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1.	**Authors:** Ahmed M. Bagabir **Paper Title:** Effects of Rib Configuration on Cooling of Gas-Turbine Blades	1-6

Abstract: This study aims to investigate the effects of rib configuration on cooling gas turbine blades. Three-dimensional ribbed square-channel of gas turbine blades are simulated with the Reynolds averaged Navier-Stokes equations. Air flow in periodical transverse and 45o inclined rib arrays, mounted in inline and staggered arrangements on the lower and upper walls of the channel. The governing equations are discretized by the second order upwind differencing scheme, decoupling with the SIMPLE algorithm. The turbulence effect is modeled with the RNG k-ε model. The present numerical results show excellent agreement with published experimental data. The presented results are streamtraces, velocities, local and area-averaged Nusselt numbers over ribbed walls for the Reynolds numbers ranging from 2□104 to 4□104..

Keywords: heat transfer, numerical simulation, ribbed channel, turbine blade.

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2.	**Authors:** Sreejith K.M., K. Suresh, K. Rajeev **Paper Title:** Color Segmentation Based Resolution Enhancement of Depth Image and Stereoscopic Image Synthesis	7-14

Abstract: In this paper a color segmentation based resolution enhancement of depth image is proposed. The resolution enhancement technique is combined with depth image based rendering (DIBR) method to generate stereo images. The major problem in transmission of stereo images is bandwidth. By using DIBR the transmission efficiency can be increased. Also if we are using low resolution depth map for transmission, the bandwidth for transmission can be further reduced. A color segmentation based interpolation procedure is used to enhance the resolution of the depth map. This depth resolution enhancement method sharpens depth image using the color information from the high resolution color image. From this resolution enhanced depth image the stereoscopic images are synthesized using DIBR method. For more textured region, we are using an edge-guided image interpolation algorithm to enhance the performance of the color segmentation based interpolation algorithm.

Keywords: DIBR, depth image, enhanced depth map, color segmentation

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3.

Authors:	**Hariharan.S, Parvathy.B.H, Aruna.N.S**
Paper Title:	**A Pictorial Review and an Algorithm for the Determination of Sickle Cell Anemia**

Abstract: Sickle cell anemia (SCA) is a heritable blood disorder which is caused by lack of red blood cells in the blood. In sickle cell anemia, red blood cell shape is changed to sickle shape or half-moon shape, which blocks the flow of blood in small blood vessels in the body. In this disease the characteristics of red blood cell will change and they become sticky and bind together. In some cases it elongates and becomes elliptical in shape. In this paper a brief pictorial review of sickle cell anemia is presented to attract the attention among researchers to work with a common goal for the elimination of this disease from this world. We have collected few SCA affected blood images and an effort is made for the analysis of these images. An algorithm is proposed to detect the presence of SCA**.**

Keywords: Computer processing of Red blood corpuscles, Image processing of blood cells, Cell image analysis, Sickle cell anemia.

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4.

Authors:	**Abdulnaser M. Alshoaibi**
Paper Title:	**Adaptive Finite Element Simulation of Fatigue Crack Propagation**

Abstract: An adaptive finite element interactive program has been developed for fatigue crack propagation simulation under constant amplitude loading condition. The purpose of this model is on the determination of 2D

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crack paths and surfaces as well as on the evaluation of components Lifetimes as a part of the damage tolerant assessment. As part of a linear elastic fracture mechanics analysis, the determination of the stress intensity factor distribution is a crucial point. The fatigue crack direction and the corresponding stress-intensity factors are estimated at each small crack increment by employing the J-integral technique. The propagation is modeled by successive linear extensions, which are determined by the stress intensity factors under linear elastic fracture mechanics assumption. The stress intensity factors range history has to be recorded along the small crack increments. Upon completion of the stress intensity factors range history recording, fatigue crack propagation life of the examined specimen is predicted. Verification of the predicted fatigue life is validated with relevant experimental data and numerical results obtained by other researchers. The comparisons show that this model is capable of demonstrating the fatigue life prediction results as well as the fatigue crack path satisfactorily.

