. This study aims to examine the extent to which financial literacy influences personal investment decisions among young Pakistani adults, focusing on their understanding of financial concepts, budgeting skills, saving behaviour, and risk perception. A quantitative research design was employed to explore this relationship. Data were collected through a structured questionnaire based on a five-point Likert scale, distributed to a sample of 150–250 university students and early-career individuals aged 18–30. Demographic factors such as income, educational background, and gender were also found to influence the strength of this relationship. These results carry important implications for policymakers, educators, and financial institutions. The study emphasizes the need for targeted financial education programs, university-level financial literacy modules, and awareness initiatives that can support young adults in developing informed and responsible investment habits. The originality of this research lies in its focus on young Pakistani investors, a group that remains underrepresented in existing literature, and contributes fresh empirical insights into how financial literacy shapes investment behaviour in an emerging financial landscape.

Keywords: Financial Literacy, Personal Investment Decisions, Investment Behavior, Young Adults, Risk Perception, Saving Behavior, Budgeting Skills, Financial Education, Pakistan, Financial Decision-Making

Paper ID: ICETEMS-25-124

THE IMPACT OF ISLAMIC BANKING GROWTH ON CREDIT AVAILABILITY FOR SMALL BUSINESSES

Fakhr Abbas

City University of Science & Information Technology, Peshawar

Email: fakhrabbas70@gmail.com

This study aims to meticulously examine the impact of the rapid expansion of Islamic banking institutions on credit availability, specifically targeting Small and Medium Enterprises (SMEs). The methodology employed utilizes a quantitative, panel data approach, drawing upon ten years (2014–2023) of secondary data covering 50 major Islamic banks across eight predominantly Muslim countries with dual banking systems. The core analytical approach involves estimating a fixed-effects regression model that links Islamic banking asset growth and market share to aggregate data on Murabaha, Ijarah, and Musharakah financing allocations to the SME sector. The primary findings reveal a complex pattern: while overall Islamic banking growth significantly increases the total volume of credit disbursed, this effect is overwhelmingly driven by asset-backed, short-term modes like Murabaha and Ijarah. Conversely, the growth of true risk-sharing modes, such as Musharakah, shows no statistically significant or substantial correlation with increasing SME credit access, suggesting a continuing gap between the ethical mandate and operational reality. These results have crucial implications for policymakers, urging them to develop regulatory frameworks that incentivize higher utilization of profit-and-loss sharing contracts over debt-based instruments. For Islamic banks, the findings highlight a need to innovate financial products that balance Shariah compliance, risk management, and the long-term capital needs of small business owners. This research contributes original value by moving beyond generic growth indicators to empirically disaggregate the specific impact of different Islamic financing modes on a financially marginalized segment, offering a nuanced and actionable view of Islamic finance's role in inclusive economic development.

Keywords: The Impact of Islamic Banking Growth on Credit Availability for Small Businesses

Paper ID: ICETEMS-25-127

ANALYSIS OF SYSTEMIC LOOPHOLES IN INTERNATIONAL LAW

Masal Khan

City University of Science & Information Technology, Peshawar

Email: masal39703@gmail.com

This study aims to explore how loopholes appear and are used in international law. It investigates how unclear wording, weak enforcement, and different rules across countries create gaps that can be exploited. The research examines specific cases including chemical weapons conventions, plastic waste trading, and private military companies to understand how these vulnerabilities operate in practice across different legal domains. The research employs multiple methodological approaches to comprehensively analyze legal loopholes. These include detailed treaty analysis and historical examination of legal documents to trace the development of ambiguous provisions. The study incorporates comparative analysis of national regulations across different countries to identify regulatory disparities. Additionally, advanced technological methods including artificial intelligence and computational modeling are used to simulate legal scenarios and identify potential vulnerabilities that might be overlooked through traditional analysis. Greater international cooperation is needed to harmonize regulations across countries and reduce regulatory disparities. The research also indicates that technology, particularly AI systems, should be proactively employed to identify potential vulnerabilities during the treaty-drafting process rather than after exploitation occurs. This research provides original insights by combining traditional legal analysis with contemporary technological approaches to demonstrate the systematic nature of loopholes in international law. The study breaks new ground by showing how vulnerabilities operate similarly across different legal domains, suggesting common structural weaknesses in international legal frameworks. The application of computational methods to identify and predict loopholes represents a significant advancement in legal scholarship, offering new possibilities for creating more robust and resilient international legal in strum.

Keywords: International law, weak enforcements

Paper ID: ICETEMS-25-128

THE VALUE OF TRANSPARENCY: HOW ESG DISCLOSURE AND COMPETITIVE ADVANTAGE DRIVE FIRM PERFORMANCE IN MALAYSIA

Umar Nawaz

City University of Science & Information Technology, Peshawar

Email: umarnawaz1236@gmail.com

This study explores how transparency through Environmental, Social, and Governance (ESG) disclosure helps companies improve their overall performance, especially in today's fast-changing global business environment. ESG has become extremely important as customers, investors, and governments now expect companies to operate responsibly, show honest reporting, and take strong actions against climate change. This research focuses on understanding whether ESG disclosure continues to have a strong positive effect on firm performance in Malaysia and across the world during 2025–2026, a period when ESG reporting is becoming more common and more regulated. To achieve this, the study proposes using modern data-collection methods. Instead of depending only on older sources such as Bloomberg ESG scores up to 2017, researchers would apply Artificial Intelligence (AI) tools to examine recent company reports from 2024 and 2025. Environmental disclosure, in particular, is likely to be the most influential factor because of global pressure to manage climate risks. Companies that use AI for accurate and transparent reporting may also perform better due to increased credibility. On the other hand, firms that only pretend to be sustainable ("greenwashing") may face negative reactions from the market. The study carries important implications. It suggests that governments and international organizations should work toward creating a unified global ESG reporting standard. It also highlights the need to support SMEs so they can comply with new sustainability demands. For businesses, the study sends a clear message: strong ESG practices are no longer optional but essential for long-term growth, investor confidence, and competitiveness. Overall, the study provides fresh and original insights into how ESG functions in a world shaped by digital transformation and climate challenges.

Keywords: this is my article not presented only submitted

Paper ID: ICETEMS-25-130

THE FUTURE OF DIGITAL PAYMENTS: HOW FINTECH IS TRANSFORMING FINANCIAL SERVICES

Masal Khan

City University of Science & Information Technology, Peshawar

Email: masal39703@gmail.com

This study examines the rapid transformation of financial services through financial technology (FinTech). It aims to analyze how digital payment systems, including mobile wallets, real-time platforms, and blockchain technology, are reshaping how money is managed and transferred worldwide, with a focus on accessibility, security, and efficiency. The research uses a structured approach, combining data analysis of payment trends with case studies of systems like India's Unified Payments Interface (UPI) and digital wallets in Africa. Reports from financial institutions and interviews with industry experts help evaluate the role of technologies such as blockchain and Central Bank Digital Currencies (CBDCs). FinTech is significantly expanding access to financial services, especially in underserved regions, through affordable and mobile-based solutions. Real-time and contactless payments are becoming standard, improving convenience and reducing costs. However, this growth brings challenges: cybersecurity threats, fraud, and data privacy concerns are rising. Technologies like biometrics and AI-driven security are being deployed in response. Blockchain and CBDCs offer potential for safer and faster transactions but require careful regulation. The ongoing shift toward digital payments calls for updated regulations to ensure security and fair access. Financial institutions must innovate to stay relevant, while governments should invest in digital infrastructure and consumer education. Collaboration between banks, FinTech companies, and regulators will be essential to build secure and inclusive financial systems. This study provides an integrated view of the digital payments landscape, linking technology, policy, and user adoption.

Keywords: Fintech, Central bank digital currencies,

Paper ID: ICETEMS-25-131

MAPPING THE FUTURE: A BIBLIOMETRIC ANALYSIS OF ISLAMIC FINANCE AND FINANCIAL TECHNOLOGY TRENDS

Muneeb Ahmad

City University of Science & Information Technology, Peshawar

Email: muneebahm099@gmail.com

This study conducts a comprehensive bibliometric review of 918 articles published between 1999 and 2022 to explore the evolving relationship between Islamic finance and financial technology (fintech). Using data from the Web of Science database and analytical tools like VOSviewer, the research identifies key trends, influential authors, leading institutions, and emerging themes in this interdisciplinary field. The analysis reveals four major research clusters: financial inclusion and corporate governance in Islamic fintech; the role of information technology in future Islamic financial services; the transformation of Islamic banking through fintech; and the growth of Islamic finance in the digital age. The findings highlight the increasing academic and practical interest in integrating Shariah-compliant principles with technological innovations, offering valuable insights for researchers, policymakers, and industry practitioners. The transformation of Islamic banking through fintech. Islamic finance as a growing force in the digital age. Notably, topics like blockchain, artificial intelligence, and mobile banking are gaining traction, reflecting the sector's shift toward digitalization and innovation. For researchers, the study highlights gaps in areas such as ethical AI, cybersecurity, and the socio-economic impacts of fintech adoption in Muslim-majority economies. Originality: This study offers a novel, large-scale bibliometric review that systematically maps the convergence of Islamic finance and fintech over two decades. By integrating cluster analysis, network visualization, and trend forecasting, it provides a holistic and forward-looking perspective that distinguishes it from existing literature reviews. The research not only catalogues past developments but also charts future trajectories, making it a foundational resource for academic and professional advancement in the field.

Paper ID: ICETEMS-25-133

DEPRECIATION

Sher Afghan

City University of Science & Information Technology, Peshawar

Email: sherafghan115137@gmail.com

Abstract: This article, "Depreciation" by H. W. Wilmot, C.P.A., published in the Journal of Accountancy in December 1909, serves as a discussion and critique of a paper on the same subject presented by Mr. Stockwell to the American Association of Public Accountants. Wilmont systematically reviews the concept of depreciation across three main divisions: Legal Requirements, Various Theories, and Practical Difficulties. Regarding Legal Requirements, the author notes that state enactments concerning the responsibility of directors to provide for the expiration of values are often ambiguous, stating that "Accountants evidently had no hand in drafting these laws." While some states prohibit reducing stock below par value through dividends, the laws generally fail to mandate the maintenance of capital assets through depreciation charges. Under Various Theories, Wilmont aligns with the view that formal depreciation charges are simply a question of what constitutes the true cost of operation, arguing that the loss of capital assets is an inescapable working expense. He distinguishes between "wear and tear" and "depreciation". He also critiques the common practice of treating sinking fund installments as a substitute for depreciation, arguing that the two provisions can only be partially merged to the extent that accrued maintenance represents a perpetual condition. The author stresses the need for detailed records, cooperation between accountants and engineers, and the establishment of the economic life of plants. Wilmont strongly advises accountants to develop a faculty for business investigation through physical inspection of assets. He concludes by questioning whether "scientific appraising" should fall within the scope of public accountancy, asserting that while the profession is expanding, it should avoid taking on duties not incident to or consistent with its legitimate boundaries.

Keywords: a reduction in the value of an asset over time, due in particular to wear and tear.

Paper ID: ICETEMS-25-134

THE ROLE OF ARTIFICIAL INTELLIGENCE IN STRATEGIC FINANCIAL & BUSINESS DECISION-MAKING: A SYNTHESIS OF CONTEMPORARY INSIGHTS

Salman Khan

City University of Science & Information Technology, Peshawar

Email: salloking74@gmail.com

This paper synthesizes recent research on how Artificial Intelligence (AI) influences decision-making in financial and entrepreneurial business contexts. Drawing on studies spanning financial decision-making, credit scoring, investment management, fraud detection, and strategic business decisions assisted by AI, the analysis highlights both the enhanced predictive accuracy, efficiency, and risk-management benefits, as well as the continued need for human judgment, particularly under uncertainty. This paper contributes to the literature and discourse in several original ways: It integrates insights from both traditional AI applications in finance (investment, credit scoring, trading, risk, fraud detection) and newer developments in generative AI applied to strategic business decisions. It highlights the dual-nature of AI's impact, not only enhanced analytics and efficiency, but also renewed emphasis on human judgment and ethical governance offering a balanced view rather than a purely optimistic or pessimistic narrative. By synthesizing across domains (finance, entrepreneurship, SME strategy), it suggests a unified framework for understanding AI's role as a decision-support tool across diverse contexts, which can aid policymakers, institutions, and business managers in holistic planning. It points toward future research gaps (longitudinal studies, cross-sector comparisons, human-AI collaboration effectiveness, governance frameworks), helping guide future academic work in this evolving field.

Keywords: Role of AI in business decisions

Paper ID: ICETEMS-25-135

FINANCIAL & BUSINESS DECISION-MAKING: A SYNTHESIS OF CONTEMPORARY THE ROLE OF ARTIFICIAL INTELLIGENCE IN STRATEGIC INSIGHTS

Salman Khan

City University of Science & Information Technology, Peshawar

Email: salloking74@gmail.com

This paper synthesizes recent research on how Artificial Intelligence (AI) influences decision-making in financial and entrepreneurial business contexts. Drawing on studies spanning financial decision-making, credit scoring, investment management, fraud detection, and strategic business decisions assisted by AI, the analysis highlights both the enhanced predictive accuracy, efficiency, and risk-management benefits, as well as the continued need for human judgment, particularly under uncertainty. The findings suggest that while AI substantially improves decision speed and data-driven precision, optimal outcomes are often achieved when AI-driven analytics are complemented by human experience and oversight. The paper discusses implications for financial institutions, entrepreneurs, and regulators, and argues for balanced integration of AI that combines technological capabilities with ethical, transparent, and human-centered governance. Aim of the Study to examine how AI is being used across financial decision-making: including investment strategies, credit scoring, risk assessment, fraud detection, algorithmic trading. For Financial Institutions and Businesses: Adopting AI can significantly improve efficiency, decision-making quality, risk management, and inclusion, but institutions must balance AI-driven automation with human oversight, especially for critical decisions involving uncertainty or high stakes. For Entrepreneurs & SMEs: Use of AI/GAI can strengthen strategic decision-making, innovation, operational efficiency, and responsiveness to volatile markets, offering a competitive edge when properly managed. By synthesizing across domains (finance, entrepreneurship, SME strategy), it suggests a unified framework for understanding AI's role as a decision-support tool across diverse contexts, which can aid policymakers, institutions, and business managers in holistic planning.

Keywords: AI role in decision making

Paper ID: ICETEMS-25-137

IMPACT OF DIGITAL BANKING ON CUSTOMER SATISFACTION IN PAKISTAN BANKING SECTOR

Muhammad Hasnain

City University of Science & Information Technology, Peshawar

Email: hasnainsafi1155@gmail.com

Impact of digital banking on customer satisfaction in Pakistan banking sector. The paper seeks to evaluate how three key forces, globalization, adoption of Artificial Intelligence (AI) in banking (AIA), and integration of FinTech solutions (FI), jointly affect the financial performance of banks and customer satisfaction in Pakistan's banking sector in the aftermath of COVID-19. It aims to fill a critical gap: whereas much prior research looked at these factors separately, this study examines their combined impact, providing a holistic understanding of how global, technological and financial-technological shifts interact to shape banking outcomes in a developing economy. The authors used panel data regression analysis examining data from major Pakistani banks over 2010–2023. a Independent variables: Globalization Index (GI), AI Adoption Rate (AIA), FinTech Integration (FI). Statistical tests included descriptive statistics, normality tests, heteroscedasticity tests, and regression with t-statistics and p-values to test hypothesis significance. Results were evaluated via R^2 values to assess explanatory power of the models. All three factors, GI, AIA and FI, have significant and positive impacts on both banks' financial performance and customer satisfaction. Among them, FinTech Integration (FI) has the strongest effect, followed by AI adoption (AIA), then globalization (GI). The model explains a substantial portion of the variance: $R^2 = 0.648$ for financial performance, and $R^2 = 0.715$ for customer satisfaction. The study suggests that post-COVID, banks that aggressively adapt fintech and AI, while leveraging global linkages, are more likely to achieve financial resilience and higher customer satisfaction.

