IEI Epitome

Volume 8 | Issue 12 | December 2023

A Century of Service to the Nation

In This Issue ...

announcements ...

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Special Contribution

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Ms H Roy

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Notification for IEI R&D Grant-in-Aid

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To promote appropriate technology, assist in building up design & research talents and, most importantly, to help in nurturing potential R&D venture amongst engineering students pursuing Diploma/UG/PG/PhD courses. The Institution of Engineers (India) had instituted the R&D Grant-in-Aid program way back in 2001.

Every year, the Institution invites applications for funding industry-oriented R&D projects and research initiatives aimed at improving the life-style of common people from engineering students pursuing full time Diploma/UG/PG/PhD engineering program in AICTE/UGC/NAAC approved Institutions / Colleges / Universities. The application form and guidelines are available in our website https://www.ieindia.org. The projects should be carried out under the guidance of faculty members who are Corporate Members of IEI. Membership criteria for student(s), guide(s) and institution(s) are as follows:

Project Category	Student/Applicant Membership	Guide(s) Membership	Institutional Membership
1. Diploma	Exempted [Membership of Student Chapter is desirable]	AMIE/MIE/FIE	Not Mandatory
2. UG (BE/BTech/ Equivalent)	'Student Member' (SMIE)	AMIE/MIE/FIE	Applicant's Institute should preferably be an Institutional Member with NBA/NAAC Accreditation or valid NIRF Rank
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4. PhD	AMIE/MIE/FIE	MIE/FIE	Applicant's Institute should preferably be an Institutional Member with NBA/NAAC Accreditation or valid NIRF Rank

The soft copy of the duly filled-up applications (in editable format), as per the proforma available on our website www.ieindia.org, should be sent through email to **research@ieindia.org** and one printed copy of the same should reach the following address:

The Director (Technical)
The Institution of Engineers (India)
8 Gokhale Road, Kolkata 700 020

Kindly go through the guidelines (visit link: **https://www.ieindia.org/webui/IEI-Activities.aspx#RnD-Initiative**) before filling up the application.

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Prof Gautam Biswas, FIE
Professor
Department of Mechanical Engineering, Indian Institute of Technology Kanpur,Uttar Pradesh
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Prof Gautam Biswas received the **2023 ASME Heat Transfer Memorial Award** in the science category for "sustained and outstanding scholarly contributions to thermal science and engineering, including heat transfer enhancement, phase change heat transfer with and without electro-hydrodynamic forces, and dynamics of liquid jet and droplet impingement" at the Heat Transfer Luncheon during the 2023 ASME International Mechanical Engineering Congress and Exposition (IMECE), October 29 to November 03, 2023 in New Orleans, Louisiana by American Society of Mechanical Engineers, New York, USA

Dr Shaik Qadeer, AMIE
Professor
Muffakham Jah College of Engineering and Technology, Hyderabad, Telangana
✉ haqbei@gmail.com

Dr Shaik Qadeer holds a **Patent** for the application of "**A Fuel Indicating and Tracking System and a Method thereof**".

Patent Number : 2022/10870
Date of Filing : 3/10/2022
Date of Grant : 21/12/2022
Co-Applicants' Names : Mohd Yousuf Khan, Modh Sanaullah Qaseem, Qazi Basheer and Hakeemuddin Ahmed
Published: Patent Journal, October 2022, Vol 55, No 10, ISSN 2223-4837
Issuing Authority : The Patent Office, South Africa

Dr A Keshav Bharadwaj, MIE
Specialist-Learning, Infosys
✉ abharadwajk@gmail.com

Dr A Keshav Bharadwaj received the Degree of **Doctor of Philosophy** in Computer Science and Engineering for his thesis titled "**Framework for Analysis of Software Requirements**" from PES University, Bangalore at the 8th Convocation held on 07 October 2023.

Dr Somnath Mahato, AMIE
Project Scientist III, Meteorological Training Institute (MTI), Indian Meteorological Department (IMD), Government of India, Pune, Maharashtra
✉ somnathmahato1@gmail.com

Dr Somnath Mahato received the Degree of **Doctor of Philosophy** in Electronics and Communication Engineering for his thesis titled "**Multi-Constellation Global Navigation Satellite System in Standalone and Real Time Kinematic Operation towards Enhanced Position Solution Accuracy**" from National Institute of Technology Sikkim on 25 November 2023.