Keywords: Finite element, Fatigue, Crack growth, Stress intensity factor, Adaptive mesh

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5.

Authors:	**Yamuna K. Moorthy, Sakuntala S. Pillai**
Paper Title:	**Performance Analysis of Cooperative Spectrum Sensing for Cognitive Radios in Nakagami-m Fading Channels**

Abstract: This paper studies and presents the effect of different hard fusion schemes applied to a cooperative cognitive radio system. The fading channel considered is the Nakagami-m channel. The hard fusion rules are the OR rule, AND rule and the majority fusion rule. Receiver Operating Characteristic (ROC) curves for cooperative sensing using the abovementioned fusion rules are plotted. The simulation results show that the OR fusion scheme gives superior performance compared to other fusion schemes. The paper also studies the effect of different number of co-operating users**.**

Keywords: spectrum sensing, data fusion, cooperative sensing

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6.

Authors: **J. Thirumaran , Nethra**

Paper Title: **Role of Digital Marketing in Innovative Business Practices**

Abstract: Digital marketing is an umbrella term for the targeted, measurable, and interactive marketing of products or services using digital technologies to reach and convert leads into customers. The key objective is to promote brands, build preference and increase sales through various digital marketing techniques. It is embodied by an extensive selection of service, product and brand marketing tactics, which mainly use the Internet as a core promotional medium, in addition to mobile and traditional TV and radio.

Keywords: Digital marketing, Mobile marketing, Facebook, Twitter, LinkedIn

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7.

Authors: **Shazeeda, Monika Sharma D**

Paper Title: **Design and Implementation of an N bit Vedic Multiplier using DCT**

Abstract: One of the basic and fundamental functions in arithmetic operation is multiplication. Many of the application such as convolution and Fourier transform in digital signal processing, in microprocessors multiplication is very frequently used operation. In this paper we propose a fast multiplication method based on ancient Indian Vedic mathematics. The Vedic mathematics demonstrate the unified structure of mathematics by the 16 formulas. The generalized multiplication formula which is applicable in all cases is called Urdhava Triyakbhyam. In this paper we designed a Vedic multiplier in VHDL (Very High Speed Integrated circuit Hardware Description Language) and synthesis is done in Xilinx ISE series. The combinational delay of this multiplier is estimated and compared with that of Wallace tree multiplier. The results showed a significant improvement in the propagation delay. The Vedic multiplier showed a propagation delay of 10.295 ns and 25.236 ns for 4 and 8 bit multiplication, respectively.a

Keywords: Vedic multiplier, Wallace tree multiplier, Urdhva Tiryakbhyam, Discrete cosine transform.

