

# Technorama' 13-14

## Department of Production Engineering

### Haldia Institute Of Technology



Vol: 1 Issue:1  
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#### FROM HOD'S DESK



It is an immense gratification to come to know that our revered Department of Production Engineering of

Haldia Institute of Technology is going to publish the annual newsletter to entail and amass all the achievements by the teaching and students fraternity in its petite form, i.e. TECHNORAMA 2013-2014.

Adhering to the mission and vision of the Department, the whole fraternity has relentlessly devoted, dedicated and extended its efforts towards the wholesome quality improvement of the students. I presume that the magnanimity of academic achievements has already reached to its pinnacle, but we have to be concerned in mitigating the lacunae more and more in the pursuit of excellence. To me this is not only a tangible booklet; rather, it encompasses the upshots of intangible endeavor of every individual to perpetually move our Department forward.

I solemnly trust and anticipate that our Department will certainly unfurl its vitality and vigor towards achieving academic excellence.

I appreciate the relentless efforts put in by members of the departmental committee for bringing out this issue of Annual Newsletter.

#### ACHIEVEMENTS OF THE FACULTY MEMBERS PAPER PUBLISHED

##### JOURNAL:

- 1 S. Bhattacharya, B. Bepari** and S. Bhaumik, "IPMC Actuated Compliant Mechanism based Multifunctional Multifinger Microgripper," *Mech. Based. Des. Struc.*, Vol. 42, pp. 312-325, May. 2014. [ISSN 1539-7734 (Print), 1539-7742 (Online)]
- 2 B. Bairagi, B. Dey, B. Sarkar & S. Sanjal.** "Selection of robot for automated foundry operations using fuzzy multi-criteria decision making approaches". *International Journal of Management Science and Engineering Management*, vol. 9 (3), pp. 221-232, Jan, 2014. [ISSN: 1750-9661 (Online)].
- 3 N. S. Mitra, B. Doloi** and B. Bhattacharyya, "Analysis of traveling wire electrochemical discharge machining of Hylam based composites by Taguchi method," *Int J Res Eng Technol*, Vol. 2 (2), pp. 223-236, Feb 2014. [ISSN (E):2321-8843; ISSN (P): 2347-4599]
- 4 B. Dey, B. Bairagi, B. Sarkar & S. Sanjal.** "A hybrid fuzzy technique for the selection of warehouse location in a supply chain under a utopian environment". *International Journal of Management Science and Engineering Management*, vol. 8 (4), pp. 250-261, July, 2013. [ISSN: 1750-9661 (Online)].
- 5 S. R. Maity** and S. Chakraborty, A visual decision aid for gear materials selection, *J Inst Eng (I): Series C*, vol. 94(3), pp.199-212, July 2013. [ISSN (Online): 2250-0553].
- 6 S. R. Maity** and S. Chakraborty, "A decision making approach for bearing material selection," *Int J Comp Mat Sc Sur Eng*. Vol. 5, No. 4, pp. 289-303, 2013. [ISSN online: 1753-

##### 7 S. Dutta, A. Saha

and **S. R. Maity**, "Non Linear Regression Model of Surface Roughness," *Int. J. Mech. Eng. Rob. Res.*, Vol. 2, No. 2, pp. 289-297, Apr. 2013. [ISSN: 2278-0149].

- 8 S. Dutta, A. Saha** and **S. R. Maity**, "Non Linear Regression Model of Surface Roughness," *Int. J. Mech. Eng. Rob. Res.*, Vol. 2, No. 2, pp. 289-297, Apr. 2013. [ISSN: 2278-0149].