Publication by the WFEO Committee on Information and Communication (CIC) — Hosted by IEI

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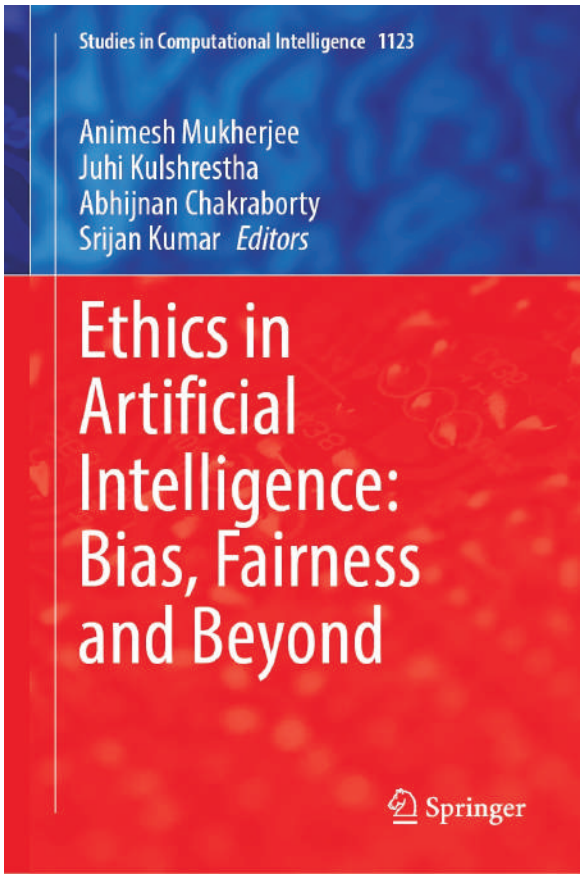
BOOK:

Ethics in Artificial Intelligence: Bias, Fairness and Beyond

Part of the book series: Studies in Computational Intelligence (SCI, volume 1123)



Abridged Foreword by Shri S S Rathore, Past President, IEI & Chair, WFEO-CIC

The Institution of Engineers (India), under the aegis of the WFEO Committee on Information and Communication (WFEO-CIC), is proud to bring you this book. It serves as a testament to our commitment to the ethical progression of AI. As we usher in an age where AI's influence on society is undeniable, it becomes imperative to equip ourselves with the critical thinking skills necessary to discern the ethical nuances that permeate this technology. The book delves into the pivotal role of Artificial Intelligence (AI) in the contemporary era, placing a strong emphasis on the ethical considerations enveloping its advancements. Titled "Ethics in Artificial Intelligence: Bias, Fairness and Beyond", this work serves as a comprehensive exploration of the intricate ethical landscape within AI, skillfully crafted by seasoned experts in the field. It meticulously addresses pressing questions and challenges concerning bias, discrimination, fairness, and accountability in AI systems.

Far beyond a mere examination of AI ethics, the book is presented as a guide and intellectual compass, offering valuable navigation through the intricate terrain of the AI landscape. It stands as a poignant reminder that the trajectory of Ai's future must be firmly anchored in ethical principles. Readers are not only invited but encouraged to embark on an enlightening journey through the book, where they can glean insights and perspectives that illuminate the ever-evolving realm of AI and its far-reaching societal implications.

About this book

This book is a collection of chapters in the newly developing area of ethics in artificial intelligence. The book comprises chapters written by leading experts in this area which makes it a one of its kind collections. Some key features of the book are its unique combination of chapters on both theoretical and practical aspects of integrating ethics into artificial intelligence. The book touches upon all the important concepts in this area including bias, discrimination, fairness, and interpretability. Integral components can be broadly divided into two segments – the first segment includes empirical identification of biases, discrimination, and the ethical concerns thereof in impact assessment, advertising and personalization, computational social science, and information retrieval. The second segment includes operationalizing the notions of fairness, identifying the importance of fairness in allocation, clustering and time series problems, and applications of fairness in software testing/debugging and in multi stakeholder platforms. This segment ends with a chapter on interpretability of machine learning models which is another very important and emerging topic in this area.