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	Authors:	**Moayyad M. Al-Nasra**
	Paper Title:	**The Use of Recycled Steel Bars as Shear Reinforcement Swimmer Bars in Reinforced Concrete Beams**
8.	**Abstract:** The discarded steel reinforcement bars can be either sent to steel plant to be melted and reproduced, or reused as steel reinforcement again. The main sources of the recycled steel bars are the demolished structures, damaged bars or collapsed structures. There is little evidence to trust the use of the recycled steel bars as a replacement of new steel bars. Engineers often question the safety of the structures built with recycled steel bars. In order to address the concern of the engineers, the recycled bars must be evaluated and categorized and eventually given an equivalent new bar label. Additional factor of safety could be used for uncertainty. In this study the recycled steel bars are used as spliced swimmer bars for shear reinforcement in reinforced concrete beams. The used bars in this study are classified as class-A recycled bars. There are several alternatives to the traditional stirrups in reinforced concrete beams. This study focuses on providing other options other than the stirrups. Due to the unsafe mode of shear failure in reinforced concrete beams, designers may find themselves reluctant to use higher factor of safety. Shear failure in reinforced concrete beams is one of the most undesirable modes of failure due to its rapid progression. This sudden type of failure made it necessary to explore more effective ways to design these beams for shear. The cost and safety of shear reinforcement in reinforced concrete beams led to the study of other alternatives. In this study two different types of shear reinforcements are used to study the effect of each type of shear reinforcement on the shear performance of reinforced concrete beams. The first type is reinforced by traditional stirrups, while the other type is reinforced by spliced swimmer bars. Two beams were prepared with spliced swimmer bars; the first is made from recycled steel bars, and the other is made from brand new bars. The beam made from recycled spliced swimmers is compared with the other two beams. Beam shear strength as well as beam deflection are the main two parameters considered in this study. The swimmer bar system is a new type of shear reinforcement. Splicing swimmer bars concept is a solution to the welding problem associated with old types of swimmer bars. Special shapes of swimmer bars are used for in this study such that the swimmer bars are spliced with the longitudinal flexural bars. Regardless of the number of swimmer bars used in each inclined plane, the swimmer bars form plane-crack interceptor system instead of bar-crack interceptor system when stirrups are used. The results of the three tested beams will be presented and discussed in this study. Also the deflection of the beams due to the gradual applied load is monitored and discussed. Cracks will be monitored and recorded during the beam test as the applied load increases. **Keywords:** Deflection, Shear, Stirrup, swimmer bars **References:** 1. Al-Nasra, M.M., and Wang, L.R.L., 1994, Parametric Study of Slab-On-Grade Problems: Due to Initial Warping and Point Loads. ACI Structural Journal, Vol. 91 No. 2. http://www.concrete.org/PUBS/JOURNALS/OLJDetails.asp?Home=SJ&ID=4596. 2. Moayyad Al-Nasra, Naeim Asha, "The Use of Bolted U—Link Swimmer Bars in the Reinforced Concrete Beams," International Organization of Scientific Research, Journal of Engineering (IOSRJEN), Vol. 3 , Issue 10 , Version 5, ISSN Print: 2278-8719, ISSN Online: 2250-3021, DOI: 10.9790/3021-031052632, ANED: 0.4/3021-031052632, http://www.iosrjen.org, Pages 26-32, October, 2013. 3. Moayyad Al-Nasra, Naeim Asha, " Investigating the Use of Spliced Swimmer Bars as Shear Reinforcement in Reinforced Concrete Beams", ," International Organization of Scientific Research, Journal of Engineering (IOSRJEN), Vol. 05 , Issue 02 , Version 02, ISSN Print: 2278-8719, ISSN Online: 2250-3021, DOI:- 05224754, ANED: 0.4/3021-05224754, ESCI-MML 3021-0502-4754, http://www.iosrjen.org, Pages 47-54, February 2015. 4. Piyamahant, (2002) , Shear behavior of reinforced concrete beams with small amount of web reinforcement, M. Eng. Dissertation, Kochi University of Technology, Japan. 5. Lesley H. Sneed and Julio A. 2008, Effect of Depth on the Shear Strength of Concrete Beams without Shear Reinforcement, USA Portland and cement Association. http://www.cement.org/exec2/11-03-08.htm 6. Noor Hamid (2005). The Use of Horizontal and Inclined Bars as Shear Reinforcement , Master Thesis, University of Technology , Malaysia, http://sunzi.lib.hku.hk/hkuto/record/B26643352 7. ACI 318-11, 2011. Building Code Requirements for Structural Concrete Commentary. http://www.concrete.org/pubs/newpubs/31811.htm 8. Edward G.Nawy, 2009. Reinforced Concrete: A Fundamental Approach, Prentice Hall International, US, PP 120-315, ISBN 0132417030, 9780132417037	**42-47**
	Authors:	**Muthana Najim Abdulleh**
	Paper Title:	**A Review of Network Virtualization (NV): A Brief Description of the Requirements, Objectives and Technology of Network Virtualization**
9.	**Abstract:** In the past few years, network virtualization (NV) has been growing steadily among other network communities. NV offers an alternative advancement of the future internet by utilizing protocols and architectures through shared physical infrastructure and control architectures in the network. The frequent usage of NV demands new requirements that focus on the control and management of the given network. The existing process that combines software network resources and network functionality and hardware has even made NV more important in the network field (e.g., virtual networks have become important resources in information technology). Virtual network has taken the importance of NV from the original hardware while server virtualization supersedes virtual machines from the original server hardware. Therefore, the aim of the current paper is to provide a review of related studies on virtualization and NV concepts as well as aims or objectives and the requirements of such NV. It provides a brief description of technology and outlines its current and future applications. Finally, the study discusses the difficulties in implementing this technology. **Keywords:** Network Virtualization, virtualization, Software-Defined Networks, Virtual Private Network	**48-52**

