GECT RESEARCH BULLETIN

VOLUME 5
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Compiled by Institute Research Advisory Council (IRAC)

Principal's Message

Research in engineering colleges has recently grown to various levels of sophistication, helping the enthusiastic faculty and students to channelize their knowledge, passion, and energy into conceptual - based education. After ensuring that some of their findings are economically feasible and sustainable,the researchers often try to implement them in our society. GEC Thrissur also follows the same trend.

The Vol 5, second edition of GEC Research Bulletin has arrived with more vigour, creating a platform for showcasing the research findings of our faculty and students. This year, GEC is proud to have 5 Research Scholars with Ph D qualification to their credit and let me congratulate each one of them and their Guides for this great achievement. As already mentioned in the previous edition, we will be witnessing an International Conference ICETEST 2023from April 19th to 21 with eminent speakers and delegates with maximum expertise in their respective areas, from across the globe. The intention behind this programme is to trigger and sustain lively and thought provoking discussions on various research findings and related matters. I hope to see many participants from GEC to project their innovative ideas. I do expect your whole hearted co – operation and involvement in bringing out the best out of this significant event.

Let me also bring to your attention the amazing role of KSCSTE in providing financial assistance for doing research work on relevant topics. The entire GEC family takes this opportunity to congratulate Dr Praseetha P Nair and Dr SubinPoulose who could benefit from this scheme. I urge all of you to utilize this opportunity and look forward to see more and more faculty members bringinglaurels to our institution. Last but not the least, my sincere words of appreciation to Mr M Sajith Kumar & team (Akshara Susan Shaju, Indrajith R, Udhav P V) of the Electronics Dept. who could hand over their own product - SPR Characterization Apparatus- to CMET.

Of course, I should not forget the hard work and the team spirit exhibited by the editorial team for bringing out this brilliant edition on time.

With Best Wishes,

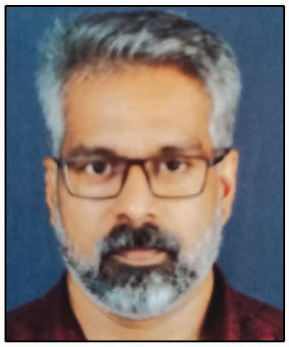
Dr Ranjini Bhattathiripad T
Principal

Dr Ranjini Bhattathiripad T
Principal

GEC's Proud Moments

Congratulations to PhD Holders...

Dr Blessy Thomas



Dr Dileesh E D

Dr Ezudheen P

Dr Jayan T D

Dr Needhu Varghese

Research Advisory Council of GEC Thrissur has immense pleasure to congratulate our faculty members Prof. Ezudheen P of Computer Science and Engineering and Sri. Jayan T D of department of Physical Education. And Ms. Blessy Thomas of department of Civil Engineering, Ms. Needhu Varghese of department of Electrical Engineering, Sri. Dileesh E D of department of Computer Science and Engineering for acquiring Ph. D.

Congratulations

Details of Ph.D Awardees

Sl. No	Name of Ph. D Awardee	*Research* Supervisor	Title of the Work	Date of Award & University
1	BLESSY THOMAS	Dr Sumam K.S. Professor (Retd) in Civil Engineering,	Effect of Blood Transients on Cardiovascular System	15.11.2022, University of calicut
2	JAYAN T D	Dr. Biju Lukose	Effects of isolated and combined multimedia and traditional training on physical, physiological and skill performance variables of intercollegiate soccer players	09/12/2022, Bharathiar University
3	NEEDHU VARGHESE	REJI P Professor (Rtd), EEE and MEENAKSHY K Professor, EEE	Management of Hybrid Energy system using Adaptive : Neuro-FuzzY Inference SYstem z 22"d	02/12/22, University of Calicut
4	EZUDHEEN P	Dr. Deepak D'Souza	Learning Invariants for Verification of Programs and Control Systems	21/12/2022, IndianInstitute of Science (IISc) Bangalore.,
5	DILEESH E D	Dr. A. P. Shanthi, CSE, Anna University	Memory Behaviour Based Models for Program Integrity Verification and Anomaly Detection Against Code Reuse Attacks	1/12/2022, Anna University, CEG,Chennai,

Congratulations to the contributors.....
RESEARCH ARTICLES

Electronics & Communication Engineering

K. Manohar, A. R. Jayan and R. Rajan, "Mlphon: A Multifunctional Grapheme-Phoneme Conversion Tool Using Finite State Transducers," in IEEE Access, vol. 10, pp. 97555-97575, 2022, doi: 10.1109/ACCESS.2022.3204403.