##### CONFERENCE

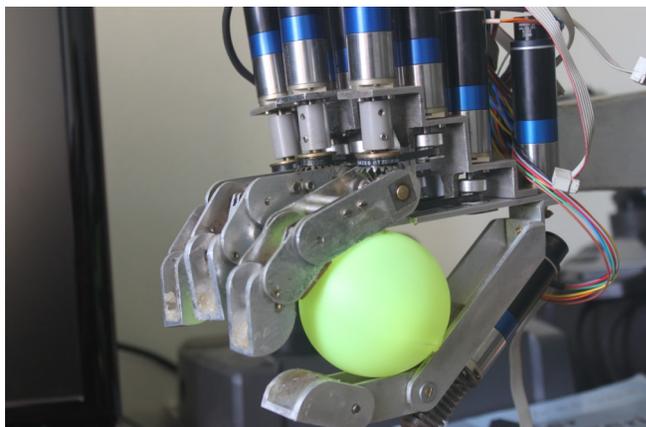
- 1 R. Chattaraj, S. Bhattacharya, A. Roy, A. Mazumdar, B. Bepari,** Subhasis Bhaumik "Gesture Based Control of IPMC Actuated Gripper", International conference on Recent Advances in Engineering and Computational Sciences, held at Panjab University Chandigarh, 06-08<sup>th</sup> March, 2014. [Available in IEEE Xplore digital library with ISBN: 978-1-4799-2291-8].
- 2 R. Chattaraj, S. Bhattacharya, B. Bepari,** S. Bhaumik, "Design and Control of Two Fingering Compliant Gripper for Micro Gripping" published in 3rd International Conference on Informatics, Electronics & Vision (ICIEV 2014). May 23-24, 2014. Dhaka Bangladesh from 23<sup>rd</sup> -24<sup>th</sup> May 2014. [Doi: 10.1109/ICIEV.2014.6850840]. [Available in IEEE Xplore digital library with ISBN: 978-1-4799-5179-6].

##### BOOK CHAPTER

The Book Chapter entitled "Selection of Robotic Grippers Under MCDM Environment: An Optimized Trade off Technique" written by A. Bhattacharjee, **B. Bepari** and S. Bhaumik is published in the book edited by S. Patnaik and B. Zhong (eds.) in "Soft Computing Techniques in Engineering Applications, Studies in Computational Intelligence" 543, DOI: 10.1007/978-3-319-04693-8\_10, Book ISBN: 978-3-319-04692-1, pp: 141-158, 2014. [Springer Inter-

## SPONSORED PROJECTS

Dr. Bikash Bepari is acting as Co-Principal Investigator in the research project entitled "Development of a Sensor Integrated Multi Fingered Dexterous Robot Hand with Data Glove Interface" by Bureau of Research in Nuclear Science (BRNS), BARC, Anushaktinagar, Mumbai. Sanction letter (letter no. 2009/36/116-BRNS dt. 10 May 2010).



BARC\_IEST\_HIT ROBOTIC HAND

## FACULTY OUTREACH STTP ORGANIZED

Dr. B. Bepari convened a 6 week STTP on AutoCAD from 6<sup>th</sup> January to 20<sup>th</sup> February 2014.

## SESSION CHAIR

Dr. B. Bepari Co-Chaired Technical Session-III (Advanced Food Engineering & Modeling) of National Seminar on "Non-thermal processing techniques: Emerging innovation for sustainable, safe and healthy foods" Sponsored by DST, CSIR, Organized by Department of Food Technology, HIT, Haldia, March 2014.

## REVIEW WORK DONE FOR

B. Bairagi reviewed four (4) different papers in the International Journal of Management Science and Engineering Management by Taylor and Francis.

Mr. B. Dey reviewed four (3) different papers in the International Journal of Management Science and Engineering Management by Taylor and Francis.

Dr. S. R. Maity has reviewed four (3) different papers in the Engineering Optimization by Taylor and Francis.

## COLLABORATIVE ACTIVITIES WITH OTHER INSTITUTES

The Department is having a liaison with The Institution of Engineers (India) in conducting the laboratory practical classes for the Production Engineering Division.

## ACHIEVEMENTS OF THE STUDENTS BOOK CHAPTER WRITTEN:

The Book Chapter entitled "Selection of Robotic Grippers Under MCDM Environment: An Optimized Trade off Technique" written by A. Bhattacharjee\*, B. Bepari and S. Bhaumik is published in "Soft Computing Techniques in Engineering Applications, Studies in Computational Intelligence" 543, Springer International Publishing Switzerland, pp: 141-158, 2014. \* (On his B. Tech. Thesis)

## PRATICIPATION AND AWARD OWN FROM TECH FEST

A. Bhagat, V. Kr. Burnwal and A. Kumar of 2<sup>nd</sup> yr, Department of Production Engineering secured the 3<sup>rd</sup> prize in TERRAINZ Robotic Competition at Neotia Institute of Technology management and science in the year 2014.