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Authors: **Ilhem Hawachi, Habib Sammouda**

Paper Title: **Modeling of Mechanical Behavior of Concretes with Organic Matrices**

Abstract: work is devoted to the study mechanical characteristics of polymer concrete. In order to improve the resistance of concretes in environmental attacks under mechanical pressures, the cement matrix can be replaced by an organic one. The addition of fibers allows moreover obtaining a better strength of these materials. We here simulate the mechanical behavior of this composite. These mechanical properties of composite material depend on the manufacturing processes employed in the present paper we will study the manufacturing processes by LRI resin infusion (Liquid Resin Infusion). The infusion process has been developed to be a cost-effective technique for the fabrication of large and complex composite structures, a strong coupling between resin flow and reinforcement deformation takes place in infusion processes. A model which describes the mechanical interaction between the deformations of the porous medium and the resin flow during infusion has been developed. The model developed is based on an ALE formulation of the liquid flow across the deformable porous medium

Keywords: Liquid Resin Infusion (LRI), Numerical model, Polymer concrete, Saturation

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Authors: **Geeta, Puja Kumari Singh**

Paper Title: **Electromagnetic Frequency Induced Stress Responses in *Vernonia Cinerea***

Abstract: The Electromagnetic frequency (EMF) pollution around the living world has gripped it to such an extreme that it has potentially become unavoidable to live without it. As the development of mankind has become a slave of technology, it has to bear the brunt also. The stress created by the exposure of electromagnetic pollution on plants is a completely novice field. The stress expression in plants may be displayed by their developmental and biochemical responses. Since chlorophyll is one of the strong antioxidants known, variation in its amount has been taken up as an established symptom of oxidative stress. The initiation of stress responses on Vernonia cinerea at different distances from cell towers having ascending number of antennae has been evaluated and found to be positively correlated with the cumulative intensities of Electromagnetic frequencies. In all the cases perceived it was decreasing significantly with increasing distances.

Keywords: antioxidants, antennae, chlorophyll, EMF, Pollution.

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Authors: **S. Santhosh Kumar, Monisha Menon A**

Paper Title: **NEC2 Based Optimum Design of Circularly Polarized Axial Mode Helical Antenna with Non-linear Pitch Profile Modeled using Catmull–Rom Spline and Particle Swarm Optimization**

Abstract: This paper presents a novel method for design of circularly polarized axial mode helical antenna with maximum directive gain. In this work helical antenna is modeled by eight parameters - helix radius (a), number of turns (N) and nonlinear pitch profile represented by a Catmull-Rom spline curve. This spline curve consists of six pitch angles, α1, α2, α3, α4, α5 and α6 at six equidistant points along the axial length of the helix. For a given number of turns optimum value of radius and pitch profile is determined for maximizing the gain subject to unity axial ratio. The gain and axial ratio are determined using NEC2 (Numerical

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Electromagnetics Code) simulation and optimization is performed using Particle Swarm Optimization (PSO). The original NEC2++ source code has been modified to incorporate Catmull-Rom spline modeling and PSO to suite the requirement of this work. Simulated and experimental results show that there is significant improvement in gain characteristics compared to design based on Kraus method which uses constant pitch profile.