Paper ID: ICETEMS-25-138

LOOPHOLES IN INTERNATIONAL ECONOMIC AGREEMENT

Muhammad Anas

City University of Science & Information Technology, Peshawar

Email: muhammad.anas3002@gmail.com

The study aims to examine how weaknesses, gaps, and loopholes in international economic and trade agreements allow harmful practices, such as uncontrolled trade of plastic waste, to continue due to weak environmental clauses, poor enforcement, and inconsistent legal standards across countries. A qualitative legal and policy analysis approach is used, reviewing international economic agreements, trade treaties, and environmental conventions. The study compares how these frameworks address trade in goods and waste, identifies inconsistencies, and highlights areas where unclear definitions or poor enforcement create loopholes that states or companies can exploit. The findings show that many trade agreements lack binding environmental provisions, creating loopholes that allow harmful trade practices to continue. Ambiguous terms such as "plastic waste" and "recyclable goods" enable misclassification and manipulation of trade rules. Weak enforcement and minimal penalties further allow countries to bypass environmental restrictions. Additionally, economic agreements often prioritize trade liberalization over environmental obligations, while inconsistent regulations across countries let traders exploit weaker legal systems. Limited border-control requirements also permit illegal or mislabeled waste shipments to pass with little oversight. These issues highlight the need for stronger, enforceable environmental clauses in international agreements. Trade and environmental frameworks must be aligned to prevent countries from using economic treaties to avoid environmental duties. Clearer definitions, unified standards, and improved monitoring systems are essential. Stronger enforcement mechanisms are also necessary to ensure accountability and protect vulnerable countries from increased environmental burdens. The study highlights the disconnect between economic and environmental treaties and shows how legal gaps across these systems allow exploitation in international trade.

Paper ID: ICETEMS-25-139

FORENSIC ACCOUNTING IN FINANCIAL FRAUD DETECTION: TRENDS AND CHALLENGES

Muhammad Junaid

City University of Science & Information Technology, Peshawar

Email: junaidmuhammadzai32@gmail.com

The primary aim of this article is to examine the evolving role of forensic accounting in the detection, prevention, and investigation of financial fraud in contemporary business environments. Over the past decade, the complexity of fraudulent schemes has increased significantly due to globalization, technological expansion, and growing digital transaction volumes. As a result, the article aims to identify how forensic accounting practices have adapted to meet these emerging challenges. Another key objective is to analyze the current trends shaping the field, such as the integration of data analytics, artificial intelligence, and advanced investigative tools that strengthen fraud detection capabilities. The article also aims to highlight the practical significance of forensic accountants within organizations, regulatory bodies, and law-enforcement agencies. The article also provides valuable insights for practitioners by emphasizing the shift from reactive to proactive forensic accounting. Its discussion of preventive forensic strategies, continuous monitoring, and integration with risk management systems offers practical relevance for organizations aiming to strengthen their fraud defenses. For academic scholars, the article presents a foundation for further research on the evolving relationship between digital technologies and forensic investigation. It highlights gaps in existing knowledge, such as the need for standardized forensic accounting practices, updated regulatory frameworks, and cross-border fraud investigation strategies. Overall, the originality and value of the article lie in its multi-dimensional approach, forward-looking analysis, and applicability to diverse stakeholders, making it a useful contribution to both academic literature and professional practice.

Paper ID: ICETEMS-25-141

FINTECH AND THE TRANSFORMATION OF TRADITIONAL BANKING MODELS

Roman Khan

City University of Science & Information Technology, Peshawar

Email: ro4010847@gmail.com

The aim of this study is to examine how FinTech is transforming traditional banking models. It focuses on the evolution of digital integration, the impact of technological tools such as artificial intelligence, big data, blockchain, and API-based platforms, and the changing expectations of customers and regulators. The study also seeks to identify the challenges and opportunities banks face as they adapt to emerging financial technologies and ecosystem-driven service models. The study is based on a qualitative research approach. It employs a structured review of academic literature, professional reports, regulatory documents, and recent developments within the financial services sector. Conceptual and thematic analysis is used to explore patterns in digital transformation, shifts in IT-architecture, and the interaction between banks and FinTech firms. No primary data is collected; the study relies entirely on secondary sources to investigate current trends and strategic responses. The findings indicate that FinTech functions both as a catalyst and a disruptor. It enhances service efficiency, personalizes customer experience, and facilitates financial inclusion. Banks are moving from traditional operational models toward digital and open-banking frameworks, where data sharing, technological collaboration, and customer-centric innovation play central roles. Digitalization also brings new risks, including cybersecurity concerns, operational vulnerabilities, and increasing regulatory complexity. Regulators need to design flexible frameworks that support innovation while ensuring financial stability and consumer protection. This study contributes by presenting a clear and structured overview of how FinTech is reshaping banking models.

Paper ID: ICETEMS-25-142

THE EFFECT OF NON-INTEREST INCOME ON BANK PROFITABILITY AND RISK

Faisal Rahman

City University of Science & Information Technology, Peshawar

Email: rehmanfaisal483@gmail.com

This study aims to assess the impact of non-interest income (NNII) on bank profitability, and how NNII affects bank risk, how the COVID-19 pandemic influenced this relationship. Empirical panel data analysis covering 25 deposit banks in Turkey over the period 2002–2021. Used a dynamic panel model with two-step system GMM estimator (which accounts for endogeneity, lagged dependent variables, and bank-specific effects). NNII has a positive and significant effect on profitability (ROA and ROE) of Turkish banks. NNII is associated with a reduction in risk (volatility of ROA/ROE), i.e., banks with higher share of non-interest income experienced lower risk. • During the COVID-19 period, profitability dropped and risk rose for banks overall, but NNII helped cushion the negative shock, confirming its role as a "shock absorber." Banks with balanced income (not overly dependent on interest margin) may be more stable and offer better risk-adjusted returns, especially in volatile economic periods. This study Provides updated empirical evidence (2002–2021, including COVID) from Turkish banking sector, a relatively under-studied region compared to U.S./European banks, adding to global literature on income diversification. Using system GMM addresses endogeneity, making results more robust than simple OLS or fixed-effect estimations common in earlier studies. This study also highlights the role of NNII as a shock absorber during a major external crisis (COVID), offering policy-relevant insight about bank resilience strategies under macroeconomic stress.

Paper ID: ICETEMS-25-144

FORENSIC ACCOUNTING AS A TOOL FOR FRAUD PREVENTION AND ECONOMIC STABILITY

Aurangzeb Khan

City University of Science & Information Technology, Peshawar

Email: kaurangzeb575@gmail.com

Traditional audits are often unable to detect modern financial crimes involving sophisticated manipulation and collusion. This has increased the importance of forensic accounting, which integrates auditing, investigation, and legal analysis to uncover and prevent fraud. In countries like Pakistan where corruption and governance weaknesses are common strengthening forensic accounting practices is vital for improving transparency, accountability, and economic stability. The studies aim to assess how forensic accounting contributes to fraud detection and prevention within organizations. They also examine its impact on internal controls, transparency, stakeholder confidence, and overall economic stability. Another central aim is to compare forensic accounting with traditional auditing and highlight its advantages in reducing fraud risks. The dependent variable is fraud detection effectiveness (measured through reduced fraud incidents, improved reporting accuracy, or enhanced detection rates). Findings show that forensic accounting outperforms traditional auditing by using investigative tools, digital analysis, and legal expertise to uncover misconduct. Organizations applying forensic methods reported stronger internal controls, better monitoring, reduced financial misreporting, and higher stakeholder trust. At the economic level, forensic accounting reduces financial losses, protects institutions, and supports stability. Policymakers can strengthen governance by mandating forensic practices, especially in high risk sectors. For Pakistan, forensic accounting can significantly reduce corruption and improve financial integrity. The studies uniquely show that forensic accounting not only detects but proactively prevents fraud while contributing to broader economic stability an area rarely addressed in existing literature.

Keywords: Forensic accounting, Economic stability, Fraud detection

Paper ID: ICETEMS-25-150

EFFICIENT USE OF FINANCIAL LITERACY IN INVESTMENT

Muhammad Hassan

City University of Science & Information Technology, Peshawar

Email: hassan9pro@gmail.com

This paper explores how effectively students apply their financial literacy in investments and identifies factors influencing their decision-making efficiency. The study aims to examine the connection between financial literacy and investment behavior, to determine whether theoretical knowledge translates into practical efficiency, to identify psychological and behavioral factors affecting decision-making, to review global interventions and best practices for improving investment efficiency, and to recommend strategies for enhancing financial education and practical readiness. A literature-based analysis was conducted using six global studies, including academic papers and peer-reviewed articles. Key themes analyzed were: financial knowledge, investment behavior, behavioral biases, educational interventions, and confidence in decision-making. Efficiency was assessed through risk evaluation, portfolio diversification, budgeting habits, and avoidance of impulsive investment choices. Financial institutions: Provide accessible investment products and mentorship programs. Apply knowledge actively, avoid emotionally driven decisions, and focus on long-term gains. Support youth-focused financial literacy and digital investment initiatives. Originality This study uniquely emphasizes efficient application of financial literacy, targets Accounting & Finance students, integrates global findings, highlights behavioral gaps, and provides actionable recommendations for institutions and policymakers. Financial literacy alone does not ensure effective investment decisions. Practical exposure, behavioral awareness, and continuous education are essential for students to translate knowledge into informed and efficient financial choices in an increasingly complex global market.

Paper ID: ICETEMS-25-151

FINANCIAL FACTORS THAT INFLUENCE THE SOCIAL ENVIRONMENT

Asim Raza

City University of Science & Information Technology, Peshawar

Email: hassan9pro@gmail.com

The aim of this study is to analyze how various financial factors, such as credit access, income levels, public financial policies, financial literacy, and investment patterns, directly influence the social environment and overall societal well-being. This study uses a qualitative and analytical approach supported by a review of conceptual and empirical literature related to finance and social development. It examines financial mechanisms such as credit availability, income distribution, investment allocation, and government financial interventions. These financial aspects are analyzed in relation to their social impacts, including social inclusion, inequality, community development, and quality of life. The study synthesizes these insights into a framework that links financial operations with social outcomes. The study finds that financial factors significantly influence the social environment. Access to credit enhances entrepreneurship, job creation, and social mobility, whereas limited credit access reinforces social and economic inequality. Income distribution strongly affects social cohesion; higher income inequality correlates with social tension and reduced community trust. Financial literacy empowers individuals to make informed decisions, improving household stability and long-term social welfare. Additionally, public financial policies and investments in health, education, and infrastructure contribute directly to community well-being. The findings highlight that financial decisions and structures shape both individual opportunities and broader social development. Implications The results suggest that policymakers must design financial systems that support social inclusion and reduce inequality. Financial institutions should promote fair credit systems, accessible financial services, and community-focused investments. Enhancing financial literacy can strengthen social stability and improve quality of life.

Paper ID: ICETEMS-25-153

ARTIFICIAL INTELLIGENCE AND THE FUTURE OF FINANCE

Laiba Gohar

City University of Science & Information Technology, Peshawar

Email: laiba882255@gmail.com

The study explains how Artificial Intelligence (AI) has rapidly transformed the financial sector in recent decades. Technologies such as machine learning, natural language processing, automation, and generative AI now support major financial functions, including credit scoring, fraud detection, digital insurance, risk management, and customer advisory services. Research in this area has grown sharply, yet many challenges remain. These include issues of data privacy, algorithmic bias, lack of transparency, and the absence of global regulatory standards. Because AI adoption in finance continues to expand, there is a strong need to understand how these technologies are being used, what issues they create, and how institutions can manage them responsibly. The study aims to review how AI has been integrated into financial services from 1989 to 2024, identify the major application areas, analyze technological trends, and explore the regulatory, ethical, and governance challenges facing the financial sector. It also aims to highlight gaps in current research and propose future directions for responsible AI use. The study further evaluates how new tools such as generative AI are reshaping decision-making, forecasting, and data handling in finance. The study uses regression analysis to examine the relationship between AI adoption and financial outcomes. However, challenges such as bias, hallucinations, data-security risks, and high computational demands continue to limit widespread adoption. The study suggests that financial institutions must develop strong governance structures, ensure transparency, and adopt responsible AI practices. Policymakers need standardized regulations to reduce risks, while researchers should explore domain-specific AI models and cross-country comparisons. The originality of the study lies in its broad, up-to-date analysis of AI in finance, combining large-scale data review with detailed insights, making it one of the most comprehensive assessments available today.

Keywords: AI, Finance, Future

Paper ID: ICETEMS-25-154

STRATEGIES FOR BUILDING LONG TERM WEALTH

Adnan Khan

City University of Science & Information Technology, Peshawar

Email: adnanwakeel034@gmail.com

The aim of this study is to examine the key strategies that enable individuals to build long-term wealth and achieve sustained financial stability. As personal finance becomes increasingly complex due to fluctuating economic conditions and technological changes in the financial sector, understanding effective wealth-building practices has become essential. This study seeks to identify the most influential habits, financial tools, and decision-making approaches that contribute to long-term financial growth. The findings indicate that long-term wealth is strongly associated with consistent financial discipline early investment, and informed decision-making. First, individuals who live below their means and maintain consistent saving habits are more likely to accumulate wealth over time. This is largely due to the long-term benefits of compound interest, which significantly amplifies savings and investments. Second diversification across various investment instruments—such as stocks bonds, real estate, and index funds, reduces financial risk and increases the likelihood of steady returns. Third financial literacy emerges as a crucial determinant. Participants with a higher understanding of budgeting, investing, and debt management make more effective financial choices. Finally, the results show that reducing high-interest debt and maintaining an emergency fund provide essential financial security enabling individuals to invest more confidently. The implications of these findings suggest that both individuals and policymakers should prioritize financial education as a core component of long-term wealth building. This study contributes originality by combining traditional financial principles with modern financial behaviors influenced by digital banking and fintech innovations. Unlike previous studies that focus solely on investment or savings behavior, this research integrates multiple dimensions of wealth-building, such as psychology, digital tools, and risk management, providing a holistic perspective on achieving sustainable financial growth.

Paper ID: ICETEMS-25-155

ANALYSIS OF FINANCIAL RATIOS

Azeema Iqbal

City University of Science & Information Technology, Peshawar

Email: itshaeema@gmail.com

The aim of the study is to evaluate the financial condition and operational performance of selected Indian mining companies through financial ratio analysis and the use of computer-aided tools. Additionally, the study seeks to incorporate software-based methods for financial calculations by developing C++ programs and using Tally 9.0 for generating financial statements and computing ratios. The methodology is based on secondary data collected from the published financial statements of five mining companies. Financial ratio analysis was conducted to examine indicators such as current ratio, debt-equity ratio, net profit margin, gross operating margin, and return on investment. Turbo C++ programs were developed to calculate eleven financial ratios, while Tally 9.0 was used for preparing balance sheets and generating specific ratios including current ratio, quick ratio, and debt-equity ratio. A comparative analysis was applied to evaluate trends and performance changes over a six-year period from 2004 to 2009. The findings show considerable variation in financial performance among the companies. ACC Ltd. displayed a weak liquidity position, with current ratios consistently below 1. JSPL and HZL maintained stronger liquidity with ratios above. Implications The study has several practical implications. Mining companies must strengthen liquidity management due to the highly capital-intensive nature of the sector. Effective cost control and financial planning are essential to sustain profitability, particularly when sales growth does not correspond with net profit growth. For investors, ratio analysis serves as a valuable tool for assessing financial health, making informed investment decisions, and evaluating risk. The study also highlights the importance of integrating traditional accounting methods with computer programming to improve accuracy and efficiency in financial analysis. By comparing five major companies over six years, it provides comprehensive insights into industry trends and offers valuable guidance for researchers, policymakers, and mining sector professionals.