Mechanical Engineering

C P Priyanka, U Sudeep, K K Ramachandran, Quantification of cell adhesion of biological samples through image processing methods applied to fluorescent micrographs (July 14, 2022), SSRN: https://ssrn.com/abstract=4295916, DOI: http://dx.doi.org/10.2139/ssrn.4295916

K Jose Tennison, K K Ramachandran, Production, Characterization and Performance Studies of Coconut Testa Biodiesel Proceedings of ICSEE2022 (December 9, 2022), SSRN: https://ssrn.com/abstract=4297980, DOI: http://dx.doi.org/10.2139/ssrn.4297980

Architecture

Bindu C.A., Vishnudas S. Measuring Disaster Resilience at Community Level and Exploring the Prospects of Revitalizing Communities Coalescing Disaster Risk. In: Ghosh C., Kolathayar S. (eds) A System Engineering Approach to Disaster Resilience. Lecture Notes in Civil Engineering, vol 205 (2022). Springer, Singapore. https://doi.org/10.1007/978-981-16-7397-9_21

Bindu C A & Kiran Kumar S,Resilience master plan as the pathway to actualize sustainable development goals – A case of Kozhikode, Kerala, India in Progress in Disaster Science 14 (2022) 100026 https://doi.org/10.1016/j.pdisas.2022.100226 (Scopus indexed)

Bindu C A & Betty Maria Chacko, "GIS based participatory mapping: A tool for disaster risk reduction and adaptation", in International Journal of Novel research and development (IJNRD)/UNRD.ORG, ISSN: 2456-4184, Vol 7, Issue 10, October 2022.

Mathematics

Seema Varghese, Non-existence of Forbidden Subgraph Characterization for H-line graphs CREAT. MATH. INFORM. Volume **32**(2023), No. 1,Pages 121–125, **DOI: https://doi.org/10.37193/CMI.2023.01.11**

Share your Expertise!

IRAC congratulates Dr. Ramachandran K K, Professor of ME, for his great contribution to the research community. Details of his research activities are listed below. He has reviewed 10 Research articles (for SCI indexed journals) during July-Dec 2022.

Sl. No.	Conference/FDP Details	Role	Title of the Speech
1	5th International Conference on System, Energy and Environment, ICSEE 2022, 5 -6 August 2022, TEQIP II, Government College of Engineering Kannur, Kerala, India.	Keynote Speaker	An Introduction to high entropy alloys
2	FDP organized by the department of physics, Bangalore Institute of technology, Karnataka, India from 10 -13 November 2022	Invited Speaker	Thermoelectric Engines – An overview
3	FDP on Carbon Materials, 30th Nov – 2nd Dec 2022, organized by the Chemical Engineering Department of GEC Thrissur	Invited Speaker	Carbon Composites

Ar. Bindu C A chaired a session on **PPP (public private Partnership)** for Bodhi - National Urban Conclave 2022 on theme "Re-inventing urban development through emerging tools and techniques, sharing of best practices and models" organized by GCDA & AMDA on **9th & 10th October 2022** at Bolghaty Palace Kochi.

THRISSUR INNOVATIVE URBAN PLANNING PROGRAMME (TIE-UP) 2022-23

On November 7, 2022, at the Conference on "Learning, Playful and Liveable Thrissur," the TIE-UP programme was formally announced. Thrissur Municipal Corporation, KILA and School of Architecture and Planning, GEC Thrissur have been collaborating under various initiatives. As part of deepening the impact of these initiatives and bringing more relevant policies, plans and spatial strategies in the Thrissur city Memorandum of Understanding (MoU) was signed. Collaborating with the TIE-UP programme brings an opportunity for young, dynamic student planners (TIE-UP Fellows) to contribute to the development of local self-governing bodies by promoting urban planning. This Fellowship is conceptualized to provide short-term academic/research support for the Municipal Councillors who are formulating local policies and programmes on a wide range of themes. This Terms of Reference (ToR) is effective for 6 months starting from (November 2022) and continues until the (April 2023) will be ongoing until terminated by agreement between the parties.