Keywords: Helical Antenna, Axial mode, Catmull-Rom spline, Method of Moments, Particle Swarm Optimization, NEC2.

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Authors: **Wilander Testone Pereira da Silva andJoão Viana da Fonseca Neto**

Paper Title: **On the LMS Algorithm Performance for Interference Elimination in Smart Antennas Array**

Abstract: Theefficient use of limited radio frequency spectrum is possible due tothe s¬mart antenna arrays.These antennas arrays incorporateadaptive algorithms, such as: Least Mean Square (LMS) algorithm, whichfinds the spatial temporal filtergains or weights according to the signal environment behavior. In terms of the mean error and mean squared error convergences of the LMS algorithm, the performance evaluationofthealgorithm is oriented by its convergence properties and the improvements in the mobile communication systems.In this paper is presented the LMS algorithm to solve the beamforming problem and antenna array concepts, as well as, it is presented general performance analysis,in terms of the LMSbeamformer to eliminate interference in antennas array.The potentialities of adaptive design are verified in modelsof smart linear antenna arrays. These antenna arrays models are connected to the beamformer model. The integration of these models allows todesign the adaptive beamformer. The results obtained from simulations of themodels showsthat the LMS algorithm is a good alternative for smart antenna design in mobile communication environment, due to the directivity improvement promoted in the antenna array.

Keywords: Smart Antenna Array, Adaptive Filter, LMS Algorithm, Algorithm Convergence, Beamforming, InterferenceElimination, Mobile Communication, Wireless communications.

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Authors: **Sheetal Shelke, Mangal Patil, J. S. Chitode**

Paper Title: **DWT-FFT Based Audio Watermarking Algorithm for Copyright Protection**

Abstract: In this proposed method a new technique is introduced to secure audio communication. Discrete Wavelet Transforms (DWT) and Fast Fourier Transform (FFT) are used in this proposed method. Separation of high frequency component and low frequency component from original audio signal is performed by applying DWT. High frequency component is then passed through Fourier Transform (FFT). Digital watermark is generated using PN sequence. The digital watermark is embedded in low amplitude high frequency region of magnitude spectrum of FFT. DWT-FFT based proposed algorithm can be used for Copyright protection of audio signals. Proposed algorithm is evaluated using SNR and NC parameters with various attacks including volume scaling, low pass filter, resampling, requantization, MP3 compression, Echo addition, time stretching and additive noise.

Keywords: Audio watermarking, Discrete Wavelet Transforms, Fast Fourier Transform

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Authors:	**K. Rani Hepsiba, S. M. Shariff, P. Saileshbabua**
Paper Title:	**Analysis of UPQC under Unbalanced and Distorted Load Conditions using Synchronous-Reference-Frame Method**

Abstract: This paper presents a new synchronous reference-frame (SRF)-based control method to compensate power-quality (PQ) problems through a three-phase four-wire unified PQ conditioner (UPQC) under unbalanced and distorted load conditions. The proposed UPQC system can improve the power quality at the point of common coupling on power distribution systems under unbalanced and distorted load conditions. The simulation results based on Matlab/Simulink are discussed in detail to support the SRF-based control method presented in this paper.

Keywords: Active power filter (APF), harmonics, phase-locked loop (PLL), power quality (PQ), synchronous reference frame (SRF), unified power-quality (PQ) conditioner (UPQC).