Paper ID: ICETEMS-25-160

FINANCIAL DISTRESS PREDICTION IN PAKISTAN'S CEMENT INDUSTRY: AN ALTMAN Z-SCORE ANALYSIS OF KOHAT CEMENT COMPANY LTD

Ghafar Ali

City University of Science & Information Technology, Peshawar

Email: ghafar.ali@cusit.edu.pk

The cement sector is especially critical because it underpins construction, housing, and national infrastructure growth. This study examines the financial stability of Kohat Cement Company Ltd., a major cement manufacturer in Khyber Pakhtunkhwa, by applying the Altman Z″-Score model using audited financial statements over a seven-year period (FY 2018–FY 2024). Using secondary data extracted from Kohat Cement's published annual reports, including total assets, total liabilities, shareholders' equity, working capital components, EBIT, and net sales, the study computes the five core Altman ratios (Working Capital/Total Assets; Retained Earnings/Total Assets; EBIT/Total Assets; Book-equity for each year. The model is applied annually to generate a time-series of Z″-Scores, allowing analysis of financial health trends over time amid changing macroeconomic and industry conditions. However, some years show relative weakening, linked to fluctuations in profitability, energy costs, and working-capital cycles - underscoring the need for continuous financial monitoring. This study contributes to the limited empirical literature on corporate distress prediction in Pakistan's cement sector by providing a firm-level time-series analysis using real audited data. The results have practical implications for investors, lenders, managers, and regulators by providing a validated early-warning framework to assess financial vulnerability. The study also recommends future work extending to multi-firm comparisons across the cement industry, incorporation of additional predictive models (e.g. O-Score), and sensitivity analyses considering macroeconomic stressors relevant for Pakistan.

Paper ID: ICETEMS-25-167

IMPACT OF FINANCIAL STATEMENTS ON INVESTMENT DECISION

Umar Farooq

City University of Science & Information Technology, Peshawar

Email: uk9700855@gmail.com

This study examines how financial statements influence investment decision making in United Bank for Africa (UBA) Plc between 2004 and 2013. The aim of the study was to determine the role of financial statements in influencing investment decision making in UBA Plc, with emphasis on how assets, liabilities, and equity contribute to profitability and investor confidence. Secondary data from ten years' financial reports were analyzed using Ordinary Least Squares (OLS) regression. The results show that transparency and reliability of financial statements significantly shape investor behavior. Specifically, assets and equity have strong positive effects on profitability, while liabilities have a negative effect. The study employed secondary data from UBA's financial statements covering a period of ten years (2004–2013). An Ordinary Least Squares (OLS) regression model was used to measure the relationship between profitability and financial indicators including assets, liabilities, and equity. Implications The findings imply that financial institutions must maintain transparent, accurate, and audited financial statements to attract and retain investors. The study further indicates that stakeholders make investment decisions based on financial reporting quality, which highlights the need for stronger corporate governance and financial literacy initiatives. This study contributes empirical evidence from a major African financial institution demonstrating strong links between financial reporting quality and investment decision making. Unlike previous studies, it integrates statistical modeling with investor perception data, providing a comprehensive understanding of financial statement relevance in emerging markets. The study concludes that profitability indicators rooted in assets, liabilities, and equity are key metrics for prospective investors. Financial institutions must therefore ensure accurate reporting, credible auditing, and accessible presentation to promote informed investment choices.

EDUCATION

Paper ID: ICETEMS-25-046

GOVERNMENT IN-SERVICE SCHOOL TEACHERS PROMOTION POLICY (2012): PROBLEMS AND IMPLICATIONS

Manzar Hassan

Sarhad University of Science & Information Technology, Peshawar

Email: manzarkhan997@gmail.com

The role of a qualified and competent school teacher is vital in the academic achievement of students. It has been observed that the quality of teaching learning process has witnessed a decline in the last decade especially in the public-sector schooling in Khyber Pakhtunkhwa, Pakistan. The current study aimed to explore the perceptions of the school heads in district Peshawar, in order to understand that what they think about the current in-service teachers' promotion policy in public sector schools in Khyber Pakthunkhwa, Pakistan and its impact on the quality of teaching learning process. This study uses a qualitative research design, in order to understand what the school heads think about the current policy. In this regard fifteen semi-structured interviews were carried out with school heads of secondary and higher secondary schools in district Peshawar, Khyber Pakthunkhwa, Pakistan. The study used convenience sampling strategy to access the respondents of this study. The data from the interviews was analyzed thematically. The findings of the study showed that the school heads had negative perceptions about the current teachers' promotion policy of 2012. The study identified that under the present teachers' promotion policy most of the teachers do not have command on their subject, therefore, students often complain against such teachers. The study recommends competitive teachers' promotion policy in public sector schools in order to promote talented, qualified and competent teachers in order to enhance the quality of teaching learning process.

Keywords: In-service teachers; Departmental Promotion; Promotion Policy 2012; Department of Elementary and Secondary Education; Khyber Pakhtunkhwa.

Paper ID: ICETEMS-25-136

PROBLEM IN EDUCATION SYSTEM

Majid Rehman

City University of Science & Information Technology, Peshawar

Email: maajidafridii1007@gmail.com

The aim of this study is to identify and explain the major problems that currently exist within the education system. The study focuses on two major areas of concern: (1) the challenges created by rapid digitalization and the influence of the information society on students' learning, behavior, and moral development, and (2) internal institutional problems related to teacher recruitment, teacher training, management practices, and the lack of modern teaching strategies. By examining these issues together, the study seeks to present a comprehensive understanding of how technological pressures and weak institutional systems contribute to declining educational quality. The originality of this study lies in combining two major areas of educational problems, digital influences on learners and institutional weaknesses within schools and universities, into one integrated analysis. The study does not rely on broad external sources but focuses solely on the specific issues provided, presenting a clear and detailed explanation of how technological pressures and weak institutional systems simultaneously contribute to the challenges facing the education system. This combined perspective offers a fresh and comprehensive understanding of the current educational crisis.

ENGINEERING AND TECHNOLOGY

Paper ID: ICETEMS-25-010

EXACT SOLUTIONS FOR THE FLOW OF TIME FRCTIONAL MODEL OF TERNERY NANOFLUID APPLICATIONS IN CEMENTITIOUS MATERIALS

Mishma Yousaf

City University of Science & Information Technology, Peshawar

Email: mishmayousaf6@gmail.com

Concrete reinforced with steel has made remarkable progress in the construction industry since it was introduced as a structural material. By adding nanoparticles, cementitious materials become self-healing, more durable, stronger, easy to clean, rapid compaction and fire-proof. Nano-titanium dioxide, nano-alumina, nano-clay, nano-zinc oxide, nanotitania, nanotubes (TNT's), and nano-magnesium oxide are some of the nanoparticles that could be used to accomplish these tasks. This paper examines the mathematical problem, modelled for ternary Nano fluids, generalized by means of Caputo-Fabrizio time fractional derivatives, and its theoretical applications in cementitious materials are theoretically discussed. The problem is solved using the Laplace transform. Graphene, silver, and copper nanoparticles are added to water (base fluid) to increase the binding strength of cement. In cementitious materials, ternary nanoparticles enhanced mechanical strength and other desired properties more than hybrid nanoparticles and single nanoparticle. Using these three nanoparticles together makes cementitious materials stronger than using either hybrid nanoparticles or single nanoparticles. Moreover, the effect of α on velocity, temperature, and concentration profiles show variation, which is called memory effect. It has shown that adding silver, graphene, and copper nanoparticles to cement can enhance its binding strength. In addition, different effects related to graphene, silver, and copper nanoparticles are discussed. Different embedded parameters are graphically represented and discussed

Keywords: ternary Nano Fluid, Caputo Fractional Derivative

Paper ID: ICETEMS-25-011

MAGNETOHYDRODYNAMIC FLUCTUATING FREE CONVECTION COUETTE FLOW OF SECOND GRADE NANOFLUIDS: A TIME FRACTIONAL MODEL

Momen Khan

City University of Science & Information Technology, Peshawar

Email: mominkhaan87@gmail.com

In fluid dynamics, the concept of free stream velocity represents a gateway to understanding the fundamental forces that govern motion through the fluid. Free stream velocity is a step toward mastering the invisible forces of nature (free stream velocity) and using them to propel innovations forward. From the recent few decades, heat transfer is become a challenge for researchers, nanoparticles carry extraordinary power to boost thermal conductivity of the fluids. Nanoparticles have unique physical and chemical properties (excellent conductivity and good stability) that make them useful and valuable when dispersed in nanofluids. Such research is not just a mathematical theory, it is a vision of gorgeous cooling systems, efficiency energy devices and futuristic industrial applications. The aim of this study, keeping in mind the applications of free stream velocity, efficiency energy devices and Nano fluids to analyze the magneto hydrodynamic MHD fluctuating free convection Couette flow of second grade with Caputo fractional derivative and generalized Fourier's and Fick's laws. For the skin friction, numerical results are calculated and shown in tabular form. For the volume fractions of nanoparticles, the temperature distribution increases, with maximum value of nanoparticles with the highest specified volume fractions. Moreover, due to nanoparticles the rate of heat transfer is intensified. It is worth mentioning, if the viscoelastic parameter tends to zero then the obtained solution is reduced to Newtonian fluids which presents the correctness and validation of our obtained exact solution.

Keywords: Generalized second grade fluid; MHD Fluctuating Couette flow; fullerene nanoparticles; Ethylene glycol nanofluid; generalized Fourier's and Fick's laws; fractional model;

Paper ID: ICETEMS-25-016

A TIME FRICTIONAL INVESTIGATION OF A CHANNEL FLOW OF ELECTRICALLY CONDUCTING COUPLE STRESS MAXWELL NANOFLUID WITH HEAT TRANSFER USING GENERALIZED FOURIER'S LAW

Munsif Ali

City University of Science & Information Technology, Peshawar

Email: monsifali666@gmail.com

The present investigation explores the flow characteristics of a couple stress Maxwell nanofluid containing reduced graphene oxide (rGO) nanoparticle suspended in engine oil to increase its thermal conductivity and lubrication efficiency, helping the engine cool faster and reduce friction. The motion in the fluid is induced of the lower plate while the upper plate remains stationary. The given flow is considered between two parallel plates and modeled in term of partial differential equations. The dimensional PDEs are then non-dimensionalized using appropriate dimensional less variable. To enhance the physical realism of the model, the classical PD equations are generalized using fractional calculus using the definition of Caputo derivative and generalized Fourier's law. The fractional model is solved analytically using the joint application Laplace-Fourier sine transform approach, yielding closed-form solutions for velocity and temperature distributions. The influence of key parameters: couple stress, nanoparticle concentration, Additionally, the skin friction coefficient and heat transfer rate are computed and presented in tabular form. This study highlights the practical significance of couple stress effects in nanofluid applications, particularly in thermal management systems where microscale interactions dominate.

Keywords: Maxwell fluid, Nano-particle GO, Couple stress fluid, Laplace and Fourier transforms, Fourier's Laws.

Paper ID: ICETEMS-25-050

PERFORMANCE EVALUATION OF FLEXIBLE PAVEMENTS USING POLYPROPYLENE AND POLYETHYLENE-MODIFIED ASPHALT

Muhammad Adnan Hanif

National University of Sciences & Technology (NUST)

Email: adnanhanif2303@gmail.com

Over the past two decades, the rapid increase in vehicular traffic, coupled with insufficient routine maintenance due to limited funding, has accelerated the deterioration of road networks in developing countries. Addressing this challenge requires innovative, cost-effective, and environmentally sustainable materials that enhance pavement performance while mitigating waste disposal problems. This study investigates the potential utilization of plastic waste specifically polypropylene (PP), high-density polyethylene (HDPE), and linear low-density polyethylene (LLDPE) as asphalt modifiers to improve the mechanical and binding properties of bituminous pavements. Both the wet and dry modification techniques were employed, with polymer contents ranging from 2–12% for the wet method and 3–18% for the dry method. The polymers were used individually and as a composite blend to assess their combined effects on the performance of the modified asphalt mix. The results demonstrated that the inclusion of plastic-based polymers significantly improved the pavement characteristics. In the dry method, performance enhancements of up to 18% were recorded for PP and HDPE, and up to 12% for the composite mix. Similarly, the wet method exhibited improvements of up to 12% for PP and HDPE, and 8% for the composite blend. These findings confirm that incorporating waste plastics into asphalt mixtures not only enhances the durability and strength of pavements but also provides a sustainable and eco-friendly approach to waste management and infrastructure development, contributing to greener and more resilient transportation systems in developing regions.

Keywords: Polypropylene; Linear-low-density Polyethylene; High Density-Polyethylene; Wet Method; Dry method; Modified Pavement; Composite Mix.

Paper ID: ICETEMS-25-062

IMPACT OF SOIL-CAISSON-STRUCTURE INTERACTION ON SEISMIC GROUND MOTION

Sohail Ahmad

Tongji University, Shanghi, China

Email: sohail.ahmad0@hotmail.com

This paper explores the effect of Soil-Caisson-Structure Interaction (SCSI) on the enclosed ground motion with particular attention given to deep caisson foundations under seismic loading with the Chichi (C)-wave seismic input. In the present study, the mechanisms of the inertial and kinematic interactions between the soil, caisson, and superstructure have been investigated with the help of a finite element model (FEM) combined with actual C-wave seismic data. The effect of SCSI is assessed by the acceleration response and amplification factor analysis at varying depths of the soil and the site motions. Not only numerical analysis but also experimental shaking table validation is used to measure the effect of the caisson density, variation of the mass and stiffness of bridge towers as well on the site movement issue. The results highlight the importance of SCSI in the transformation of ground shaking, especially in the intimate area of enormous foundations. The findings of this work may be used in designing the seismic and safety assessment of the caisson foundations of long-span bridges.

Keywords: Soil-caisson-structure interaction, Ground motion, Seismic loading, Finite element modeling, Shaking table test

Paper ID: ICETEMS-25-063

IMPREGNATED ORGANOPHILIC NANO CLAY: A SUSTAINABLE SOLUTION TOWARDS WELL-PERFORMING ASPHALT BINDER AND MIXTURES

Farhan Qadir

Iqra University of Science & Information Technology, Peshawar

Email: farhankhattak96@gmail.com

This study investigates the effects of impregnated hydrophobic (organophilic) nano clay on the properties and performance of both soft and hard grade asphalt binders. Organophilic nano clay was added at dosages ranging from 3% to 5% by weight of the binder, and its impact was assessed through a comprehensive three-phase analysis. The raw nano clay was modified into organophilic nano clay via a wet impregnation method, improving its compatibility with the asphalt binder, as confirmed by FTIR and X-ray diffraction (XRD) analysis. The FTIR results revealed enhanced bonding between the modified nano clay and binder, while XRD analysis showed that the organophilic nano clay remained amorphous and homogenized within the binder. Rheological tests revealed that the modified binder exhibited improved viscosity, reduced phase separation, and enhanced stiffness at both low and high temperatures, with up to a 34% improvement in binder performance compared to the virgin binder. Asphalt mixtures prepared with the modified binder showed significant improvements in rut resistance, fatigue resistance, and moisture susceptibility, outperforming traditional 60/70 penetration grade binder mixtures by 22%. Furthermore, moisture resistance increased by 14% following modification. Compared to 60/70 pen grade stiffness characteristics, fatigue, rut resistance and moisture resistance of 80/100 pen grade binder improved 22% more than 60/70 pen grade. Overall, the incorporation of organophilic nano clay enhances asphalt binder properties and mixture performance, offering a promising solution to improve the durability and functionality of asphalt pavements.

Paper ID: ICETEMS-25-064

A COMPARATIVE STUDY OF AUTOREGRESSIVE INTEGRATED MOVING AVERAGE, RANDOM FOREST, AND GATED RECURRENT UNIT FOR SOLAR POWER GENERATION FORECASTING.

Ahsan Zafar

City University of Science & Information Technology, Peshawar

Email: ahsanuetp@hotmail.com

To effectively monitor and predict energy production in smart grids integrated with renewable energy sources, machine learning and deep learning algorithms have become indispensable key technologies. This study employs statistical models such as Autoregressive Integrated Moving Average (ARIMA), machine learning models like Random Forest (RF), and deep learning models such as Gated Recurrent Units (GRU) to predict solar power generation for the next year. All models are trained and evaluated using one year of real-time solar power generation data, with performance metrics including Mean Absolute Error (MAE) and Mean Squared Error (MSE) for quantitative analysis. The research findings indicate that the GRU model outperforms both the RF and ARIMA models in prediction accuracy, primarily due to its superior ability to precisely capture complex patterns and long-term dependencies in time-series data. Specifically, the GRU model achieved a lower root mean square error (RMSE) of 0.2459 for daily power generation. This study highlights the significant potential of deep learning techniques (particularly the GRU approach) in advancing the integration of renewable energy into smart grids, providing crucial technical support for building more efficient and environmentally sustainable power systems.