Keywords: Fairness, Bias, Discrimination, Interpretability, Ethics, Philosophy of Artificial Intelligence

Editors and Affiliations

Animesh Mukherjee, *Department of Computer Science and Engineering, IIT Kharagpur, West Bengal, India*

Juhi Kulshrestha, *Department of Computer Science, Aalto University, Espoo, Finland*

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Srijan Kumar, *School of Computational Science and Engineering, College of Computing, Georgia Institute of Technology, Atlanta, USA*

Bibliographic Information

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Dr Chockalingam Kunjan, FIE
Professor
Department of Mechanical Engineering, Thiagarajar College of Engineering, Madurai, Tamilnadu
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Title of Paper: **Mechanical, Corrosion and Biological Behavior of Centrifugal Casting Processed Mg–2Zn–1Mn Alloy Reinforced with β Tricalciumphosphate (βTCP) for Orthopaedic Applications**

Journal of Mechanical Behavior of Biomedical Materials, Elsevier, 144, 19 June 2023, ID 105983, Print ISSN: 1751-6161, Online ISSN: 1878-0180
DOI: https://doi.org/10.1016/j.jmbbm.2023.105983

Co-authors: Vignesh Chandran, Velkannan Veerapandian & Ramesh Kannan

Abstract: *Zinc and manganese were selected to develop magnesium alloys along with the bioactive ceramic β Tricalciumphosphate (βTCP) for biomedical applications fabricated by centrifugal casting. Microstructure, mechanical properties, corrosion properties, and biocompatibility of the Mg–2Zn–1Mn–xβTCP (x = 0, 2.5, 5 wt%) alloys have been investigated by use of an optical microscope, field emission scanning electron microscopy (FESEM), energy dispersive X-ray (EDX) analysis, XRD analysis, mechanical testing, cell toxicity and blood hemolysis. A microstructure study has shown that the addition of βTCP significantly reduces the size of the grain. The experimental results of mechanical testing and corrosion studies show that the Mg–2Zn–1Mn–2.5βTCP alloy performs better among the three alloys developed, and the values in Vicker's microhardness, compressive strength, density, and porosity with 47.32HV, 238.22 MPa,1.75 g/cm3 and 2.28% respectively and the values of corrosion potential (Ecorr), corrosion current density (Icorr), linear polarization resistance (Rp) and corrosion rate (mm/year) of the Mg–2Zn–1Mn–2.5 βTCP alloy in the outer and inner layers were found to be −1.46V, 2.71 ×10−5 A/cm2, 1677O, 0.62 mm/year and −1.41V, 3.92 ×10−6A/cm2, 4286O, 0.20 mm/year respectively. MTT Test and hemolysis experiments revealed that the magnesium alloy had no cell toxicity and good cytocompatibility, however, it produced hemolysis to the blood system. It was proposed that surface modification be used to improve the blood compatibility of the magnesium alloy for use in blood environments.*

Keywords: *Biological Behavior, Characterization, Centrifugal Casting, βTCP, Orthopaedic Applications*

Title of Paper: **Characterization of 3D-Printed Graphene-Reinforced PLA Scaffold for Bone Regeneration**

Emerging Materials Research, Emerald Publishing Limited, 12(4), December 2023, pp 1-13, Published Online: October 04, 2023, ISSN 2046-0147, E-ISSN 2046-0155
DOI: https://doi.org/10.1680/jemmr.23.00048