THRISSUR LEARNING CITY INITIATIVE

Thrissur corporation has received confirmation from UNESCO to be included in the Global Network of Learning Cities. On November 7, 2022, Shri M.B. Rajesh, honorable minister for LSG officially declared Thrissur to be a learning city in the presence of **Dr. R. Bindu**, honorable minister of higher education, at the Conference on "Learning, Playful and Liveable Thrissur." The corporation had submitted a proposal to the UNESCO Institute for Lifelong Learning, Hamburg, Germany, in partnership with Kerala Institute for Local Administration (KILA) and School of Architecture and Planning, GEC Thrissur.

The students of M.Plan (batch 2020-22) along with faculty members **Prof. Bindu C.A**. (head of the department) and **Ar. Devika K. C.** in the time span from August 2021- November 2021 worked on the studio project, titled "Envisioning Thrissur as a Learning City". The project consists of three parts. Part 1 makes an attempt to understand the learning city concept through case studies while Part 2 deals with a comprehensive study of Thrissur Corporation to understand its potentials and challenges to develop into a learning city. Finally Part 3 comes up with the vision, strategies and programmes that could be implemented in Thrissur to grow into a learning city.

The Learning City Thrissur initiative seeks to facilitate learning, build awareness and undertake actions around the areas of sustainability and regeneration, waste management, local history and heritage, traditional knowledge systems and more, to aid localisation and promote an active citizenry in the city.

Congratulations to the Investigators of Funded Research Projects

IRAC congratulates the funded research projects' principal investigators and co-investigators.

Sl. No.	Investigators	Title of the project	Funding Agency / Scheme	Sanctioned Amount
1	Dr. K K Ramachandran (P I) Dr. Arun M S – Co-Investigator	Investigation on properties and biocompatibility of hydroxyapatite and titanium diboride reinforced MgAZ91D Magnesium alloy hybrid composites	AICTE / RPS(Sanction Order No. 8-42/FDC/ RPS/POLICY-1/2021-22 dated 18/02/2022)	Rs. 8,95,266/-
2	Dr. Prasetha P- Nair (PI) Dr. Subin Poulose- Co-Investigator	Development of Hybrid Bio-nano composites using Cellulose Derivative/ Hydroxyapatite Matrix for Controlled Release of NPK Fertilizers	Under Engineering & Technology Programme (ETP), KSCSTE	Rs. 15,00,000/- (3 years)

PhD Abstracts

Effect of Blood Transients on Cardiovascular System
(BLESSY THOMAS)

Hemodynamics plays an important role in the development and progression of coronary artery diseases (CAD), especially atherosclerosis. The deposition of plaques inside coronary artery develops blockage, known as stenosis, which is the leading cause of death across the world as per WHO. During high physical and psychological activities, coronary arteries have to carry a higher volume of blood by self-expansion, such condition is known as hyperaemia. Hyperaemia can be a life-threatening condition for persons with coronary artery diseases (CAD). To have better understanding of local flow dynamics in patient specific stenosed arteries (33%, 66% and 85% stenosis), numerical analysis is done, using ANSYS FLUENT software. The study employed Transition Shear Stress Transport k-ù model to represent the arterial blood flow dynamics. The results show large variation in hemodynamic characteristics, viz., Wall Shear Stress (WSS), pressure drop, velocity, and turbulence and re-laminarization of flow in the post stenotic region. The WSS values exceed the permissible lower and upper ranges by a large margin, subsequently damaging the endothelial cells leading to development of secondary stenosis. Fractional Flow Reserve (FFR) is an index used by cardiologist for evaluating the criticality of stenosis. The study proposes a methodology for evaluating the FFR by using non-invasive method and reveals that stenosis at the order of 47% can be critical under hyperaemic conditions. Further the study reveals that the FFR value in the case of diabetic patients reaches critical value even when the stenosis is at the order of 40%.