Keywords: Renewable Energy, Forecasting, Deep Learning Model, GRU Model

Paper ID: ICETEMS-25-065

MACHINE LEARNING BASED CLASSIFICATION OF LIGHTWEIGHT CONCRETE BLOCKS INCORPORATING EXPANDED POLYSTYRENE (EPS)

Maaz Khan

Ghulam Ishaq Khan Institute of Engineering Sciences & Technology

Email: maazzkhan692@gmail.com

Expanded Polystyrene (EPS) lightweight concrete blocks are becoming popular in the modern construction industry since they have less density, better thermal insulation properties and sustainability features. Nevertheless, their performance cannot be predicted and classified accurately due to the difference in the composition of materials and curing conditions. This paper explores the application of machine learning (ML) in improving the classification and performance forecast of EPS-based light-weight concrete blocks by providing an alternative and less costly method in place of the traditional testing procedure. The research adopted an Extreme Vertices Design process to come up with a comprehensive experiment matrix of different proportions of cement, sand, gravel, and waste EPS beads. The data obtained was pre-processed and statistically tested and split into 80% training and 20% test sets. The application and experimentation of four ML algorithms (Decision Tree, Support Vector Machine (SVM), k-Nearest Neighbors (kNN), and Random Forest) were done. The findings have shown that the SVM and kNN models provided the best balance and performance, and high accuracy and F1-scores during the training and testing stages, which guarantees a wide scope of generalization. Random Forest model and Decision Tree model were performing well, and the test results of the Random Forest model were unrealistically high, and this could be due to overfitting or leakage of data. In general, the research paper reveals that both ML models, i.e. SVM and kNN, are effective to predict and categorize EPS lightweight concrete block properties with sufficient accuracy, thus, leading to effective and sustainable material design in the construction industry.

Keywords: Lightweight Concrete, Expanded Polystyrene, Machine Learning, Performance Prediction, SVM, k-Nearest Neighbors

Paper ID: ICETEMS-25-066

AI ENHANCED DELAY PREDICTION AND RISK ANALYSIS IN CONSTRUCTION PROJECT MANAGEMENT

M. Hanifullah

University of Engineering & Technology, Peshawar

Email: 22jzciv0552@uetpeshawar.edu.pk

In the construction industry, delays in the project and associated risks are problems that exist worldwide and significantly impact on the performance of the project in terms of financial cost overrun Therefore, the construction industry continually seeks effective and innovative solutions to address these persistent challenges. Therefore, this study will focus on identifying the significant factors that will influence the project timelines. After determining the critical issues, the performance of different Artificial Intelligence (AI) models will be evaluated to predict and mitigate the project delays accurately. This process will help plan and manage projects more efficiently. Furthermore, emerging studies have also shown that the potential of AI and predictive analysis can help minimize the delay. The proposed model will provide early warnings of possible delays and risks, thus enabling proactive mitigation measures. Ultimately, this research aims to help improve project delivery, cost efficiency, and overall productivity in the construction sector.

Keywords: Artificial Intelligence (AI), Construction Delays, Risk Analysis, Predictive Modeling, Project Management, Machine Learning, Cost Overrun, Productivity.

Paper ID: ICETEMS-25-087

DESIGN AND GRID INTEGRATION OF A PV SYSTEM FOR AN EV CHARGING STATION

Muhammad Yameen

City University of Science & Information Technology, Peshawar

Email: yameenofficial8@gmail.com

The rapid rise in electric bike (e-bike) adoption in Pakistan, driven by escalating fuel costs and increasing environmental concerns, has highlighted a critical gap in the availability of sustainable and reliable charging infrastructure. At present, most e-bike users rely on the conventional national grid, which is highly vulnerable to load shedding, voltage fluctuations, and is largely dependent on fossil fuels. This dependence significantly diminishes the environmental and economic advantages associated with electric mobility. This research proposes the design and development of a solar-powered electric vehicle (EV) charging station specifically tailored for electric bikes, integrating renewable energy sources to ensure a clean, reliable, and cost-effective charging solution. The proposed system consists of a photovoltaic (PV) array, an MPPT charge controller, a battery storage system, and a locally developed custom inverter. The inverter serves as the core of the system, converting the DC power generated by the solar panels into a suitable AC/DC output required by e-bike batteries. A dual implementation strategy is adopted to ensure project feasibility: (i) the development of a complete solar-based EV charging station prototype under available funding, and (ii) a focused design and testing of the custom inverter in a self-funded scenario. This approach not only guarantees technical continuity but also emphasizes innovation in inverter design to reduce dependence on expensive imported technologies. This work contributes to the advancement of sustainable transportation and aligns with the United Nations Sustainable Development Goals (SDGs), particularly SDG 7 (Affordable and Clean Energy), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action).

Keywords: Electric Vehicles, Sustainable energy, Renewable energy

Paper ID: ICETEMS-25-088

NATURE BASED SOLUTION FOR FLOOD RISK REDUCTION: A REVIEW OF SUSTAINABLE HYDRAULIC INFRASTRUCTURE WITH IMPLICATIONS IN PAKISTAN

Shabir Hussain

University of Engineering & Technology, Peshawar

Email: shabirhussain@uetpeshawar.edu.pk

Flooding is worsening globally due to climate change and poor land-use practices, increasing event frequency and intensity. Conventional grey infrastructure, built mainly for drainage or containment, is proving inadequate for current flood challenges. Nature-Based Solutions (NBS), such as Ecosystem-based Disaster Risk Reduction and Green Infrastructure, instead harness natural processes to manage water, lower flood peaks, and strengthen landscape resilience. resilience. Aims/Objectives This paper aims to review the paradigm of Nature-Based Solutions for hydraulic infrastructure and flood-risk reduction. Its objectives are to synthesize global evidence on the efficacy of NBS interventions in mitigating flood risk, examine the co-benefits of NBS, including biodiversity conservation, water-quality improvement, and climate-adaptation potential. The evidence demonstrates that integrating NBS into hydraulic infrastructure offers a robust, sustainable alternative to traditional grey systems. For Pakistan, one of the most vulnerable nations to catastrophic flooding, the adoption of NBS across its diverse landscapes presents significant potential to enhance resilience. The paper proposes an integrative framework for embedding NBS within a multi-scale, adaptive flood-risk mitigation strategy, contributing to national water and flood-management policies aimed at strengthening Pakistan's resilience to future flood disasters.

Keywords: Nature-Based Solutions, Green Infrastructure, Flood Risk Reduction, Pakistan Floods, Sustainable Water Management, Hydraulic Structures

Paper ID: ICETEMS-25-097

EEG-DRIVEN NEUROSTRIDE: A BRAIN-CONTROLLED EXOSKELETON FOR NEUROREHABILITATION AND MOBILITY

Abdur Rehman

City University of Science & Information Technology, Peshawar

Email: rehman40t9@gmail.com

This paper presents Neuro Stride, a brain-controlled full-body exoskeleton designed to assist individuals with impaired mobility, particularly those with conditions such as cerebral palsy or spinal cord injuries. The system integrates an EEG headset to capture neural signals, which are wirelessly transmitted to a microcontroller that interprets these inputs and translates them into motor commands. The exoskeleton supports both upper and lower limb movements and is equipped with motor drivers, sensors, and a modular structure to enable precise actuation and control. A hybrid control approach initially tested using physical buttons and potentiometers was implemented to validate the system before integrating EEG-based commands. This work highlights the feasibility of non-invasive brain-computer interface technology in achieving intuitive and hands-free robotic mobility, paving the way for future improvements in neurorehabilitation and assistive robotics.

Keywords: Brain-Computer Interface, Exoskeleton, EEG, Rehabilitation, Cerebral Palsy, Assistive Technology, Neuroreha- bilitation

Paper ID: ICETEMS-25-100

CLUSTERING-BASED DECOMPOSITION WITH LOCAL OPTIMIZATION FOR RELAY COORDINATION

Mubashar Javed

City University of Science & Information Technology, Peshawar

Email: mubashar_3001@yahoo.com

This study presents a practical way to simplify the directional over current relay coordination task by dividing the IEEE 30-bus system into smaller and more manageable groups. The relays are first grouped using k-medoids clustering based on their scenario features. Each cluster is then optimized independently using the Fractional Particle Swarm Optimization and Gravitational Search Algorithm with Entropy Evolution (FPSOGSA-EE). The performance of this cluster-based strategy is compared with a single global FPSOGSA-EE run applied to the entire network. The findings show that partitioning the system into clusters reduces the overall search complexity and frequently results in lower, or at least comparable, total relay operating times. In several cases, it also improves the convergence behavior of the optimizer. The results further highlight the influence of the number of clusters and the decay parameter alpha on the final operating time and overall optimization quality.

Keywords: Relay coordination, clustering, k-medoids, FPSOGSA-EE, IEEE 30-bus, decomposition

Paper ID: ICETEMS-25-102

DESIGN AND DEVELOPMENT OF A COST-EFFICIENT IOT-ENABLE VACUUM CLEANER WITH OPTIMIZED HARDWARE ARCHITECTURE

Muhammad Hamza Azmat

City University of Science & Information Technology, Peshawar

Email: muhammadhamza1463@gmail.com

Robot vacuum cleaners are popular but often expensive and complex. This paper presents a low-cost, IoT-enabled vacuum cleaner with an optimized hardware design that reduces parts, power use, and overall cost. The system uses one ultrasonic sensor and servo-assisted scanning to mimic multi-directional sensing, plus simple light-based actuation for cleaning control. It supports two modes: remote manual control via internet of things and autonomous operation using ultrasonic obstacle detection and basic motion rules. By avoiding multi-sensor arrays, LiDAR, and advanced navigation, the system remains simple while performing essential cleaning tasks effectively. Results show stable obstacle detection, smooth movement, and reliable IoT control. The study concludes that practical, low-cost smart cleaning devices can be built without high-end robotics hardware.

Keywords: Internet of Things, Optimized Hardware Design, Single-Sensor Navigation

Paper ID: ICETEMS-25-049

GEOTECHNICAL AND PETROGRAPHIC ANALYSIS OF LIMESTONE FOR INFRASTRUCTURE PROJECTS IN PAKISTAN

Hassan Ayaz

Tongji University, China

Email: hassanayaz444@gmail.com

Carbonate rocks are widely used as construction materials, but their suitability for structural and infrastructure applications depends on their petrographic and Geotechnical characteristics. This study evaluates whether limestones from local Pakistani formations can be reliably used in civil and building engineering works, including heavy structural applications. The investigation (i) characterizes the geological and engineering properties of the sampled limestones (ii) assesses their applicability in load-bearing and large-scale construction. Petrographic analysis was carried out using optical microscopy and scanning electron microscopy (SEM), supported by energy-dispersive X-ray spectroscopy (EDS). Physical and mechanical parameters including unconfined compressive strength, unconfined tensile strength, Porosity, and specific gravity, were analyzed to evaluate their interdependence. The results support the sustainable use of locally available limestone resources in Pakistan and provide guidance for material selection in pavements, foundations, and other structural applications. These findings have direct economic implications for building and infrastructure design and promote more efficient and rational use of regional rock resources in the construction industry.

Keywords: Limestone; rock structure; physical–mechanical properties; relationships; sustainability

COMPUTER SCIENCE

Paper ID: ICETEMS-25-179

AI-BASED ANTI-HARASSMENT & CAMPUS SAFETY PREDICTION SYSTEM USING NLP AND RISK ANALYTICS

Zulfiqar Ali

City University of Science & Information Technology, Peshawar

Email: zulfiqarali@cusit.edu.pk

It is becoming important to have a safe, secure, and harassment free campus. Conventional reporting mechanisms are not able to identify the warning signs of misconduct early, thus taking time to improve responses and discouraging the trust of students. We suggest an AI-based anti-harassment and campus safety prediction model that will actively recognize and address threats. The system takes incident reports, which are anonymous, and runs them through a multi-stage NLP pipeline. Bi-LSTM/transformer models' sentiment analysis identifies emotional conditions, e.g., fear, anger, urgency, and rates them on a scale. A BERT/RoBERTa classification identifies the reports as harassment, bullying, misconduct, safety issues, or emergency. Named entity recognition (NER) the important context (location, time, people) so that they can be pinpointed accurately geospatially. Topics modeling (LDA) reports the development of patterns, like evening harassments or clusters of cyberbullying. Predictive analytics involves a number of different ML algorithms: Random Forest uses interpretable risk scores; XGBoost/LightGBM uses high-accuracy high-risk zone predictions; logistic regression can be used to estimate the probability; SVM can be used to handle imbalanced data. Protecting student data yet remaining accountable: Safeguards, like privacy, and clear explanations of the models. Pilot implementation on campuses has verified the scalability of the system, with universities stating that the incident response time has been accelerated by 30 percent and the frequency of repeat offenses has decreased.

Keywords: Natural Language Processing (NLP), Risk Prediction Analytics, Campus Safety Systems, Machine Learning and Deep Learning, Anti-Harassment Detection

Paper ID: ICETEMS-25-005

COMPARATIVE ANALYSIS OF BORDERLINE SMOTE, SVM SMOTE AND K-MEANS SMOTE TECHNIQUES IN CYBERBULLYING

Muhammad Bilal Babar

City University of Science & Information Technology, Peshawar

Email: muhammadbilalrajpoot96@gmail.com

Imbalanced class distribution is a common challenge in machine learning, particularly in cyberbullying textual datasets. This research aims to address this issue by comparing oversampling techniques for improving classifier performance on imbalanced text data. The study focuses on three diverse oversampling techniques, including Borderline Synthetic Minority Over-Sampling Technique, Support Vector Machine Synthetic Minority Over-Sampling Technique, and K-Means Synthetic Minority Over-Sampling Technique, are implemented and evaluated. The performance of these techniques is assessed using accuracy, precision, recall, f1-score and training time as the evaluation metrics. The experimental results demonstrate the effectiveness of different oversampling techniques in balancing imbalanced text dataset. The Support Vector Machine Synthetic Minority Over-Sampling Technique consistently outperform other techniques in terms of all aforementioned metrics. However, the choice of oversampling technique depends on the specific characteristics of the dataset and the problem at hand. Overall, this research contributes to the field of imbalanced text classification by providing insights into the strengths and limitations of various oversampling techniques. The findings can guide practitioners and researchers in selecting appropriate methods to improve the performance of classifiers on imbalanced text data. Future work may explore ensemble approaches and deep learning methods to further enhance the detection of cyberbullying.

Keywords: Machine Learning, Synthetic Minority Oversampling Technique, Support Vector Machine.

Paper ID: ICETEMS-25-028

COMPARATIVE DEEP LEARNING MODELS FOR IOT INTRUSION DETECTION USING LSTM AND GRU ARCHITECTURES

Nouman Imtiaz

Pak-Turk Maarif International School & College Peshawar

Email: nouman.imtiaz660@gmail.com

The Internet of Things (IoT) facilitates the interconnection of billions of smart devices across various sectors. However, this rapid growth has increased the susceptibility of IoT systems to cyberthreats. Devices such as industrial machinery, smart energy grids, and automated buildings are increasingly being targeted by intrusion attempts that exploit weak communication protocols and insufficient security configurations. Intrusion detection systems (IDS) are crucial for identifying malicious activities in real time. This study seeks to enhance IDS performance in IoT environments using deep learning approaches. Two recurrent neural network architectures, Long Short-Term Memory (LSTM) and gated recurrent units (GRU), were developed and evaluated for their effectiveness in detecting various IoT network attacks. The models were trained and validated using the NF-UNSW-NB15-v2 dataset, which included nine distinct attack categories. During preprocessing, network traffic data were transformed into RGB spectrogram images to capture both spatial and temporal features. The models were optimized and assessed using standard classification metrics including accuracy, precision, and recall. Although the GRU exhibited slightly faster convergence, the LSTM demonstrated greater robustness in multiclass detection and generalization. These findings confirm that deep recurrent architectures are effective for IoT intrusion detection and highlight LSTM as a promising candidate for future lightweight real-time security applications in IoT systems.