Co-authors: Manoharan Karthic, Chandran Vignesh & K Jawaharlal Nagarajan

Abstract: *In orthopedic application, bone tissue engineering (BTE) is a novel treatment method for bone defects involving bone regeneration using an artificial supporting structure called scaffold. The aim of this work is to fabricate graphene-reinforced poly(lactic acid) (PLA/Gr) scaffolds with different pore shapes (circular, square and hexagonal) and different pore sizes (1000, 1500 and 2000 μm) using the fused deposition modeling process. The characteristics of the three-dimensionally (3D) printed PLA/Gr scaffolds were analyzed through Fourier transform infrared spectroscopy, thermogravimetric analysis, derivative thermogravimetry, scanning electron microscopy and energy-dispersive X-ray spectroscopy. The water contact angle measurement showed a hydrophilic surface (70 ± 2.7°) for scaffolds with a pore size of 1000 μm. Mechanical property studies showed that the scaffold with circular 1000 μm pores had a compressive strength of 18.53 ± 0.90 MPa, which was similar to the cancellous bone value. In addition, this study involved an examination of the in vitro bioactivity, water uptake and biodegradation characteristics of the scaffolds. The results reveal that the 3D-printed PLA/Gr scaffold featuring a circular pore shape with a pore size of 1000 μm exhibits great potential as an implant for BTE.*

Keywords: *Biopolymer, Characterization, Scaffold, Bone Tissue Engineering*

Know-Your-Member (KYM)

The Institution of Engineers (India) is updating the database of all its Corporate Members along with their achievements for which a Know-Your-Member (KYM) form has been introduced.

Every Corporate Member is requested to kindly fill up the form and forward it along with the self-attested copy of photo ID proof to the address given below:-

The Director (Membership)
The Institution of Engineers (India), 8 Gokhale Road, Kolkata 700020
Email: datamemb@ieindia.org

The form can be accessed & downloaded at :
https://www.ieindia.org/WebUI/ajax/Downloads/WebUI_PDF/HIGHLIGHTS_DOCUMENT-3332.pdf

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Dr Kudiyarasan Swamynathan, FIE & Certified Professional Engineers, IEI
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Title of Paper: **PV based OFF Grid Charging Station for E-vehicles using PWM and Phase Shift Controlled Interleaved Three Port Converter**

S N Applied Science Journal,Springer Nature Switzerland AG, 5, 2023, article number 331, Electronic ISSN 2523-3971
DOI: https://doi.org/10.1007/s42452-023-05571-w

Co-authors: N Mahalingam, Alagumariyappan Paramasivam & Sankaran Vijayalakshmi

Abstract: *In recent years, Electric Vehicles are becoming more popular. The pollution level in the atmosphere can be effectively minimized by using Electric vehicles for large-scale transportation. A battery station is required for continuous operation; however, the Photovoltaic-based OFF grid charging station can only operate during the day. Therefore, the three-port converters have started to arise from a number of current EV charging station developments. In this study, a unique PWM and Phase Shift Controller are proposed to reduce switching losses and to improve reliability. In addition, for Maximum PowerPoint Tracking, a Fuzzy is added to the PV system. Furthermore, an appropriate interleaved boost converter topology is used to create the various charging voltages required for EV and battery stations. The proposed topology is simulated, and the hardware prototype has been created and tested. The result shows that the proposed topology has a better efficiency than the traditional converters.*

Keywords: *Charging Station, Electric Vehicle, OFF-GRID, Photovoltaic, PWM Converter*

Er Vipin Kumar Sharma, MIE
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Title of Paper: **Technical Modification of Alkali Leaching Circuit to Improve Slurry Throughput into the Autoclave**

Suranaree Journal of Science and Technology, Thailand, 30(4), July 2023, ISSN 0858-849X (print), E-ISSN 2587-0009 (online)
DOI: https://doi.org/10.55766/sujst-2023-04-e0998

Co-authors: Venkata Rajesh Namboori, Chandrasekhar Reddy Tunga, Koteswararao Lankalapalli, Suman Sarkar & Madala Srinivasa Rao

Abstract: *Tummalapalle Mill represents an alkali-leaching-based uranium processing plant. Alkali leaching occurs inside pressurized autoclaves at controlled temperature and pressure. Although the rated capacity of the Tummalapalle Mill is 3000TPD, only some obstructions were present to achieve the rated capacity. The technical study was done by the process and mechanical engineering team of Tummalapalle Mill for necessary improvements to achieve the rated power, which helped in the overall grinding rate of the processing plant. In the alkali leaching section of the Tummalapalle unit, Autoclaves (pressure vessels) are used for alkali leaching purposes. To run the plant at full rated throughput, i.e., 3000TPD, it is required to push the slurry into autoclaves by double hose-diaphragm pump through spiral heat exchangers with a sufficient flow rate. During the regular course of operation, each double hose-diaphragm pump was able to discharge a limited flow rate with the existing motor-designed parameters. This paper deals with the technical details of double hose-diaphragm pumps, recent technical modifications incorporated and consequent trials taken to increase the pump flow rate and thereby achieve the required throughput into autoclaves.*