Learning Invariants for Verification of Programs and Control Systems
(EZUDHEEN P)

Programs and control systems are two essential components of modern automation technologies. The reliability of systems that use these technologies thus depends on the correct functioning of these components. The thesis is about automated techniques for formally verifying the correctness of programs and control systems. A formal verification technique allows one to prove precise properties of mathematical models of software systems. It helps us get a higher level of assurance about the correct functioning of the system compared to techniques that use simulation and testing alone. This verification automation has been accomplished by combining deductive reasoning (automated theorem proving) with inductive reasoning (machine learning). The resultant toolchains can verify the band convergence properties of Simulink models; and pre-post specification of sequential, recursive or concurrent style programs within a few seconds.

Power Management of Hybrid Energy System Using Adaptive Neuro-Fuzzy Inference System
(NEEDHU VARGHESE)

The rate of energy utilization is expanding in all respects very quickly. The energy supply is draining because of the depletion of non-renewable energy sources, bringing about inûation and energy deficiencies. This work proposes a rule-based charge controller based on ANFIS for the battery of a standalone photovoltaic system. A semi-active battery supercapacitor hybrid energy storage system is proposed to stabilize the fluctuations in the DC voltage. Rule based charge controller with ANFIS is proposed to analyse the performance of solar and wind energy system with supercapacitor as energy storage system. The developed rule-based charge controller with ANFIS manages the power flow among the standalone photovoltaic sytsem and hybrid battery and supercapacitor with load management. The voltage fluctuations are eliminated and life time of battery is improved when a supercapacitor is used in hybrid with the battery.

Memory Behaviour Based Models for Program Integrity Verification and Anomaly Detection Against Code Reuse Attacks (DILEESH E D)

Computing systems are under the persistent threat of information leakage and unauthorized accesses. Computer systems' defence capabilities and attack vectors are evolving over each other. This work proposes strategies to detect run-time anomalies without any hardware or software modification in the underlying machine or the application code. The broad objective of the thesis is to build a behaviour model that detects run- time anomalies in applications. The specific objective is to detect the non-control- data attacks created using Return Oriented Programming (ROP) and Data Oriented Programming (DOP) strategies. The three major contributions proposed towards the detection of run-time anomalies are -M-PIVAD (Memory-usage based Program Integrity Verification and Anomaly Detection),F-PIVAD (Function-based Program Integrity Verification and Anomaly Detection), SCF-PIVAD (Security-Critical Function based Program Integrity Verification and Anomaly Detection).

Effects of isolated and combined multimedia and traditional training on physical physiological and skill performance variables of intercollegiate soccer players
(JAYAN TD)

Abstract
The purpose of the study was to find out the"effect of isolated and combined multimedia and traditional training on physical, physiological and skill performance variables of intercollegiate soccer players". To achieve the purpose, 120 men students were selected randomly as subjects from Junior Kollam Football Academy (JKFA) Kollam, Kerala, India. The selected subjects were divided into three experimental groups and a control group. Group I given training with multimedia, Group II given traditional training , Group III given combined training on three alternate days in a week for a period of sixteen weeks and Group IV acted as Control. The age of the subjects was restricted into 17 to 20 years. All the subjects in the experimental groups (I, II and III) were given their respective training programme for sixteen week's duration. The study was restricted to the following dependent variableswas restricted to the following dependent variables namely namely agility, cardiovascular endurance, explosive power, flexibility, speed, blood pressure, Resting heart rate, dribbling, passing and shooting, they were tested by standardized test items. The participants were trained for sixteen weeks of three days a week (alternate days). A pre and post-test randomized design was employed for this investigation. The collected data were statistically analysed by using dependent 't' test and ANACOVA. The Scheffe's test was used as post-hoc test to determine which of the paired means differed significantly where the differences in adjusted post-test means resided in univariate ANCOVA among four groups. All the above statistical analysis tests were computed at 0.05 level of significance (P<0.05). It
was concluded that, the multimedia training group, traditional training group and combined training group had significantly improved the participants' agility, cardiovascular endurance, explosive power, flexibility, speed, blood pressure, Resting heart rate, dribbling, passing and shooting. The combined training group had significantly performed than the traditional training and multimedia training group on the agility, cardiovascular endurance, explosive power, flexibility, speed, blood pressure, resting heart rate, dribbling, passing and hooting. Keywords: Multimedia training, traditional training