T. Kolay and A. Kumar of 2<sup>nd</sup> yr, Department of Production Engineering secured the 3<sup>rd</sup> prize in Quiz Competition at Neotia Institute of technology management and science in the year 2014.

## NO OF STUDENTS OPTED FOR HIGHER STUDIES

NAME	GATE/ CAT/ GRE	SCORE	AIR (APPEARED FROM)
ANISH GAUSH	GATE 2014	737	1161(ME)
ROHIT KUMAR GUPTA	GATE 2014	631	3655 (ME)
SUMIT BISWAS	GATE 2014	437	15676(ME)
ASHISH BHARTI	GATE 2014	464	13069 (ME)
MUKESH CHANDRA	GATE 2014	475	12131(ME)
SUNNY KUMAR	GATE 2014	533	7985(ME)
KESHAV JHA	GATE 2014	709	1666(ME)
BARSHA THAKUR	GATE 2014	291	38242 (ME)
TANIA SAHA	GATE 2014	344	27310(ME)
TANMAY	GATE 2014	518	9003(ME)
AMRITASH	GATE 2014	495	10581(ME)
MANISH BHAGAT	GATE 2014	411	18404(ME)
KUMAR GAURAV	GATE 2014	355	410(PE)
VIPIN KUMAR BURNWAL	GATE 2014	415	18003(ME)

Sl no.	Name of the faculty member	Title of the Thesis	University	Date of Registration/ Submission /Award	Name of the Supervisor/ (s)
1	S. Bhattacharyya	Design Development and control of a Compliant Micro Gripper	IEST, Shibpur	02/08/12(DoR)	Prof. B. Bepari.
2	R. Chattaraj	Design Development and control of an anthropomorphic hand under Tele-operation	IEST, Shibpur	13/08/13 (DoR)	Prof. B. Bepari

## UNIVERSITY RESULT (BATCH)

Year of Graduation	Total strength	Number of students having more than 8.25 DGPA	Number of students having more than 7.5 DGPA	Number of students having more than 6.75 DGPA	Number of students having more than 6.00 DGPA
2014	39	9	27	36	38

### 2010-2014)

NAME	Organization
BARSHATHAKUR	Infosys Technologies Ltd.
RAHUL KUMAR	Accenture India
MANISH BHAGAT	TCS
AMRITASH	SBI
TANIA SAHA	Infosys Technologies Ltd.
ANAND KUMAR	NIT TRICHY
SUBHENDU NASKAR	L&T-MHPS Boilers Private Limited
DEBARGHYA SAHA	METAL CANS COMPANY
AKASH RANA BISWAS	SHRIRAM TRANSPORT FINANCE CO. LTD.
KUMAR GAURAV	Flipkart India Ltd.
MUKESH CHANDRA	NIT, Trichy
SUSOVAN BHATTACHARYA	Skipper India Limited
SAGNIK GHOSH	KITs
UJJAL SARKAR	Haldia Logistics Pvt Ltd.
ALOK KUMAR	IITR
TANMAY	NIT Tiruchirappalli
DIPANKAR MAITY	Tata METALICS
SUMIT BISWAS	NIT ALLAHABAD
SANJOY BHATTACHARJEE	Energy Plus (ISO 9001:2008)
SUBHRANGSHU SEN	Accenture India
ASHISH BHARTI	Vindhya Institute of Technology and Science
SUNNY KUMAR	IITM
ABHISHEK DAS	Infosys Technologies Ltd.
ABHIK MAJI	Kotak Mahindra
NABNIT KUMAR	Flipkart India Ltd.
SHANKAR KUMAR PANDIT	Fuzikawa powers

## PLACE MENT AND HIGHER STUDIES

### PROJECT-1

**Simultaneous parametric optimization of single pass finish cut end milling through weighted grey relational analysis for Calmax-635 mould steel**