Keywords: *Spiral Heat Exchanger, Electric Motor, Double Hose-Diaphragm Pump, Autoclave, Alkali Leaching*

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Er Aliasker K T, MIE
Research Scholar
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Title of Paper: **Exploring the Effects of Self-lubricating MoS_2 in Magnesium Metal Matrix Composite: Investigation on Wear, Corrosion, and Mechanical Properties**

Colloids and Surfaces A: Physiochemical and Engineering Aspects, Elsevier, 667A, November 2023, ISSN: 0927-7757
DOI: https://doi.org/10.1016/j.colsurfa.2023.132362

Co-authors: Gopal P M, Suresh V, S Naveen, S Madhu & K P Yuvaraj

Abstract: *The prime focus of this experimentation is to develop a lightweight self-lubricating surface composite with superior wear resistance. This article inquires into the consequences of Molybdenum di Sulphide (MoS_2) for its 2, 4, and 6 vol% dispersion on magnesium surface by applying friction stir processing (FSP). The prepared composites were analysed for their microstructure, mechanical, and wear characteristics. The observation of the microstructure reveals the smaller grain size as a result crystallization process occurring during FSP and the uniform dispersion of reinforced particles. The surface composite shows a growing tendency in its hardness which can be assumed as the outcome of the reduced grain size and reinforcement dispersion. On the other hand, the developed composite exhibited lower tensile characteristics than the base matrix. The composite shows constructive enhancement in wear resistance with the increase in the vol% of MoS_2 particles whereas the increase in load increases the wear rate. The value of the corrosion rate is decreased up to 60% with 2% reinforcement addition whereas further addition resulted in a higher corrosion rate.*

Keywords: *Mollydeum Disulphide, Self Lubricating, Magnesium, Friction Stir, Microstructure, Wear*

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Er Devesh Kumar Singhal, MIE
Director
Chandpur Enterprises Ltd, Tharpur, Uttar Pradesh
✉ deveshksinghal@gmail.com

Title of Paper: Safe Storage of Paper & Waste Paper and its Handling for Accident Free Operation

IPPTA: Quarterly Journal of Indian Pulp and Paper Technical Association, 35, E3, 2023, pp 112-114, ISSN: 0379-5462
URL: https://ippta.co/wp-content/uploads/2023/11/112-114-1.pdf

Abstract: *For past few years, end of winter months have been really tough for paper mills. These months often witness maximum fire accidents particularly in paper mills. This year too, some severe fire incidents were reported. Fortunately no casualties were reported in such incidents, but the quantum of losses was huge. This paper explores some possible strategies which may be considered to reduce the possibility of fire mishaps significantly.*

Keywords: *Paper Mill, Fire, Safety, Hazard, Accident, Waste Paper*

Dr Shaik Qadeer, AMIE 0961348
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Title of Paper: Low Power and Complexity Implementation of the Modified FFT with a New Bit-Slicing Scheme

The Institution of Engineers (India): Series B, October 2023, 104, pp 1285–1302
DOI: https://doi.org/10.1007/s40031-023-00923-x
Co-authors: Harsha Keerthan, Syed Azeemuddin & Mohammed Zafar Ali Khan

Abstract: *This paper talks over an efficient VLSI realization of the simplified arithmetic radix-2 Decimation In Time (DIT) Fast Fourier Transform (FFT) technique. High performance FFT processors are used in several types of signal processing, and in order to fulfil these performance demands, the processor must be parallel and pipelined. This enhanced radix-2 method is used to create an improved ASIC design that implements a fully pipelined and parallel architecture for the hardware realization of a 64 point FFT. This scheme uses lesser multipliers by reducing bit-width of twiddle representation for improved power, area and speed with a considerable Signal to Noise Ratio (SNR). A reduction of 32.8% is obtained in the area occupied, 25.08% reduction in power consumption and 20.8% improvement in speed in comparison to the Cooley–Tukey FFT realization. Compared with serial implementation an improvement of 90% and parallel implementation an improvement of 58% in latency count is observed. The design is simulated using Xilinx ISE WebPack 13.1 and synthesized using Cadence Encounter RTL Compiler with CMOS 180 nm technology.*