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Authors: **M. A. Kounain, F. Al-Sulaiman, Z. Khan**

Paper Title: **Low Velocity Impact and Post Impact Tensile Properties of Plain Weave Woven GFRP Composite Laminates**

Abstract: Instrumented drop weight impact tests at different impact energies were performed to investigate the effect of ply stacking sequence and thickness in plain weave glass fiber reinforced composite laminates with 0º and 0/90º ply orientations. Post impact tensile tests were performed to predict the residual strength of the material. It was found that the stacking sequence did not significantly affect the impact behavior of the composite laminates. The peak load increased with increase in the number of plies. Residual tensile strength, strain at failure and elastic modulus of the laminates decreased with the increase in the impact energy due to increase in the impact damage area.

Keywords: GFRP laminates, Low velocity impact, post impact tensile properties

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Authors: **Abdisalam Issa-Salwe**

Paper Title: **A Comparison of Information Systems Programmes Taught to Undergraduates at Saudi Arabian Colleges**

Abstract: This paper presents a comparison of information systems (IS) programmes taught to undergraduates at 20 Saudi Arabian colleges. The colleges were divided into two groups: one group of 10 colleges and programmes focused on management information systems (MIS) and another group of 10 colleges and programmes on computerized information systems (CIS). Despite a shared core focus on IS, the two programme types differ in terms of where they are taught (at either business or science colleges) and the types of courses they offer. Regardless of type, all programmes tend to be internationally accredited. Programmes of the first type seek accreditation from the Accreditation Board for Engineering and Technology (ABET), whereas programmes of the second type seek accreditation from the Association to Advance Collegiate Schools of Business (AACSB).

Keywords: Information Systems (IS), Curriculum Comparison, ABET, AACSB, Accreditation, IS Environment, IS Specialisation.

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18.

Authors: **Nikita Ingle**

Paper Title: **Triplen Harmonics in Electrical Distribution Systems**

Abstract: In an AC circuit, a resistance behaves in exactly the same way as it does in a DC circuit. That is, the current flowing through the resistance is proportional to the voltage across it. This is because a resistor is a linear device and if the voltage applied to it is a sine wave, the current flowing through it is also a sine wave. But most electronic power supply switching circuits such as rectifiers, silicon controlled rectifier (SCR's), power transistors, power converters and other such solid state switches which cut and chop the power supplies sinusoidal waveform to control motor power, or to convert the sinusoidal AC supply to DC. Theses switching circuits tend to draw current only at the peak values of the AC supply and since the switching current waveform is non-sinusoidal the resulting load current is said to contain Harmonics. we can say that "harmonics" are multiples of the fundamental frequency and can therefore be expressed as: $2f$, $3f$, $4f$, etc. Positive sequence harmonics (4th, 7th, 10th, …) causes overheating of transformer ,conductor power lines whereas negative sequence harmonics (2nd, 5th, 8th, …) circulates between phases producing additional problems in motor as opposite phasor rotation weakens rotating magnetic field required by the motor. There is another harmonics set called triplen means odd multiple of third harmonics (3rd, 6th, 9th, …), etc zero rotational sequence hence therefore zero sequence harmonics circulates between phase and neutral or ground.

Keywords: AC circuit, DC circuit, (SCR's), AC supply to DC, "harmonics", as: $2f$, $3f$, $4f$, (2nd, 5th, 8th, …),(3rd, 6th, 9th, …)

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Authors: **T. Amaranatha Reddy, K. Krishna Reddy**

Paper Title: **Direct Aerosol Radiative Forcing Over Three Different Environments**

Abstract: In the present report, we have utilised the inversion products of AERONET to study the aerosol optical properties and to estimate their direct adiative forcings over three different environments (Re Union, Nainital and Pune). Derived aerosol optical properties over all stations showed significant temporal (seasonal) and spatial variation. These properties have been used in SBDART model for the assesment of direct aerosol radiative forcing. The estimated averaged radiative forcings at top of the atmosphere are -2 ± 1, -7 ± 4 and -8 ± 2 Wm-2, and the surface aerosol radiative forcings are -6 ± 3, -18 ±14 and -36 ± 8 Wm-2 over Re Union, Nainital and Pune respectively. Subsequntly the atmospheric forcings are 3 ± 2, 11 ± 11 and 28 ± 7 Wm-2 over Re Union, Nainital and Pune respectively. Moreover, we found that higher the aerosol loading or aerosol optical depth the more aerosol radiative forcing. The estimated atmospheric aerosol radiative forcing will heats the lower atmosphere and leads modification of the thermal structure of the atmosphere. Hence, our study emphasized the importance of optical properties of aerosols in the estimation of direct aerosol radiative forcing.