Keywords: Internet of Things, Intrusion Detection System, Deep Learning, LSTM, GRU

Paper ID: ICETEMS-25-029

AN INTEGRATED MACHINE LEARNING FRAMEWORK FOR HEART DISEASE RISK PREDICTION AND REAL-TIME USER INTERFACE DEPLOYMENT

Nouman Imtiaz

Pak-Turk Maarif International School & College Peshawar

Email: nouman.imtiaz660@gmail.com

Heart disease (HD) continues to be a major cause of death globally. This research introduces a predictive framework based on machine learning for the early identification of heart disease, utilizing the Framingham dataset. The dataset underwent preprocessing steps such as imputing missing values, scaling features, and balancing data through upsampling. Ten classification algorithms, including Random Forest, XGBoost, Gradient Boosting, Decision Tree, Logistic Regression, and Support Vector Machine, were trained and assessed using metrics like accuracy, F1-score, precision, recall, and AUC. Among these models, Random Forest stood out with the highest accuracy of 97.2% and an AUC of 0.995, surpassing the other classifiers. A web-based interface was created to deliver real-time heart disease predictions using the trained random-forest model. The findings highlighted the practicality of employing machine learning for effective and precise clinical decision support, offering a promising tool for preventive healthcare systems.

Keywords: Heart Disease, Machine Learning, Framingham Dataset, Random Forest, Predictive Modeling

Paper ID: ICETEMS-25-189

DEEP LEARNING FOR THE DETECTION OF INACCURATE RESPONSE PATTERNS IN HEALTH SURVEY DATA

Iftikhar Alam

City University of Science and Information Technology, Peshawar

Email: iftikharalam@cusit.edu.pk

Inaccurate or distorted information remains a significant challenge in health-related survey research, particularly in studies relying on subjective self-reports from patients with chronic conditions, such as Parkinson's disease. This study proposes a machine learning approach to identify inaccuracies in health survey data using a Decision Tree classification model. A local dataset was constructed based on the Parkinson's Disease Questionnaire (PDQ-39), completed by 100 clinically diagnosed Parkinson's patients from the Khyber Pakhtunkhwa province. The collected data underwent preprocessing steps, including cleaning, normalization, and manual labeling according to logical consistency and clinical plausibility. The model achieved an accuracy of 85%, demonstrating its effectiveness in detecting potentially unreliable response patterns. The Decision Tree was selected due to its high interpretability and suitability for small, structured datasets typical of localized healthcare studies. This work contributes to the growing domain of healthcare data validation by providing a transparent and reproducible method for identifying bias in patient-reported outcomes. The findings suggest the potential of machine learning, particularly Decision Tree, as a decision-support tool to enhance the credibility of survey-based medical research and inform public health policy.

Keywords: machine learning, Parkinson's Disease Questionnaire, Decision Trees

Paper ID: ICETEMS-25-090

INTELLIGENT DETECTION OF MALICIOUS BEHAVIOUR IN 6G COMMUNICATION SYSTEMS

Ikram Ullah

City University of Science & Information Technology, Peshawar

Email: ikram.ullah@cusit.edu.pk

The development of sixth-generation (6G) networks brings extremely high data rates, intelligent connectivity, edge computing, and massive numbers of connected devices. While these advancements promise major improvements, they also create new chances for attackers to hide, adapt, and launch more advanced malicious activities. This study focuses on understanding different forms of malicious behavior that may appear in 6G networks, especially those enabled by AI-driven communication, ultra-dense device connections, and automated network management systems. The objective of this research is to investigate how attackers can exploit the smart features of 6G, including autonomous decision-making, distributed AI, and high-speed communication channels. The research also aims to propose an intelligent early-detection method that can identify unusual or harmful behavior before it causes serious damage to the network. A hybrid methodology is used, which includes: (1) building a simulated 6G environment with AI-based routing and edge processing; (2) generating several malicious behaviors such as spoofing, AI model poisoning, smart jamming, and cross-layer manipulation; and (3) applying a federated anomaly detection system combined with behavioral analysis to detect these attacks. These findings demonstrate that 6G networks require advanced, learning-based security mechanisms to remain secure. The study concludes that malicious behavior in 6G networks is more dynamic and smarter than in earlier generations. Therefore, future security solutions should be intelligent, collaborative, and capable of adapting automatically to changing threats in real time.

Keywords: 6G Security, Malicious Behavior, Anomaly Detection, Federated Learning, Intelligent Networks

MATHEMATICS

Paper ID: ICETEMS-25-001

EXACT SOLUTIONS FOR TWO-DIMENSIONAL SECOND-GRADE FLUID FLOW IN A CHANNEL: A FRACTIONAL MODEL WITH NON-SINGULAR KERNEL

Waqas Ali

City University of Science & Information Technology, Peshawar

Email: waqasali331996@gmail.com

The two-dimensional flow of a second-grade fluid with Caputo-Fabrizio fractional derivatives plays a vital role in heat and mass transfer studies. Objective: This research aims to establish exact analytical solutions for fractional-order fluid flow problems. The governing equations are solved by employing Caputo-Fabrizio fractional derivatives together with special functions. Result: The obtained exact solutions reveal the significant influence of fractional parameters on velocity, temperature, and concentration fields. Conclusion: The proposed fractional model enhances the understanding of non-Newtonian fluid behavior and provides new insights into transport phenomena.

Keywords: Two-Dimensional Flow; Second-grade fluid; Caputo-Fabrizio Fractional Derivatives; Exact solutions; Heat and Mass Transfer; Special Functions.

Paper ID: ICETEMS-25-004

BIOCONVECTION SLIP FLOW OF A MICROPOLAR FLUID OVER A VERTICAL PLATE

Zulikha Shah

City University of Science & Information Technology, Peshawar

Email: zulikhashah08@gmail.com

The study focuses on the bioconvection flow of a micropolar fluid over a vertical plate, with partial differential equations (PDEs) serving as the basic framework. The Atangana-Baleanu derivatives approach is used in the study to modify the model by inserting non-integer orders to account for system memory effects. This synergy improves transport efficiency, which is essential in industry sectors like as engineering, chemistry, and biotechnology, where precise control over microscale mass and heat transfer processes is required for the development of novel technologies and applications. The researchers proceed to attain exact solutions using the Laplace transform technique, meticulously confirming that these solutions not only adhere to the governing equations but also satisfy the stipulated boundary and initial conditions of the problem. This comprehensive methodology provides a robust and precise means of addressing complex systems with memory effects. The use of a unique non-singular, non-local kernel is a novel component of this technique. This technique attempts to help progress knowledge in the subject and improve our understanding of the complexities inherent in fluid dynamics settings. A high Prandtl number indicates that momentum diffuses faster, while a low Prandtl number suggests that micro-structural features diffuse faster. The Schmidt number, on the other hand, reveals how quickly substances diffuse within the fluid compared to the fluid's momentum. Our study also calculates and presents key engineering quantities in a tabular format, providing valuable insights for practical applications.

Keywords: Micropolar fluids, Bioconvection and slip flow, Mass and Heat transfer, and Fractional model.

Paper ID: ICETEMS-25-006

ATANGANA-BALEANU FRACTIONAL MODELING OF OLDROYD-B FLUID FLOW AND HEAT TRANSFER IN A CAPILLARY TUBE

Ikram Ullah

City University of Science & Information Technology, Peshawar

Email: ikram362000@gmail.com

This work explores the flow and heat transfer of Oldroyd-B fluids inside a capillary tube in a fractional model developed using the Atangana–Baleanu time-fractional derivative. The movement of the fluid is induced by a time-varying pressure gradient, and analytical velocity and temperature solutions were obtained via the Laplace and finite Hankel transforms. To analyze the effect of fractional parameters, material time, pulsation frequency, and the Prandtl number, numerical simulations were carried out in Math CAD and the solutions shown graphically. The results are notable for pointing out that solutions of fractional order exhibit behaviors different from those of the classical model. Additionally, the speed and heat transfer in the capillary tube can be conveniently controlled by adjusting the fractional derivative parameter, relaxation and retardation times, and the Prandtl number. These observations are particularly useful in biochip technology, where nanoscale control of bioliquid samples is essential for biological analysis and medical diagnostics applications.

Keywords: Oldroyd-B fluid, heat transfer, Atangana-Baleanu fractional derivative, time-fractional modeling

Paper ID: ICETEMS-25-008

STABILITY ANALYSIS OF THE STOCHASTIC GREY-SCOTT MODEL USING SPECTRAL METHOD

Muhammad Awais

City University of Science & Information Technology, Peshawar

Email: owaismomn888@gmail.com

This work extends the classical two-species Grey-Scott model, a foundational reaction-diffusion system for studying pattern formation, to a novel three-species framework. The original model's deterministic equations are augmented with additive white noise to account for stochastic fluctuations inherent in real-world systems. The primary focus of this research is to conduct a stability analysis of this proposed stochastic three-species Grey-Scott model. We employ the spectral collocation method to investigate how the introduction of a third interacting chemical species influences the linear stability characteristics of the system. The analysis reveals how stochastic perturbations modulate the Turing instability space and drive transitions between different patterning regimes. This mathematical investigation provides a more generalized framework for understanding pattern generation in complex, multi-component systems, with potential implications for modeling biological processes where interactions extend beyond a simple activator-inhibitor pair.

Keywords: Stochastic Grey-Scott Model, Three-Species System, Stability Analysis, Spectral Collocation Method, Pattern Formation.

Paper ID: ICETEMS-25-014

SPECTRAL SCHEME-BASED SIMULATION AND STABILITY STUDY OF THREE COUPLED FRACTIONAL STOCHASTIC DELAY DIFFERENTIAL EQUATIONS

Muhammad Suleman

City University of Science & Information Technology, Peshawar

Email: m.suleman201718@gmail.com

This study explores the stability of a system of three coupled fractional stochastic delay differential equations (FSDDEs), a more realistic model for complex systems influenced by memory, randomness, and time delays. We focus on how these factors interact and affect system behavior, using both asymptotic and Lyapunov stability analysis. By extending existing methods to handle three equations, we analyse how fractional orders and delays influence the system's stability. Numerical techniques, including spectral methods with Legendre–Gauss–Lobatto nodes, are used to solve and simulate the system. The results highlight the challenges and richness of working with multi-equation FSDDEs and offer insights for real-world applications

Keywords: Coupled FSDDEs, Stability analysis, Fractional order, Stochastic delay, Spectral method

Paper ID: ICETEMS-25-017

APPLICATION OF SPECTRAL COLLOCATION METHOD TO STABILITY ANALYSIS OF FRACTIONAL DIFFUSION-REACTION SYSTEMS WITH MULTIPLE CHEMICAL SPECIES"

Ali Jan

City University of Science & Information Technology, Peshawar

Email: ajan80034@gmail.com

This study investigate the stability of a fractional diffusion-reaction system by extending an existing two-species model through the inclusion of a third chemical species. The motivation behind this extension lies in better capturing the complexity of real-world biochemical interactions, where multiple interacting substances often influence the system's dynamics. To analyze the resulting model, we employ the Legendre spectral collocation method, which proves effective in handling the non-local and irregular diffusion characteristics inherent in fractional systems. The governing equations are discretized using this method, and a detailed mathematical analysis is conducted to establish stability criteria. Our extended model offers new insights into how additional chemical interactions influence the long-term behavior and stability of the system. The results contribute both to the theoretical understanding of fractional reaction-diffusion systems and to the development of reliable numerical schemes for simulating their dynamics.

Keywords: Fractional diffusion-reaction equations · Spectral method · Stability and quantitative analysis · Fractional calculus

Paper ID: ICETEMS-25-024

AN INNOVATIVE FRACTIONAL MODAL FOR HEAT AND ELECTRO-OSMOTIC FLOW IN COUPLE-STRESS FLUIDS BASED ON MODIFIED ATANGANA-BALEANU DERIVATIVES

Zafar Shaheen

City University of Science & Information Technology, Peshawar

Email: zshaheen557@gmail.com

The study of non-Newtonian couple stress fluids (CSFs), characterized by a unique material constant that influences lubricant viscosity and couple stress through a fourth-order spatial derivative in the governing equations, presents significant theoretical and practical challenges. Despite their critical applications in industries such as aerodynamic heating phenomena, suspension and colloidal solutions, liquid crystal solidification, electrostatic precipitations, cooling of metallic plates, and crude oil extraction, these fluids have been scarcely examined using classical derivatives to obtain exact solutions. Motivated by the need for more accurate models in these industrial applications, this research aims to analyze CSF dynamics using the modified Atangana-Baleanu fractional derivatives in the Caputo sense (MABC), a novel and rarely utilized approach in existing literature. Existing definitions of fractional derivatives with singular and non-singular kernels have been found inadequate for certain problems, specifically due to initialization issues with the Atangana-Baleanu fractional derivative. The results are graphically represented to illustrate the effects of various parameters, including electro osmotic flow term the Prandtl number Pr, Grashof number Gr, pressure gradient G, and Reynolds number Re, on temperature and velocity distributions. It is noted that the velocity field of the fluid shows an elevation with the amplification in the magnitude of Electro-osmotic Flow (sE).

Keywords: Electro osmotic Flow, Laplace transform, Fourier sine transform, Nusselt number, Modified Atangana-Baleanu Derivatives, Couette flow

Paper ID: ICETEMS-25-025

A FRACTIONAL MODEL FOR PULSATILE FLOW OF BLOOD AS A SECOND GRADE FLUID WITH HEAT AND MASS TRANSFER

Suleman Irshad

City University of Science & Information Technology, Peshawar

Email: sulemani832@gmail.com

Pulsatile flow of blood represents a complex and vital aspect of cardiovascular physiology. Understanding the behavior of pulsatile flow of blood as a second-grade fluid presents a unique route for research. This study investigates the pulsatile flow of blood as a second-grade fluid along with the transfer of heat and mass in an oscillating cylinder under the effect of magnetic field. The resultant flow in this phenomenon is due to buoyancy forces, pressure and oscillation of cylinders. This physical phenomenon is modelled in the terms of partial differential equations. The obtained system of differential equations is non-dimensionalized using some appropriate dimensionless variables. The definition of Caputo-Fabrizio fractional derivative is used to make the model fractional. The exact solutions for velocity, temperature, concentration profile are obtained by the application of Laplace and Hankel transforms. The various effects of some dimensionless parameters i.e. Thermal and mass Grashof numbers, Hartman number, Prandtl. and Schmidth numbers are analyzed on the velocity, temperature, and concentration distributions respectively. It has been noticed that the velocity is the increasing function of mass and thermal Grashof numbers whereas its profile shows decline due to increase in Hartman number.

Keywords: Fractional model, heat and mass transfer, MHD flow, blood flow, cylindrical flow

Paper ID: ICETEMS-25-026

NUMERICAL INVESTIGATION OF ELECTRICALLY CONDUCTING MAXWELL HYBRID NANOFLUID IN A POROUS MEDIUM WITH CRANK-NICOLSON METHOD

Nabeel Khan

City University of Science & Information Technology, Peshawar

Email: nabeelbkucchd321@gmail.com

In this modern era hybrid nanofluids play an important role in engineering, medical and modern sciences. It is due to the fact that most notably, hybrid nanoparticles have thermal properties such as high thermal conductivity and a convective heat transfer coefficient as compared to nanofluids. For that purpose Alumina nanoparticles and Tungsten trioxide nanoparticles are used as hybrid nanofluid because both are essential metallic oxides have having huge range of applications and unique physio-chemical features. Most notably. Therefore, this study is conducted to integrate the adsorption of Al2O3 in mineral oil-based Maxwell fluid. The ambitious goal of this study is to intensify the mechanical and thermal properties of a Maxwell fluid under heat flux boundary conditions. The novelty of the research is increased by introducing fractional derivatives to the Maxwell model with the effect of porosity and heat generation. There are various distinct types of fractional derivative definitions, with the Caputo fractional derivative being one of the most predominantly applied. Therefore, the fractoinal-order derivatives are evaluated using the fractional Caputo derivative, and the integer-order derivatives are evaluated using the Crank–Nicolson method. The obtained results are graphically displayed to demonstrate how all governing parameters, such as nanoparticle volume fraction, relaxation time, fractional derivative, magnetic field, thermal radiation, and viscous dissipation, have a significant impact on fluid flow and temperature distribution.