Keywords: *Fast Fourier Transform, Discrete Fourier Transform, VLSI Implementation, ASIC Design*

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We would like to thank our erudite members for sharing their professional achievements through the IEI Epitome and making the content more abounding and at the same time inspiring many others to share their accomplishments as well. To streamline the process and make it convenient for the member to give their inputs we would like to obtain the information in a more structured and comprehensive manner. We would request our members to send the details of their achievements as per the appended formats only.

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(ix)	Details of Award/Achievement#	
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(xi)	Supporting Documents/links [which are clearly indicative of the incumbent's achievement(s)]	

 # Reporting of Award of stipend/fellowship at PG/PhD level and awards from esoteric events/communities may be avoided.

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FORMAT FOR PATENT / DESIGNS / TRADE MARKS / GEOGRAPHICAL INDICATIONS BY MEMBERS

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(ix) Tick the appropriate BOX	☐ Patent ☐ Designs ☐ Trade Marks ☐ Geographical Indications
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(xii) Patent No	
(xiii) Date of filing (DD/MM/YYYY)	
(xiv) Date of Grant (DD/MM/YYYY)*	
(xv) Patentee	
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(viii)	Membership No (please use the prefix F/M/AM as the case may be)	
(ix)	Title of Paper	
(x)	Name of Journal/Proceeding/Technical Volume	
(xi)	Volume No (Not required for Indian Engineering Congress)	
(xii)	Issue No (Not required for Indian Engineering Congress/Annual Technical Volumes of IEI)	
(xiii)	Theme (Only for Technical Volumes of IEI)	
(xiv)	DOI: (Not required for Indian Engineering Congress/Annual Technical Volumes of IEI)	
(xv)	ISSN	
(xvi)	Date of Publication (Date-Month-Year)	
(xvii)	Co-authors (if any)	
(xviii)	Abstract in full	
(xix)	5/6 Keywords	
(xx)	Supporting Documents/links [which are clearly indicative of the incumbent's achievement(s)]	

** publications in local seminar, conference and symposia will not be accounted*

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(viii) Membership No (please use the prefix F/M/AM as the case may be)	
(ix) Title of Book	
(x) Title of Book Chapter	
(xi) Book Chapter Number	
(xii) Publisher Details	
(xiii) ISBN	
(xiv) Date of Publication (Date-Month-Year)	
(xv) Co-authors (if any)	
(xvi) About the book (100-150 words)	
(xvii) Supporting Documents (complimentary copies for IEI Headquarters)/links [which are clearly indicative of the incumbent's achievement(s)]	

** accommodate works published in journals/reputed conference proceedings/books for the last one year*

Notification for Advertisement in IEI Epitome

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The Institution of Engineers (India) reserves a coveted privilege in being the largest multi-disciplinary professional body of engineers encompassing 15 engineering disciplines with a Corporate membership of over 2.54 lakhs maintaining a national/international presence through hundred twenty five Centres and six Overseas Chapters, Fora's and Organ (Engineering Staff College of India). The Institution has been disseminating the various information through IEI-Epitome and other publications.

We would like to share with you that we are now providing the facility to advertise engineering / technical products/services, information brochure, recruitment notices etc. in our official publication portal IEI Epitome (12 issues-140000 reach online). Besides, IEI Epitome is also uploaded on our website (www.ieindia.org) on a monthly basis and is accessible to all free of cost. Given its immense footprint in the engineering and technical diaspora spanning the globe, IEI with its distinguished heritage of a century provides you the ideal portal to connect with the National and International Engineering and Technical Community at very competitive rates. We invite you to take this unique and privileged opportunity to advertise and communicate your service and product portfolios under our prestigious banner and make us your brand emissaries in your promotional campaigns.

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