*Amritash, Manish Bhagat, Mukesh Chandra, Sumit Biswas, Tanmay*

*Supervisor: Prof. (Dr.) Bikash Bepari*

#### Abstract

This paper encompasses parametric optimization for machining (finish cut) of Calmax-635 mould steel through GRA, which is still in its embryonic stage as revealed in the literature review. To substantiate the same, a full factorial experiment was carried out for the factors, namely, spindle speed (N), feed rate (f) and depth of cut (d) during high speed single pass end milling of the same material for enhanced surface quality (lower  $R_a$ ,  $R_z$  and  $R_{max}$ ). Grey relational analysis (GRA) has established itself as an adroit tool to convert multiple process parameter optimization problems to a single objective optimization problem in the past decade. GRA is generally adopted to find out the best process parameter (factor) combination entailing the different levels of factors and the goodness is ascertained through an index known as grey relational grade. This is achieved by weighted aggregation of the grey relational coefficients. To determine the weights for the responses, principal component analysis was combined with

of spindle speed and lower levels of feed rate and depth of cut can achieve the good surface quality. Furthermore it is seen that,  $R_z$  is having equal or seldom more weightage than  $R_a$  and  $R_{max}$ . Hence  $R_z$  value also to be considered while ascertaining the surface quality characteristics.

**Keywords:** Calmax-635, Grey relational analysis, Principal component analysis, Grey entropy, Grey relation grade, Surface quality.

### PROJECT-2

**Comparative study of warehouse location selection model using TOPSIS, MOORA and SAW methods**

*Subhendu Naskar, Sourav Nandi, Ujjal Sarkar, Subhranshu Sen, Abhishek Das*  
*Supervisor: Prof. Balaram Dey*

#### Abstract

The location of a warehouse is one of the most important criteria which plays a key role in the optimization of logistic systems. Warehouse is a long-term decision and is influenced by many quantitative and qualitative factors. In this paper we have included two decision matrices including many important criteria such as cost, labor characteristics, infrastructure, markets, unit price, stock holding capacity, average distance to market supplier etc. We also included sum sub-criteria in one of the two decision matrices because of the hierarchical structure of the problem like tax incentives and tax structures, availability of labor force, quality and reliability of modes of customers. A comparative study of the proposed mathematical models TOPSIS, MOORA and SAW are carried out to assess the credibility of their usages in relation to the warehouse location selection problems. This paper encompasses a suitable example on warehouse location selection for the comparative study of the methods TOPSIS, MOORA and SAW.  
**Keywords:** TOPSIS, MOORA, SAW, Fuzzy numbers, Warehouse location, Weights.

### PROJECT-3

**Corrugated Plate Solar Water Heater**  
*Rashid Ansari, Amit, Dipankar Maity, Biplab Das, Susovon Bhattacharya*

*Supervisor: Mr. Soumik Dutta & Prof. (Dr.) Bikash Bepari*

#### Abstract

An experimental investigation is performed on natural convection heat transfer through a rectangular enclosure of cross corrugated plates. This investigation encompasses the variation of heat transfer rate through the rectangular enclosure with the variation of both absorbing and bottom plate temperatures. Absorbing plate temperature is varied by heat inputs. To vary the cold plate temperature two parameters are considered. First parameter is mass flow rate of water used to remove heat from cold plate and other is the inlet temperature of water. Air is the medium to transfer heat from absorbing corrugated plate to glass cover. The result shows that the increase of mass flow rate increases the heat transfer rate and the decrease of water inlet temperature increases the heat transfer rate.

**PROJECT-4**

**Mathematical modeling of cutting parameters for X38CrMoV5-1 steel using multi-objective Taguchi method**

*Alok Kumar, Anand Kumar, Kumar Gaurav,*

*Rahul Kumar, Rohit Kumar*

*Supervisor: Mr. Abhijit Saha*

**Abstract**

In this research work, a detailed experimental investigation is presented for the effects of cutting speed, feed rate and depth of cut on the cutting force components and the surface roughness parameters in hard turning of X38CrMoV5-1 (50 HRC) steel with CBN tool. A three-factor, three-level factor technique can be employed easily to develop a mathematical model for predicting surface roughness and cutting force components of cutting conditions during the turning operation. The results have indicated that the effect of depth of cut on the cutting force components is remarkably significant. According to presented results, the surface roughness is highly affected by feed rate, whereas the cutting speed has negative effect and depth of cut a negligible influence. Moreover, multi-objective Taguchi method as employed in this investigation brings the relationship between various process parameters and the response factors within the desired limits. The optimum machining combinations for minimizing surface roughness parameters and cutting force components for hard turning of the X38CrMoV5-1 within the ranges of variable studied are also tested through confirmation experiments that show fairly good agreement with prediction of empirical models developed. However, the validity of the procedure is limited to the range of factors considered for the experimentation.