Keywords: Hybrid nanofluid; Maxwell fluid; fractional derivative; Crank–Nicolson method; Porosity.

Paper ID: ICETEMS-25-027

MODELING OF MHD FLOW PAST A CURVED SURFACE WITH TEMPERATURE DEPENDENT ELECTRICAL CONDUCTIVITY

Sabahat Khan

City University of Science & Information Technology, Peshawar

Email: saba.math.a@gmail.com

The primary focus of this work is the viscous fluid flow generated by a stretched, curved sheet under the influence of a electrical conductivity as a nonlinear function of temperature. These equations are connected to the conventional Navier-Stokes fluid dynamics equations. The modelled system, which is represented as a system of partial differential equations (PDEs), may be transformed into an ordinary differential equation (ODE) system by applying the proper transformation. The numerical solution of the modified system of ODEs is obtained using the parametric continuation method (PCM). The numerical results are compared to previously published work and the bvp4c MATLAB tool in order to evaluate the validity of the PCM technique. Despite the effect of several physical characteristics, there appears to be a high degree of agreement and convergence between the two numerical solutions. Variable electrical conductivity and magnetic field characteristics are among the factors considered by the model's novelty. Electrical conductivity variation exponent increases fluid velocity, While Stuart number has the opposite effect. High-voltage pulsed electric fields (PEF) are used in practical applications, such food preservation, to inactivate enzymes and spoilage bacteria and prolong shelf life by using regulated magnetic fields and the temperature-dependent electrical conductivity of food.

Keywords: Magnetic Batchelor number, Nusselt Number, Prandtl number, electrical conductivity variation

Paper ID: ICETEMS-25-031

OSCILLATORY FLOW CHARACTERISTICS AROUND FOUR-SQUARE CYLINDERS IN CLUSTER: A LATTICE BOLTZMANN METHOD NUMERICAL STUDY

Muhammad Ghayoor

Air University Islamabad

Email: ghayooropf@gmail.com

This research study investigates the flow dynamics behind a cluster of four-square cylinders under varying gap spacing and oscillating frequencies, utilizing numerical simulations with the Lattice Boltzmann Method (LBM) at a fixed Reynolds Number of 200. The study examines two flow types: non-oscillating and oscillating, across three distinct gap spacings (g*=0,3.5, and 7) with oscillation frequencies ranging from 0 to 6. The finding reveals three distinct flow patterns: (i) Single cluster structure flow at g*=0, where cylinders behave as a cohesive unit, leading to a unified vortex structure in the wake; (ii) Antiphase partially symmetric flow at intermediate gap spacing g*=3.5, characterized by anti-phase vortex shedding, though symmetry is disrupted downstream; and (iii) Antiphase symmetric flow at extended gap spacing g*=7. The oscillating frequency notably influences the drag coefficient (〖Cd〗 _mean), root mean square of drag (〖Cd〗 _rms), root mean square of lift coefficient (〖Cl〗 _rms), and Strouhal number (St), with most significant increase in drag observed at an oscillating inflow frequency (f_s=2). Overall, the study enhances understanding of flow interactions in clustered cylinder configurations, with implications for engineering applications in fluid dynamics.

Keywords: Lattice Boltzman Method, Oscillating flow, drag lift coefficient, cluster of square cylinders

Paper ID: ICETEMS-25-032

ROTATING FLOW OVER A VERTICAL RIGA PLATE WITH RAMPED HEATING USING TRANSFORMER OIL

Gul Afshana

City University of Science & Information Technology, Peshawar

Email: gulafshana512@gmail.com

Electromagnetohydrodynamic flows of Casson nanofluid with ramped wall temperatures along a vertical Riga plate in a rotating frame are examined in the present study. Nanofluids are crucial in the rate of heat transfer. In the current study, transformer oil is used as the base fluid due to its extensive applications in engineering. A graphene nanoparticle is added to the transformer oil base fluid in order to increase the rate of heat transfer. Moreover, this study takes into account the impacts of radiation, chemical reactions, and porous media. The current flow regime is described by a set of partial differential equations. A system of equations with boundary conditions can be simplified by using variables with no dimensions. Temperature, concentration, and velocity distributions are computed using the Laplace transform method. This paper presents a physical discussion and graphic representations of how different physical parameters affect velocity, temperature, and concentration profiles. Based on the findings, 4% graphene nanoparticles significantly improve the rate of heat transfer from transform oil to 7.88% in the case of ramped wall temperatures (RWT) and 7.88% in the case of isothermal wall temperatures (IWT). By increasing thermal conductivity and reducing oxidation reactions in the transformer oil, graphene nanoparticles extend the lifetime of transformers, ultimately resulting in a better heat dissipation and decreased degradation.

Keywords: Casson Fluid, Riga Plate, chemical Species, Rotational Flow, Thermal Radiations

Paper ID: ICETEMS-25-033

CAN FRACTIONAL REACTION–DIFFUSION MODELS CAPTURE VEGETATION PATTERNS IN ARID ECOSYSTEMS?

Zubair Ahmad

University of Naples Federico II, (Italy)

Email: zubair.ahmad@unicampania.it

Vegetation patterns in arid ecosystems emerge from complex feedback between water availability and soil toxicity, yet their dynamics under fractional-order derivatives remain poorly understood. In this study, we extend the integer-order model proposed by Cartenì et al., (2012) by reformulating it using fractional derivatives. The model consists of a coupled system of reaction–diffusion partial differential equations (PDEs) governing biomass and toxicity dynamics, enabling us to investigate how ring formation in biomass is shaped by toxicity interactions. Building on the study of Marasco et al. [2], the model is further extended to incorporate water–toxicity interactions that drive vegetation patterning. Through numerical simulations, we explore the formation of self-organized spatial structures, including rings, spots, stripes, and gaps, across varying fractional derivative indices. Our results demonstrate that non-local memory effects, intrinsic to fractional operators, alter pattern formation compared to classical integer-order models. These findings advance the understanding of fractional-order dynamics in plant–soil feedback systems and highlight their ecological implications for arid ecosystems under environmental stress. By integrating fractional calculus with ecological modeling, this work provides a novel mathematical framework to predict vegetation resilience in water-limited ecosystems.

Keywords: Mathematical modelling; fractional calculus; vegetation dynamics; pattern formation; numerical simulations.

Paper ID: ICETEMS-25-034

VISCOELASTIC DUSTY NANOFLUIDS CONTAINING NANODIAMOND IN A ROTATING POROUS CHANNEL

Rahib Ullah

City University of Science & Information Technology, Peshawar

Email: rahibullah53@gmail.com

The utilization of viscoelastic fluid is prevalent in various industries such as medical sector, food, petrochemical and polymer due to its ability to reduce turbulent drag, exhibit elastic turbulence, and other notable characteristics. This aspect has consistently captured the attention of researchers. In the present study, the aim is to report the results associated with the Couette flow of viscoelastic rotating dusty nanofluids between rotating porous plates. Furthermore, in the present study, transformer oil is used as a base fluid, because to its numerous application in power engineering and industrial sciences. Transformer is one of the crucial element that requires high-level condition monitoring to ensure continuous power supply. Therefore, an effort is made to improve the critical features of the transformer oil by suspending Nanodiamond and Aluminium oxide nanoparticles, because the creation of transformer oil with desirable dielectric and thermal properties is in high demand due to its essential role in development. The governing equations for the above flow regime is modeled and formulated in terms of partial differential equations. A definite method (Poincare Light-Hill technique) is then used to solve the non-dimensional partial differential equations. The impact of different parameters on the temperature and velocity profiles are shown graphically. Nusselt number and Skin friction are computed and tabulated. The nanofluid velocity is observed to decline with raising suction parameter and magnetic field. It is noteworthy that the transformer oil's heat transfer rate is improved by for nanoparticles and for Nanodiamond particles, when the and Nanodiamond nanoparticles volume fraction is raised. This study has a wide range of applications in industrial science and engineering.

Keywords: Dusty fluids, suction and injection, nanoparticles, Transformer oil, Aluminium oxide, Nanodiamond, Light Hill technique.

Paper ID: ICETEMS-25-041

MATHEMATICAL MODELING OF TUBERCULOSIS EPIDEMIOLOGY: A STOCHASTIC FRAMEWORK FOR DISEASE CONTROL

Naveed Khan

University of Campania "Luigi Vanvitelli" Caserta, Italy

Email: naveed.khan@unicampania.it

The most common site of infection for tuberculosis is the lungs. A tuberculous infection is most often found in the lungs. It is crucial to highlight the significance of identifying the threshold and executing efficient strategies to eradicate TB from the population. Therefore, the present study aims to solve the issue mentioned above by providing a mathematical model. The analysis of this model will help public health agencies to control the spread of TB in the population. The model is derived in terms of ordinary differential equations. Furthermore, unlike the previous deterministic TB models, the stochastic effect is considered in the present model. Since the deterministic approach neglects the randomness of the dynamics of the process, it has great limitations in the modelling process. To mitigate these problems, convert the deterministic model into a stochastic one, which is more realistic than the deterministic approach. The positivity and uniqueness of the model are checked, and the extinction and persistence theorems are proved using Ito's method. The dynamics of virus spread are determined by a threshold), if the disease eventually disappears from the population. Conversely, if the disease continues to persist in the population. The numerical simulation shows that the stochastic model gives more realistic results than the deterministic model, and the effect of various parameters on disease propagation is shown through graphs. The results show that by decreasing the contact rate, the propagation of disease will be reduced. While by increasing the vaccination rate plays an important role in controlling the spread of TB disease in the population.

Keywords: Tuberculosis (TB); Stochastic model; Deterministic model; Ito's method; Threshold parameter; Vaccination rate.

Paper ID: ICETEMS-25-047

ENHANCING MEDICAL ULTRASOUND IMAGING THROUGH FRACTIONAL MATHEMATICAL MODELING OF ULTRASOUND BUBBLE DYNAMICS

Hijab ur Rehman

City University of Science & Information Technology, Peshawar

Email: hijabmath@gmail.com

The classical mathematical modeling of ultrasound bubbles is so far used to improve the medical imaging quality. A clear and visible medical ultrasound image relies on the bubble's diameter, wavelength, and intensity of the scattered sound. A bubble with a diameter much smaller than the sound wavelength is regarded as a highly efficient source of sound scattering. The dynamical equation for a medical ultrasound bubble is primarily modeled in the classical integer-order differential equation. Then a reduction of order technique is used to convert the modeled dynamic equation for the bubble surface into a system of incommensurate fractional-orders. The incommensurate fractional-order values are calculated directly, by using the Riemann stability region. Based on stability, the convergence and accuracy of the numerical scheme are also discussed in detail. It has been found that the system will remain stable and chaotic for the incommensurate values and, respectively.

Keywords: Acoustic, stability analysis, chaos, incommensurate fractional model, synchronization, constant ultrasound speed

Paper ID: ICETEMS-25-086

INCOMMENSURATE FRACTIONAL MODELING OF CAVITATION BUBBLE DYNAMICS WITHIN A SPHERICAL DROPLET

Bakhtawar Shah

City University of Science & Information Technology, Peshawar

Email: bakhtawarshah307@gmail.com

Cavitation bubbles inside droplets represent a complex multi-phase phenomenon critical to fields like microfluidics, medical ultrasound, and drug delivery, where traditional integer-order models often fail to describe irregular oscillations and memory-dependent viscoelastic interactions. The work discusses fractional modeling of cavitation bubble dynamics in spherical droplets within fluids. By incorporating fractional calculus with incommensurate orders, we capture non-local memory effects and anomalous diffusion in viscoelastic responses, extending classical Rayleigh-Plesset models to account for density ratios and bubble-to-droplet size scales. The depiction of a multi-phase fluid system commonly studied in cavitation and bubble dynamics research, a small spherical bubble with radius Rb containing gas, fully enclosed within a larger droplet with radius Rd composed of Fluid 1, such as oil or water. This droplet is suspended in an outer host medium of Fluid 2, forming an immiscible emulsion like oil-in-water. The key interfaces include the bubble surface Sb and the droplet boundary Sd, indicating radial directions that highlight formation during bubble oscillations. The enhanced models provide accuracy over conventional approaches, particularly in capturing memory effects that influence real-world outcomes in emulsification and biomedicine. The future extensions could integrate machine learning for real-time predictions, and laser-induced cavitation experiments in oil-in-water and water-in-oil systems reveal distinct mixing mechanisms.

Keywords: Biomedicine, viscoelastic, fractional modelling.

Paper ID: ICETEMS-25-113

HEAT TRANSFER IN TRANSIENT OSCILLATORY FLOW OF MAXWELL FLUID

Muhammad Yousaf shah

Islamia College University, Peshawar

Email: yousafmath2019@gmail.com

This study presents exact analytical solutions for the velocity, temperature, and stress fields in the transient oscillatory magnetohydrodynamic (MHD) flow of a Maxwell fluid through a porous medium. Oscillatory heat and mass transport in viscoelastic fluids plays a significant role in various industrial and biomedical applications, yet analytical investigations of such flows under combined MHD and porous-medium effects remain limited. The governing momentum, energy, and stress equations are solved using the Laplace transform technique. The flow is generated by both cosine and sine oscillations of an infinite vertical plate, and thermal effects are incorporated to examine the coupled behavior of viscoelasticity and heat transfer. The obtained solutions reveal distinct transient and steady-state components that satisfy the governing equations and the corresponding initial and boundary conditions. Graphical analyses demonstrate that transient contributions decay with time, and the long-term motion and heat transfer characteristics are governed entirely by the steady oscillatory solutions. The results further show that the interaction of viscoelastic parameters, magnetic field strength, Grashof number, porous medium permeability, and thermal parameters significantly influences the flow dynamics. In particular, the temperature distribution is strongly dependent on the Prandtl number and time. The analytical solutions provide valuable insight into the transient and steady responses of Maxwell fluids under oscillatory forcing, offering a useful theoretical foundation for engineering systems involving viscoelastic and MHD flow phenomena.

Keywords: Heat transfer, Maxwell fluid, Transient oscillatory flow, Magnetohydrodynamic (MHD)

Paper ID: ICETEMS-25-156

EXACT SOLUTIONS OF FRACTIONAL MHD HYBRID NANOFLUID IN A DARCYS MEDIUM

Zulfiqar Ali

Islamia College University, Peshawar, Khyber Pakhtunkhwa

Email: zzulfi40@gmail.com

In recent developments, hybrid nanofluids, comprising two or more types of nanoparticles have gained prominence for their superior thermal conductivity, chemical stability, mechanical strength, and cost-effectiveness compared to conventional nanofluids. The present study investigates the unsteady magnetohydrodynamic (MHD) flow, heat transfer, and mass transport of a fractional-order hybrid nanofluid through a porous (Darcy) medium under thermal radiation effects. A hybrid suspension of Magnetic Iron Oxide (FeO) and Silver (Ag) nanoparticles dispersed in engine oil is considered. The governing equations are formulated and then generalized using the Caputo Fabrizio definition of fractional derivatives, allowing a more realistic representation of memory effects in fluid behavior. Exact analytical solutions to the fractional momentum, energy, and concentration equations are obtained using the Laplace transform technique. The influence of key physical parameters including the magnetic parameter, radiation parameter, fractional order, porous medium permeability, and nanoparticle volume fractions is examined through graphical interpretation of the solutions. The results reveal significant sensitivity of the velocity, temperature, and concentration fields to variations in fractional order and nanoparticle composition. The hybrid nanofluid consistently exhibits enhanced heat transfer characteristics relative to conventional nanofluids. Furthermore, the implementation of generalized boundary conditions yields new solution structures that provide deeper physical insight into the oscillatory behavior of hybrid nanofluid flows.