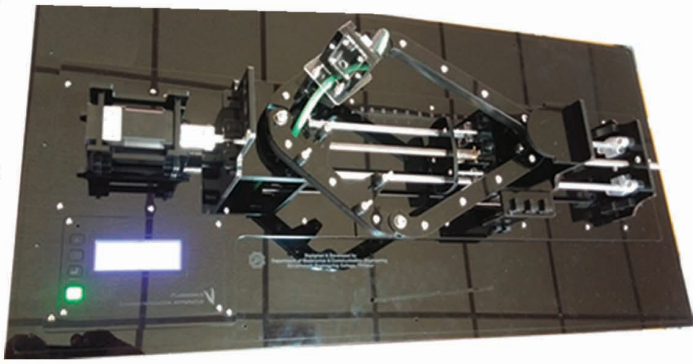
Seed money for research projects Granted by TEQIP

Research Seed Money granted for the topic 'Effect of web slenderness on lateral torsional buckling behaviour of monosymmetric I section subjected to end moments" to **Dr. Divya B Mathew,** Assistant Professor, Civil Engineering.

Congrats to Dr. Job!

Dr. Job Chunkath has been granted an IPR in the Federal Republic of Germany for the title "A Unified System for Error Control Coding and Peak-to-Average Power Ratio Minimization." This was part of the research work that resulted in his Ph.D. IRAC congratulates Dr. Job for his great achievement.

A tool developed for CMET Thrissur for the study of plasmonics



Department of Electronics & Communication Engineering has developed a tool, which is useful for the studies related to surface plasmons, as a student project.

Plasmonics is a branch of nanophotonics, which has emerged in connection with the phenomena called surface plasmon resonance (SPR). Plasmons are very sensitive to the properties of the material used to excite them and the medium around them. These properties have applications in biosensors, gas sensors, and solar panels.

Plasmonics is a major research and development area at the Centre for Materials for Electronics Technology (C-MET) located at Mulanganathukavu, Thrissur.

C-MET is a research centre set up by Government of India. The tool developed by ECE department of GEC Thrissur is very much useful for the studies related to surface plasmons. It was developed by GEC, after understanding the requirements of C-MET.

Dr. S N Potti, Scientist, Sri. Sumesh K & Sri. Vishnu K N research scholars CMET Thrissur and Sri. Sajithkumar M, Trade Instructor of ECE Department and students Akshara Soosan Shaju, Uddhav PM and R Indrajith were the team members.

Congratulations!

SAJITHKUMAR M
Trade Instructor

AKSHARA SOOSAN SHAJU
S7 ECE

UDDHAV P M
S7 ECE

R INDRAJITH
S5 ECE

Dr S N POTTI
Scientist
CMET Thrissur

12 മാതൃഭൂമി

പ്ലാസ്മോണിക് ഗവേഷണത്തിന് നവീന ഉപകരണം; ചരിത്രമെഴുതി വിദ്യാർഥികൾ

Thrissur engg college students devise research equipment for C-MET

Dear Colleagues,

GECT Research Bulletin is the official news bulletin of GEC Thrissur, intended to publish research activities of Students and Teachers. Kindly send the details of your research activities to the e-mail address gectresearchbulletin@gectcr.ac.in at the earliest.

The newsletter focuses on the following:

- Publications of faculty/staff/students in International/National Journals/Conference proceedings (please send the abstract)
- Awards/Achievements of faculty/staff/students in Research and Development activities
- Award of project funding/grants from external agencies
- Achievements of GECT Innovation centre
- Articles on latest research trends by faculty/staff/students
- Details with photograph of faculty/staff/students who secured Ph. D degree
- Details of Ph. D registration of faculty/staff/students under various research guides of our college and other institution.
- Details of synopsis presented/DC meeting held etc.

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