**Keywords:** Cutting force, Surface roughness, Hard turning, Taguchi method.

**PROJECT-5**

**Thermo-Electric Refrigeration**

*Ashwani kumar Bharti, Pankaj Saw, Pavan*

*Dev, Roushan Ranjan, Shankar Kumar Pandit*

*Supervisor: Abhishek Samanta*

**Abstract**

A new dimension has been added to the cooling challenge by reduction of temperatures using thermoelectric, with the continued demand for improved cooling technology to enhance performance, reliability and reduction in operating cost, a thermoelectric cooling may be considered a potential candidate. Thus a thermoelectric refrigerator is designed and simulated to maintain the temperature of enclosure at 4°C. The minimum temperature, allowable module power, current equations presented here provide a useful means to perform trade-off analysis to assess whether or not thermoelectric augmentation will be advantageous over conventional techniques. To use these equations, detailed information in terms of the parameter pertaining to the thermoelectric module under consideration is required, average values of the parameters of Bismuth telluride ( $\text{Bi}_2\text{Te}_3$ ) are used for analysis. From the plot of COP against current, the coefficient of performance of such devices is independent of the temperature difference between the hot and cold side of the module, for maximum COP, the temperature is kept to the barest minimum which is also function of the ambient condition or room temperature, a plot is obtained for a temperature difference of 20°C.

**PROJECT-6**

**Performance Evaluation and Selection of Quadcopter Considering Tangible and Intangible Factors using Multi-Criteria Decision Making Approaches**

*Arijit Naskar, Debargha Saha, Debabrata Das,*

*Sagnik Ghose, Abhik Maji*

*Supervisor: Mr. Bipradas Bairagi*

**Abstract**

This paper employs four fuzzy multi-criteria decision making (MCDM) approaches for performance evaluation and selection of quadcopter considering tangible and intangible factors. Assuming the criteria considered are independent, conventional Entropy weighing method as well as Analytical Hierarchy Process is used for measuring weight of the criteria. Simple Additive Weighting Method (SAW), Multi Objective Optimization on the basis of Ratio Analysis (MOORA), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) and Complex Proportional Assessment (COPRAS) are used for evaluation of the performance by integrating performance ratings of alternatives and weights of the criteria. The alternatives are ranked by each method and the results obtained are compared.

**Keywords:** MCDM, SAW, MOORA, TOPSIS, COPRAS

**PROJECT-7**

**Six leg kinematic linkage moving machine**

*Ashis Bharti, Nabnit Kumar, Sanjoy Bhatta-*

*charya, Sunny kumar, Vipin Kumar varnwal*

*Supervisor: Satyajit Chatterjee*

**Abstract**

Walking machines have been attempted since the beginning of the technology of transportation machinery with the aim to overpass the limits of wheeled systems by looking at legged solutions in nature. But only since the last part of the 20th century very efficient walking machines have been conceived, designed and built with good performances that are suitable for practical applications carrying significant payload with relevant flexibility and versatility. Wheeled mechanism is highly studied and developed in the field of locomotion but legged mechanism has got its importance and needs in several industrial, military and other purposes. Legged locomotion is a fascinating form of motion, it is found in almost every animal and is performed so easily, yet it remains a big challenge despite many technical achievements. A large variety of efficient mechanical and physiological designs have evolved in nature in order to fit with the characteristics of a given physical environment and different locomotion modes. The work presented here aims to make contribution to the understanding and application of six-legged statically stable walking machines in both theoretical and practical levels. The walking machine follows the simple crank-rocker mechanism, which is one of the inversions of four bar linkage. There are six such mechanisms which act individually and synchronously to perform to and fro motion. One link of the linkage which acts as crank and makes the complete rotation is connected to the leg. Three among six such legs touch the ground at a time and other three follow them. The two front cranks are connected to the motor. Power from motor to crank can be transferred with the help of sprocket-chain mechanism or belt-pulley mechanism. In our prototype we are using belt-pulley type of power transmission system. The length of each link is obtained using Grashoff's law.

**Keywords:** six-legged walker, four bar linkage, Grashoff's law, Power requirement, walking machine.