Keywords: Heat Transfer, Magnetohydrodynamic (MHD), Nanofluids, Caputo Fabrizio, (Darcy) medium.

Paper ID: ICETEMS-25-159

HEAT AND MASS TRANSFER OF CMC-BASED-CNT'S NANOFLUID WITH MAGNETO-HYDRO-DYNAMICS CHANNEL FLOW THROUGH A POROUS MEDIUM BY USING YAC FRACTIONAL OPERATOR

Mehwish Shafat

Shaheed Benazir Bhutto Women University, Peshawar

Email: khanmehwish7750@gmail.com

This paper aims to employ the Yang-Abel-Cattani (YAC) fractional derivative to examine the convective flow of a Carboxy Methyl Cellulose (CMC)-based carbon nanotube (CNT) nanofluid within a vertical micro-channel. This investigation considers the flow of an electrically conducting fluid through a porous medium under the influence of a magnetic field, including thermal and mass transmission impacts. To more effectively capture the generalized memory effects, the YAC fractional operator with its Rabotnov exponential kernel has been employed offering a more accurate representation of the rheological behavior of nanofluid compared to other fractional operators. The system of dimensional governing equations has been obtained for the suggested flow problem with initial and boundary conditions, which has been further converted to dimensionless form by choosing appropriate dimensionless parameters. Exact analytical solution for the system of dimensionless governing equations like, velocity, temperature and concentration are achieved through the Laplace transform technique. Lastly, the impacts of key parameters like Prandtl, Grash of, fractional parameter etc are explored through graphical illustration by using Mathcad software, which interpreted the physical behaviour of the problem.

Keywords: Yang-Abdel-Cattani operator, nanofluid, porosity, channel flow, Rabotnov exponential kernel, Graphical representation, heat transfer.

HEALTH SCIENCES, PUBLIC HEALTH AND BIOINFORMATICS

Paper ID: ICETEMS-25-051

DEVELOPMENT AND CHARACTERIZATION OF SUPPOSITORY FORMULATION FOR RECTAL DELIVERY OF CLARITHROMYCIN

Sharoon Mirza

City University of Science & Information Technology, Peshawar

Email: doctorsharoonmirza@gmail.com

Clarithromycin (CLR), a broad-spectrum antibiotic, is widely used to treat genitourinary infections caused by Gram positive bacteria via conventional drug delivery approaches, such as tablets. However, bitter taste, nausea and first pass hepatic effects hamper its usage. Moreover, CLR exhibits poor flow property making it difficult to formulate into tablet dosage form. The current study aimed to formulate CLR suppositories to address limitations associated with its oral administration. Aims/Objectives: 1. To overcome the bioavailability issues associated with oral dosage form of Clarithromycin. 2. To avoid the bitter taste of Clarithromycin. 3. To consider the streamline administration process particularly for comatose patients, children, and geriatrics, to enhance the drug's efficacy and ease. Methods: CLR suppositories were prepared using a molding method and characterized by different analytical techniques to assess the bioavailability of the drug using in vitro and in vivo models. Results: Fourier Transform Infrared analysis indicated no significant chemical interaction between CLR and the suppository base. A higher drug loading was observed with an entrapment efficiency of 90 %. Physicochemical characterization demonstrated the compatibility of CLR with the suppository base, as supported by analytical parameters. XRD analysis confirmed a crystalline to amorphous transition, indicating that the drug has been successfully loaded in the formulation.

Keywords: Clarithromycin Suppositories Cocoa butter Analytical techniques, In vivo, In vitro

Paper ID: ICETEMS-25-053

TRANSDERMAL TRANSFERSOMAL HYDROGEL: A BREAK THROUGH IN CARBAMAZEPINE DELIVERY FOR EFFECTIVE EPILEPSY MANAGEMENT

Wahid Hussain

City University of Science & Information Technology, Peshawar

Email: wahid.hussainn1999@gmail.com

This study focused on developing and evaluating therapeutic effectiveness of Carbamazepine loaded transfersomal hydrogel (CBZ-TRFsG) for the management of epilepsy. CBZ-loaded transfersome (CBZ-TRFs) were formulated using thin film hydration method and optimization was done through Design Expert software (Box-Behnken model). The optimized formula demonstrated particle size (PS) 137.3 nm, Zeta Potential (ZP) of approximately -28 mV and entrapment efficiency (EE) of 86%. The optimized (CBZ-TRFs) were added to Carbopol®934-based hydrogel and assessed for their physicochemical properties. Comprehensive characterization, as well as in vitro, ex vivo and in vivo evaluation was performed. (CBZ-TRFsG) demonstrated sustained release of drug and efficient skin penetration. Additionally, the nanocarrier system showed therapeutic efficacy in a PTZ-induced epilepsy model. The therapeutic potential was confirmed through in vivo anticonvulsants activity and behavioral studies i.e. light-dark box and Y-maze tests. The CBZ-TRFsG showed significant improvements in anticonvulsant activity, with an increased onset time of myoclonic, tonic clonic seizure and reduced duration of tonic clonic seizure. This study demonstrated that the novel CBZ-TRFsG provided substantial improvements in the PTZ-induced epilepsy model. Therefore, CBZ-TRFsG holds promise as a potential carrier system for epilepsy management. Furthermore, this nanocarrier system could be explored for the management of other neurological disorders.

Keywords: Carbamazepine, Transfersome, Transdermal hydrogel, Epilepsy, PTZ induced epilepsy model, Drug delivery system.

Paper ID: ICETEMS-25-089

THE NEGLECTED ROLE OF KLEBSIELLA PNEUMONIAE IN FOOD-PRODUCING ANIMALS AND ITS CONSEQUENCES FOR FOOD SAFETY AND PUBLIC HEALTH

Saddam

City University of Science & Information Technology, Peshawar

Email: Saddam.khan@cusit.edu.pk

Klebsiella pneumoniae is a versatile bacterium capable of causing infections across multiple species. Although K. pneumoniae has been widely recognized for causing nosocomial infections in humans, its effect on animals' health, specifically bovine mastitis, has received inadequate attention. Besides its virulence, the ability of *K. pneumoniae* to uptake multiple antibiotic resistance (AR) elements is highly challenging. The main objective of this study is to isolate and identify the K. pneumoniae from mastitis milk. We isolated a total of 100 milk samples from animals having mastitis from different areas of district Peshawar for screening of K. pneumoniae. Firstly 24 (24%) *K. pneumoniae* were recovered after that ESBL resistance were checked among which 11 (52%) samples were confirmed as ESBL producing *K. pneumoniae*. The confirmed ESBL resistant K. pneumoniae were further checked for their antibiotic sensitivity against various classes of antibiotics. That showed highly resistance to, Vancomycin and Fusidic acid was (100%), while highly susceptibility was found to Amikacin, Ciprofloxacin, (81%). Also the ESBL positive *K. pneumoniae* were checked through PCR for the genes responsible for ESBL resistance that is blaCTX-M, blaSHV and blaTEM. All the three genes were detected in our isolates. According to our findings the percentages of these genes were blaCTX-M (27%), blaSHV (63%) and blaTEM (36 %) respectively. In our study it is concluded that selective pressure for propagation as well as the occurrence of resistant isolates is applied due to the prolonged and common use of antibiotics.

Keywords: Key words: Klebsiella pneumoniae, Prevalence, ESBL, Mastitis, AMR

Paper ID: ICETEMS-25-094

IMPACT OF FEATURE REPRESENTATION IN OFF-TARGET EVENT PREDICTION THROUGH CRISPR/CAS9

Faiza Hasin

City University of Science & Information Technology, Peshawar

Email: faizamaqsood782@gmail.com

This study examines how different feature representations affect the accuracy and interpretability of machine learning models for predicting CRISPR/Cas9 off-target activity. Starting from an XGBoost model trained on CHANGE-seq data, we extended the framework to support multiple sequence encoding methods, including NPM, Bulges, LEP, k-mer, One-Hot, One-Hot-5-Channel, 8XL, and Match-Mismatch encodings. We evaluated these encodings using two widely adopted datasets, CHANGE-seq and GUIDE-seq, under a leave-11-sgRNAs-out evaluation scheme. Model performance was assessed using AUPR for classification and Pearson correlation for regression, while interpretability was examined using SHAP, Partial Dependence Plots (PDP), and Accumulated Local Effects (ALE). Results show that Bulges and NPM encodings achieved the best classification performance, while OH5C delivered the highest regression accuracy. SHAP analysis highlighted key biologically relevant positions in the PAM-proximal region, confirming that models capture meaningful sequence patterns. Overall, findings demonstrate that feature representation has a direct impact on both predictive performance and biological interpretability. No single encoding dominates across all metrics, emphasizing the need to choose representations based on the specific balance between accuracy and interpretability required in CRISPR off-target prediction tasks.

Keywords: CRISPR/Cas9, off-target, feature representation, XGBoost, SHAP.

Paper ID: ICETEMS-25-092

IDENTIFICATION AND ANTIBIOGRAM ACTIVITY OF MRSA AND VRSA ISOLATED FROM SAMPLES OF UNTRIMMED NAILS

Aleeshba Tariq

City University of Science & Information Technology, Peshawar

Email: aleeshbatariq801@gmail.com

Fingernails are a perfect area for harboring bacteria such as Staphylococcus aureus. This bacteria under the long nails may cause diseases due to the contact of nails with food or while biting the nails. Therefore, nails play an essential role in the spread of many pathogens, even drug-resistant ones. Many bacterial pathogens are now resistant to multiple drugs. In recent years, several multi-drug resistant bacterial pathogens with epidemiological significance have emerged, such as MRSA and VRSA. Methods: A descriptive cross-sectional study was conducted on 50 randomly selected individuals in Peshawar, using sterile swab sampling technique. The isolates were grown on Mannitol Salt Agar and Nutrient Broth Agar subsequently identified using biochemical tests (oxidase, catalase, coagulase and DNase). The disc diffusion method was employed to evaluate their antibiotic susceptibility Patterns. Results: 50 samples were taken from untrimmed nails. The samples were cultured on MSA (Mannitol salt agar) and NBA (Nutrient broth agar) for bacterial growth. Gram staining was done which identify Gram positive cocci. Different antibiotic was used (Methicillin, Vancomycin, Teicoplanin and Linezolid). Methicillin and Vancomycin was strongly Resistant to *S. aureus* whereas Teicoplanin and Linezolid was strongly Sensitive to *S. aureus*.

Keywords: MRSA, VRSA, untrimmed nails, Mannitol salt agar, Disc diffusion tests

Paper ID: ICETEMS-25-096

PROGNOSTIC VALUES OF ELECTROLYTES ABNORMALITIES AND CARDIAC BIOMARKERS IN ACUTE MI AND DURING THE CONVALESCENT PHASE: A COMPARATIVE STUDY

Dur-E-Shahwar Khan

City University of Science & Information Technology, Peshawar

Email: fakhrunnisa16.03.2006@gmail.com

This study compared the prognostic values of electrolytes abnormalities and cardiac biomarkers in myocardial infarction patients during the acute phase and the convalescent phase. Data was collected from 100 patients, including both male and female participants. The study found a significant reduction in Troponin I levels during the acute phase and a significant low serum sodium and potassium levels in patients during the convalescent phase. The study concluded that sodium and potassium levels are ideal biomarkers for diagnosing acute myocardial infarction, aiding in prognosis assessment. Keywords: Myocardial infarction, Troponin I, electrolytes, sodium, potassium, chloride, acute phase, convalescent phase, cardiac biomarkers, prognosis, cardiology.

Keywords: Keywords: Myocardial infarction, Troponin I, electrolytes, sodium, potassium, chloride, acute phase, convalescent phase, cardiac biomarkers, prognosis, cardiology.

Paper ID: ICETEMS-25-101

DETERMINANTS OF LOW PRACTICE PATTERN OF PERIPHERAL NERVE BLOCKS IN PUBLIC AND PRIVATE SECTOR HOSPITALS OF PESHAWAR, PAKISTAN

Muhammad Hamza

City University of Science & Information Technology, Peshawar

Email: muhammadhamz99@gmail.com

Peripheral nerve blocks (PNBs) are globally recognized for their safety, effectiveness, and ability to reduce dependence on general anesthesia. However, their routine use in Pakistan, particularly in Peshawar—remains limited. Despite the potential benefits of improved pain control and reduced anesthesia-related risks, little local evidence explains this low adoption. This study investigates the determinants behind the limited practice of PNBs across public and private hospitals in Peshawar. Objective: To identify and understand the key barriers contributing to the low practice of peripheral nerve blocks among anesthesia professionals, including issues related to training, resources, institutional policies, and clinical awareness. Methods: A hospital-based cross-sectional study was conducted using a structured questionnaire administered to anesthesia professionals (n = 285) through convenience sampling. Ethical approval was obtained from relevant hospitals. Data were analyzed using SPSS version 22. Results: Several barriers to PNB practice were identified, including equipment limitations (55.1%), inadequate knowledge and skills (39.6%), surgeon-related factors (3.5%), and cost constraints (1.8%). Reported complications associated with PNBs included local anesthetic toxicity (44.9%), pneumothorax (20.4%), respiratory depression (22.5%), neurological deficits (7.7%), wrong-side blocks (3.5%), and cardiac arrest (1.1%). Statistical analysis demonstrated a significant association between these complications and the identified barriers.

Keywords: Peripheral nerve blocks, Regional anesthesia, Barriers, Training limitations, Equipment availability, Anesthesia practice

Paper ID: ICETEMS-25-103

EFFFECTS OF COGNITIVE BEHAVIORAL THERAPY ON STRESS, ANXIETY, DEPRESSION AND SELF-ESTEEM OF NURSING STUDENTS

Amanullah Khan

City University of Science & Information Technology, Peshawar

Email: amanullah.khan@cusit.edu.pk

Mental health problems are considered to be the most serious public health issues among students at college level who are in a state of transition from higher secondary schools to university level. Elevated levels of stress, anxiety and depression are frequently reported among these students which not only affect their academic performance, but also badly influence the overall health and well-being. all health and well-being. The purpose of the study was to identify effective mental health intervention to address the mental health issues of the students at university level. The objective of this study was to investigate the effect of cognitive behavioral therapy on levels of stress, anxiety, depression and self-esteem among undergraduate female nursing students. Quasi-experimental One group Pre-test, post-test approach was used for conducting this study. Purposive sampling technique was implied for recruitment of the participants. Written informed consent was secured from the participants. Thirty-five female nursing students matching the inclusion criteria were included in this study. DASS 21 and RSE scales were used for data collection. Data were entered into computer software statistical package for social sciences version 16, for analysis. The level of self-esteem, however, remained un-influenced. CBT may be used as an effective intervention to address mental health problems like stress, anxiety and depression among nursing students.

Keywords: Key Words: Cognitive behavioral therapy. CBT, Stress, Anxiety, Depression, Self-esteem, nursing students, undergraduate students.

Paper ID: ICETEMS-25-095

DOMINANCE OF IRON DEFICIENCY ANEMIA IN ADOLESCENT FEMALES IN OUTPATIENT'S DEPARTMENT OF HAYATABAD MEDICAL COMPLEX HOSPITAL PESHAWAR, PAKISTAN

Qaisar Shah

City University of Science & Information Technology, Peshawar

Email: qaisar.shah@cusit.edu.pk

A common public health issue, especially in developing countries, is iron deficiency anemia. Teenage girls are more vulnerable because of their fast growth, higher iron needs, and menstruation. In order to shed light on a serious health concern in this susceptible group, this study investigates the prevalence, severity, and contributing factors of IDA among teenage girls who visit the outpatient department at Hayatabad Medical Complex, Peshawar. This study was aimed to find the prevalence of iron deficiency anemia in adolescent females (10 to 19 years old) in Hayatabad Medical Complex from the Outpatient Department. 306 adolescent girls between the ages of 10 and 19 participated in a six-month cross-sectional study. To diagnosis IDA, hematological analyses such as serum ferritin assays and CBC have been performed. SPSS version 22 was used for data analysis. The study, which involved 306 participants between the ages of 10 and 19, discovered that the overall prevalence of IDA was 35.9%, with the highest incidence occurring in the 17–19 age range (19.9%). The prevalence of anemia overall, including non-IDA forms, was 68.3%. Of the individuals, 33.3% had mild anemia, 23.2% had moderate anemia, and 11.8% had severe anemia. There were notable socioeconomic differences; IDA rates were greater in the middle-income (22.2%) and low-income (11.8%) groups than in the high-income (2.3%) group. Adolescents in urban areas were more prevalent (27.5%) than those in rural areas (8.5%). The study's findings highlight the critical need for public health programs that target IDA in teenage girls by enhancing food education, providing iron supplements, and providing socioeconomic support.