Keywords: optical properties of aerosols; radiative transfer.

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20.	**Authors:**	**M.Y. Abdollahzadeh Jamalabadi**
	Paper Title:	**Forecasting the Economic Impact of Fuel Cells**

Abstract: Fuel cells are promising energy carrier whose adoption would signify a radical change in which energy is produced, distributed and consumed. Growing attention is being devoted to this energy cycle in order to explore the possibilities offered to alleviate the susceptibilities and weaknesses of the present schemes. Hydrogen does not normally exist naturally in the world, but it can be used as an energy course to extract or store energy from relic fuels or intermittent renewable energy sources (RES) and then change it into electrical power and heat using fuel cells or combustion engines. It is therefore expected to play a key role in integrating future energy systems, bridging the transition from a largely fossil-based to a more RES-based European energy economy - with the advantages of diversified sources and sustainability. Used in conjunction with fuel cells for stationary, mobile, small portable or micro-power applications, hydrogen opens the real prospect of a paradigm shift in the provision of heat and power to the transport, residential and commercial sectors.

Keywords: Social impact, economic analysis, solid oxide fuel cell, clean energy

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21.	**Authors:**	**Th. Kiranbala Devi, S. Elizabeth**
	Paper Title:	**Seismic Protection of Non-Engineered Building in North East India**

Abstract: Northeast India is regarded as one of the most seismically six active regions worldwide. Moreover, rapid urbanization in the region have provided a higher level of man-made constructions deviating from the typical traditional houses to multistoried structures but most of these structures are non engineered construction. Even though engineered, more emphasis is given to architectural concept than the structural design, which is indeed very important. So the implementation of earthquake resistant building design and construction code at the local level has been more of an exception than the rule, thereby implicating increased vulnerability to earthquake disasters. That's why there is a need for the construction of a simple construction practices for use by the community. This paper deals with the different types of non engineering building construction that are practiced in Northeast India and the ways for strengthening these building to make them a low cost earthquake resistant building.

Keywords: Community, Construction code, Disaster resistant, Non- engineered building, Strengthening technique.

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Authors:	**Atul Sharma, R.K. Agarwal**
Paper Title:	**Simulation of Rectangular Duct for Performance Analysis of Trapezoidal Transverse Rib of Different Top Faced Tapered Angle**

Abstract: Heat transfer enhancement using artificial roughness attached to the surface of duct is a effective technique in many application. This study presents the comparative change in flow characteristics between trapezoidal shaped of different top face tapered angle artificial roughness in a duct by using CFD. A commercial finite volume package ANSYS FLUENT 12.1 is used to visualize and analyze the nature of the heat transfer and flow phenomenon. The simulations were performed with transversely trapezoidal ribs placed periodically with downstream top face tapered angle of 00, 50, 100, 150 and 200. Different profile of transverse ribs are compared at fixed p/e, p/d and Reynolds Number(45000). Different profile of the transverse ribs are compared on the basis of pumping power requirement, hot spot region, Nusselt number ratio, friction factor ratio. It is found that Nusselt number ratio is increased on increasing the top face tapered angle from 100 to 150. Friction factor ratio is decreased on increasing the top face tapered angle. Finally, It is investigated that Performance evaluation parameter is maximum for trapezoidal rib with top face tapered angle of 200.

Keywords: Artificial roughness, CFD, Heat transfer enhancement, Rectangular Duct

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