Keywords: Prevalence, Iron Deficiency Anemia, Adolescent Females, Serum Ferritin, HMC

Paper ID: ICETEMS-25-119

SUB-THRESHOLD NEUROMUSCULAR ELECTRICAL STIMULATION (NMES)-ASSISTED ROTATIONAL GLIDES FOR ACCELERATED FUNCTIONAL RECOVERY IN POST-IMMOBILIZATION SHOULDER STIFFNESS

Muhammad Suleman Sikander

City University of Science and Information Technology

Email: muhammad.suleman@cusit.edu.pk

Sub-threshold Neuromuscular Electrical Stimulation (NMES)-Assisted Rotational Glides for Accelerated Functional Recovery in Post-Immobilization Shoulder Stiffness. Conventional manual therapy for post-immobilization shoulder stiffness often involves painful, high-grade mobilizations. This pilot randomized controlled trial (RCT) introduces the novel combination of continuous sub-threshold Neuromuscular Electrical Stimulation (NMES) synchronized with low-grade Rotational Glides (RG) to leverage neurological priming and muscle guarding reduction for accelerated functional gain. Thirty-two participants with non-diabetic shoulder stiffness following 4-6 weeks of immobilization were randomized into two groups for a 4-week. This suggests the continuous NMES likely inhibited protective muscle co-contraction, enabling greater end-range tissue elongation during the glides. The synchronous application of sub-threshold NMES with Rotational Glides represents a novel, pain-mitigating, and highly effective accelerated approach to treating post-immobilization shoulder stiffness. This methodology warrants further investigation as a superior alternative to traditional high-grade mobilization techniques.

Keywords: Shoulder Stiffness, Neuromuscular Electrical Stimulation (NMES), Rotational Glides, Manual Therapy, Randomised Controlled Trial (RCT)

Paper ID: ICETEMS-25-163

PREVALENCE OF MIGRAINE, ITS REALTED DISABILITIES AND ITS IMPACT ON QUALITY OF LIFE IN UNDERGRADUATE STUDENTS OF PRIVATE SECTOR UNIVRSITIES OF PESHAWAR

Baz Meer

City University of Science & Information Technology, Peshawar

Email: bazmeer.afridi786@gmail.com

Headache (migraine), a common neurological disorder, is characterized by recurrent episodes of moderate to severe throbbing pain, often accompanied by symptoms such as nausea, vomiting, and sensitivity to light and sound. This study aimed to assess the prevalence of headaches, determine the associated disabilities, and evaluate the impact of headaches on the quality of life among students in private sector universities in Peshawar. A cross-sectional study was conducted from January to June 2023, involving 226 students (122 males and 104 females), aged 19 to 24 years, attending private universities in Peshawar. A total of 226 students participated in the study, with 122 males (54.0%) and 104 females (46.0%). The average age of male participants was 22.42 ± 2.22 years, while female participants had an average age of 21.91 ± 1.91 years. Among the male participants, 41 (33.6%) reported experiencing headaches, while 81 (66.4%) did not. In contrast, 40 (38.5%) female participants experienced headaches, and 64 (61.5%) did not. According to the migraine disability assessment, 145 participants (64.5%) reported no disability, 6 (2.7%) had minimal or no disability, 22 (9.7%) had moderate disability, 45 (19.9%) had severe disability, and 8 (3.5%) experienced extreme disability. The prevalence of headaches was slightly higher among females than males. Significant risk factors associated with headaches included head injury, poor neck posture, nerve tension from accidents, and cervicogenic pain.

Keywords: Disability, Migraine, Quality of Life, undergraduate student

Paper ID: ICETEMS-25-175

PRECLINICAL ANTITUMOR EFFICACY ASSESSMENT OF GREEN SYNTHESIZED ZNNPS AGAINST CCL4 INDUCED HEPATOTOXICITY IN ALBINO RATS

Arbab Muhammad Amir Khan

City University of Science & Information Technology, Peshawar

Email: arbab@cusit.edu.pk

Hepatocellular carcinoma (HCC) is the most common primary liver cancer in adults, frequently arising in the setting of chronic liver disease. There is a continuous need for novel, cost-effective, and environmentally sustainable therapeutic agents. This study aimed to evaluate the therapeutic potential of green-synthesized Berberis aristata-induced Zinc nanoparticles (BrZnNPs) in attenuating carbon tetrachloride (CCl_4)-induced hepatocellular carcinoma in an Albino rat model. BrZnNPs were synthesized using a green synthesis method with Berberis aristata extract. The nanoparticles were characterized using dynamic light scattering (DLS), zeta potential, scanning electron microscopy (SEM), Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), and energy-dispersive X-ray spectroscopy (EDX). Characterization studies confirmed the successful synthesis of stable, spherical BrZnNPs. The plant extract contained significant phenolic and flavonoid compounds, which facilitated reduction and stabilization. In vivo results demonstrated that BrZnNPs, particularly at a dose of 2.56 mg/kg, significantly reduced elevated serum levels of ALT, ALP, and AST compared to the CCl_4 control group, indicating attenuation of liver damage. Histopathological analysis corroborated the biochemical findings, showing improved liver architecture with minimal hepatocellular damage. The therapeutic effect of BrZnNPs was comparable to, and in some aspect's notable against, the standard drug Silymarin. The findings underscore the potential of green-synthesized BrZnNPs as an eco-friendly, economically viable, and effective therapeutic agent against experimental hepatocellular carcinoma, warranting further investigation

Keywords: Berberis Aristata, Zn Nanoparticle, Liver Cancer, Nanoparticles Characterization

Paper ID: ICETEMS-25-055

COMPREHENSIVE COMPUTATIONAL AND IN VIVO APPROACHES TO ASSESS THE ANALGESIC ACTIVITY OF THE SELECTED FLAVONOIDS FROM THE MACLURA PLANT AGAINST THE MU-OPIOID RECEPTOR

Ashraf Ullah Khan

City University of Science & Information Technology, Peshawar

Email: ashrafwazir6@gmail.com

The Maclura plant and its active constituents have been reported for various biological activities including inflammation, cancer, and neurological disorders. The various flavonoids that are reported from the Maclura plant include Morin, Rutin, Quercetin, and Kaempferol. These constituents were evaluated in the present study against the central pain receptor, i.e., Mu-opioid receptor, whose activation is associated with a significant reduction in pain responses. The computational studies showed that Morin and Rutin bind with the Mu receptor vividly and the highest binding score was noted with the Mu receptor. The docking studies of the top two compounds (Morin and Rutin) were subjected to assess the dynamic behavior of ligand-receptor complexes using molecular dynamic simulation. The simulation studies showed marked stability of both Morin and Rutin with Mu receptor and no significant changes were noticed in the protein following binding with the receptor. The simulation studies were commenced by the free binding energies calculation using MM-PBSA/GBSA analysis. The results of the simulation were validated by the free energy calculations and revealed favorable binding affinities of the Morin and Rutin with the Mu receptor. Furthermore, the PCA analysis and free energy landscape analysis further validated the results and exhibited dynamic stability of the complexes during the transition of the conformation. Additionally, the in vivo analgesic studies were performed to validate the result of the computational studies.

Keywords: Acetic acid, Carrageenan, MD simulation, MM-GBSA, MM-PBSA, Molecular Docking

Paper ID: ICETEMS-25-056

SYNTHESIS AND EVALUATION OF ANTI-INFLAMMATORY AND ANTI-NOCICEPTIVE POTENTIAL OF NOVEL ACYL HYDRAZONE DERIVATIVES OF KETOPROFEN USING DFT, VIRTUAL SCREENING, MD SIMULATION AND BINDING FREE ENERGY CALCULATIONS

Ashraf Ullah Khan

City University of Science & Information Technology, Peshawar

Email: ashrafwazir6@gmail.com

In this study, the ketoprofen derivatives were evaluated against inflammation and nociception using comprehensive computational methods. These derivatives were synthesized by modifying the structure of ketoprofen, a well-known NSAID (nonsteroidal anti-inflammatory drug) used clinically for the management of pain and inflammation. The virtual screening was performed to predict the binding affinities of the ketoprofen-based acyl hydrazone derivatives with key inflammatory and pain-related targets including cyclooxygenase-2 (COX-2), Transient Receptor Potential menthol-8 (TRPV1), c-Jun N-terminal Kinase-3 (JNK3), Extracellular Receptor Kinase (ERK) and Purinergic Receptor Type Y1 (P2Y1) to obtain the top hits. The virtual screening studies revealed the top hits such as COMP2, COMP10, COMP16 and COMP17 against the target protein. Based on the virtual screening, Molecular Dynamic (MD) simulation was performed on the top hits for 50 ns by using parameters like Root Mean Square Fluctuations (RMSF), Root Mean Square Deviation (RMSD), Radius of Gyration (RoG), Solvent Accessible Surface Area (SASA) and hydrogen bonds. Furthermore, the per-residue decomposition was carried out to evaluate each amino acid involved in the ligand-protein interaction, and highest contributing amino acid in terms of energy involved in the ligand-protein interactions. In conclusion, the four compounds showed significant activity against pain and inflammation based on the computational analysis; however, to employ it clinically further analysis will be required.

Keywords: Anti-inflammatory, anti-nociceptive, MM-PBSAMM-GBSAMD simulation

ENGLISH

Paper ID: ICETEMS-25-003

REIMAGINING RESISTANCE: THE HUDOOD ORDINANCE THROUGH THE LENS OF A CASE OF EXPLODING MANGOES

Hamza Bin Anees

City University of Science & Information Technology, Peshawar

Email: hamzaofficialwork2009@gmail.com

Literature has long served as a powerful tool of resistance against oppressive legal structures, exposing the inherent contradictions and injustices within the legal system. This research paper examines Mohammad Hanif's novel A Case of Exploding Mangoes through the lens of Critical Legal Studies (CLS) to highlight how the novel serves as a critique against the Hudood Ordinance, 1979. By employing qualitative content analysis, the study highlights how Hanif's satirical narrative deconstructs the legitimacy of laws, such as Hudood Ordinance, that reinforce state power and silence dissent. The novel's portrayal of legal absurdity in Hudood Ordinance sheds light on the complicity of legal authority in maintaining the status quo. Through a close reading of A Case of Exploding Mangoes, this research paper postulates that literature can challenge hegemonic discourses by reimagining resistance and exposing oppressive legislation. The analysis alludes to the notion that fictional narratives not only reflect socio-legal realities but also offer substitute spaces for critique and resistance. By foregrounding the nexus of law, power, and narrative, this research highlights the role of literary discourse in contesting legal authoritarianism and articulating a call for justice.

Keywords: Literature, Resistance, Hudood Ordinance, Critical Legal Studies, Oppressive Legislation

Paper ID: ICETEMS-25-013

STYLISTIC DEVIATIONS AND FIGURATIVE LANGUAGE IN KAMILA SHAMSIE'S "OUR DEAD, YOUR DEAD"

Zara Ilyas

City University of Science & Information Technology, Peshawar

Email: zarailyas850@gmail.com

Stylistic Deviations and Figurative Language in Kamila Shamsie's "Our Dead, Your Dead" ABSTRACT : This research critically examines Kamila Shamsie's short story Our Dead, Your Dead through the stylistic model of Leech and Short (2007). Unlike conventional literary studies that prioritize historical or thematic perspectives, this work highlights the central role of linguistic form in shaping literary meaning. The study adopts a qualitative and descriptive approach, with particular attention to figurative devices such as metaphor, imagery, simile, personification, and hyperbole, alongside multiple categories of linguistic deviation including lexical, semantic, grammatical, graphological, and phonological shifts. By analyzing these features, the research demonstrates how Shamsie's manipulation of language foregrounds themes of identity, memory, and trauma while simultaneously enriching the narrative's aesthetic and emotional impact. The findings establish that Shamsie's stylistic techniques function not as embellishment but as an integral component of her storytelling, offering new interpretive possibilities for readers. In applying Leech and Short's framework to South Asian diasporic fiction, this study extends the applicability of stylistic theory and contributes to ongoing debates about the relationship between language, form, and meaning in contemporary literature.

Keywords: Stylistics, Leech and Short

Paper ID: ICETEMS-25-099

IDEOLOGICAL COMPONENTS IN NELSON MANDELA'S SPEECH' GLORY AND HOPE': A CRITICAL DISCOURSE ANALYSIS

Masood Ur Rahman

City University of Science & Information Technology, Peshawar

Email: masaud621@gmail.com

According to systemic functional linguistics (SFL), language serves to account for different functions in different social settings and serves both personal and social purposes. In other words, language is not only a tool of communication but also a means through which social realities are constructed. Critical discourse (CD) analysts regard language not just a mere activity of producing utterances, but as a socially driven activity shaped by ideology and power. This research aims to analyze the inaugural speech of Nelson Mandela, Glory and Hope, in order to uncover its hidden meanings and ideological components. Inaugural speeches always carry much significance due to its special context of production. The 'Three-dimensional approach' of Fairclough is used to analyze the text to examine how linguistic choices contribute to the construction of the dominant ideologies of 'unity and freedom'. This model views any text from three interconnected levels: the textual level, the discursive practice, and social practice level. The analysis reveals that Mandela uses certain rhetorical and linguistic devices- such as repetition, parallelism, simile, metaphor and personification, to propagate his ideology in exciting way. These linguistic tools help Mandela build solidarity, inspire hope, and persuade the audience to align them with his political aspirations. Result shows that politicians rely on certain linguistic tools and certain discursive strategies to shape public opinion, promote their ideology, and legitimize their authority. Overall, the study implies that language in political discourse functions not only to inform the audience but also to influence, mobilize, and unify the society towards shared goals.

Keywords: Critical Discourse Analysis (CDA), Systemic Functional Linguistics (SFL), Fairclough 3D model, Rhetorical devices

Paper ID: ICETEMS-25-115

A COMPARATIVE ANALYSIS OF FEMINISM FROM THE PERSPECTIVE OF WESTERN FEMINISTS AND ALLAMA IQBAL

Sundas Qureshi

City University of Science & Information Technology, Peshawar

Email: sundasq72@gmail.com

Feminism has long been a complex and widely debated topic among researchers, philosophers, thinkers, and poets, prompting a range of perspectives on the status and nature of women. This study examines feminism from a different angle by exploring the status of women through the lens of Allama Iqbal. It aims to compare Western feminist concepts with Iqbals understanding of womanhood as reflected in selected poems from Zarb-e-Kaleem. Using textual analysis, the study interprets relevant stanzas and lines in light of Iqbals philosophical ideas alongside the theories of various Western feminist writers. The analysis suggests that Western society reduces women to instruments of its own agendas, diverting them from their natural roles. In contrast, Allama Iqbal portrays women as pure in character, guardians of their honour and modesty, central to the moral and aesthetic beauty of the universe, and empowered through the institution of motherhood. He emphasizes that women hold a dignified and influential position, while men bear the responsibility of protecting and supporting them. The findings indicates that in Western opine female is mere a tool of their lust and associate frailty with their nature, they have failed to recognize and to claim the true nature of women. Overall, this study offers a fresh perspective on feminist discourse by highlighting Allama Iqbals unique conceptualization of womanhood. It contributes to ongoing scholarly discussions and provides new insights for future research on feminism from non-Western and philosophical perspectives.

Keywords: Feminism, Allama Iqabal, western feminists, status of women