

# Association for Machines and Mechanisms NewsBulletin

Volume6, No. 3

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## Our Objectives and Activities

The main objective of AMM is to contribute to mechanical design at all levels starting from academic research to industrial initiatives, thereby enhancing the quality and reliability of indigenous machines. With this in view, AMM organises the International & National Conference on Machines and Mechanisms, iNaCoMM, and the workshops on Industrial Problems on Machines and Mechanisms, IPRoMM regularly.

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## Message from the Editor-in-Chief

Since the April 2014 issue of the Bulletin of the Association of Machines and Mechanisms, the new editorial team constituting of the Editor-in-Chief and four Zonal Vice-Presidents (ZVPs) takes the responsibility of bringing out the issues of this news letter. To publish April 2014 issue of Volume 6, Dr. R. Ranganath of ISRO Satellite Centre, Bangalore and Zonal Vice-President (South) took the lead role along with the AMM Secretary, Dr. G. Saravana Kumar. Now, this Volume 6, No.3, July 2014 issue of the Bulletin is being published with the active support of the Zonal Vice-President (East), Dr. Ranjit Kumar Barai of Jadavpur University, Kolkata, the Secretary, AMM and other office bearers of the AMM. I personally thank them for extended their support for bringing out this issue within July 2014, although missing the deadline.

This issue contains an introduction about the AMM as well as about the IFToMM. A contributed article on “Control Oriented Modeling of Mechatronic Systems: Present Status of Research at the Mechatronics Laboratory, Department of Electrical Engineering, Jadavpur University” is written by Dr. Ranjit Kumar Barai of Electrical Engineering Department, Jadavpur University, Kolkata. A Technical Brief on “Design and Fabrication of a Universal Robotic Arm” written by a group from Kalyani Government Engineering College, Kalyani is also included in this issue. The Editor-in-Chief sincerely acknowledges the office bearers and Editorial Board members for peer reviewing technical articles and briefs. Only after incorporating review comments, the revised articles are included in the Bulletin.

A brief about “Kinematics Summer School” to be held at The University at Buffalo, New York, brochure of MAMM-2014 being held in Romania, IFToMM 2015 World Congress to be held in Taipei, Taiwan, and iNaCoMM 2015 to be held at Indian Institute of Technology, Kanpur are also published to facilitate participation of interested persons in these forthcoming events. Advertisement section is also there as usual.

AMM members are requested to contribute articles and send the same to the editorial team. Any constructive suggestion or comments to improve the Bulletin of the AMM are most welcome.

On behalf of the Editorial Team of the Bulletin of the AMM, I heartily thank all concerned for their active support to make this endeavour a success. Wish you all Happy Seasons Greetings!

**Prof. Santanu Das**  
Editor-in-Chief

### Where are the creators?

Ever since I retired and moved to Bangalore in February 2013, I have been interacting with engineers from industry and start-ups more or less on a daily basis. Most complain of their inability to find "engineers" amongst the lakhs of youngsters graduating in engineering annually. I had recently attended a seminar on this issue by one of our largest and venerated industrial houses. The participants were asked to outline all possible reasons for this scenario. Most felt that the root cause was the attraction of finance and IT sectors.

It was then that some of the more senior people present pointed out that even in these sectors the scene is dismal, and we are yet to come out with any original products or solutions in these sectors too. "Designers" conceive and create engineering products- the corresponding name for those in IT is "architects". Just as we are able to find just about one person in a hundred who could "design", the IT sector barely finds a similar percentage of "architects". Comparisons were made with the medical sector where students are required to dissect bodies and examine, spend a period of internship in a hospital before obtaining a license to practice.

Several generations of engineering graduates have by and large not been exposed to the skills required for successful creation or development of technologies and products. Middle level engineers do not find anyone to pass the baton to - and as precious time is lost there would be no one to hold the baton too.

As I looked around I found similar sentiments being expressed by our teaching colleagues all over the world, but no one has been able to find either a single reason or a single solution to the problem, though many feel that the problem needs to be tackled at the level of academic institutions itself. Institutions, they state, should experiment and evolve methods for inspiring students and evoking their passion to "create" new technologies, solutions and products. The brief for my association with Cummins College of Engineering is along these lines. The Cummins company- instrumental in establishing the college- has a large presence in engines and power generation and they hire graduates from all over the country. Cummins is of the opinion that our graduates have immense potential, but exhibit little or no enthusiasm for engineering.

Many engineering associations worldwide (ASME, IEEE, IMechE, SAE) are addressing this issue and have in their own way contributing to the effort through academic institutions. Modern engineering products have large MTBF and do not delight the tinkerers in the sense that they leave little scope for stripping, examining, experimenting and reassembly. Consequently, youth who for long were exposed to engineering through hobbies and tinkering are no longer able to exercise their passion. Several leading academic institutions have hence established "Tinkering" and "Makers" labs to bring about an attitudinal change and evoke their passion.

Mechanical Engineering has hitherto been concerned by and large with machines (devices with moving elements), and equipment (composed of static elements). The arrival of electronics has resulted in newer possibilities in both these traditional domains and there are immense challenges to be met. Our association is well placed to handle these challenges and enthuse our younger generation to tread this long and exciting path. This is an opportunity we cannot afford to miss, in our quest to be a major contributor to the technological growth of our country. The time has come to experiment with newer methodologies of imparting engineering education to youth- it is never too late to do so.

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**Prof. C. Amarnath**  
**President - AMM**  
**Cummins Chair of Mechanical Engineering (Visiting),**  
**Cummins College of Engineering, Pune**

## About the Association of Machines and Mechanisms (AMM)

The AMM headquarter is currently located at the Department of Engineering Design, IIT Madras. A new set of office bearers have taken charge of the affairs of AMM. AMM invites both individual and corporate membership from Indian academia, research organizations and industry. Membership benefits and other information about AMM are available at [www.ammindia.org](http://www.ammindia.org). The body of Zonal Vice Presidents (ZVPs) is active over the past several years with representations from the four corners of the country. They are playing the role of nodal agencies so as to decentralise the AMM official activities and to organise workshops under the aegis of AMM to popularise the mechanism science in their respective regions. They also form the editorial team of this news bulletin. AMM invites contributory articles from its members and others working in the various fields of mechanisms science for this quarterly news bulletin. Interested people can contact the editorial team.

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**Don't tell people how to do things,  
tell them what to do and let them  
surprise you with their results.**

**--- George S. Patton**

# About the International Federation for the Promotion of Mechanism and Machine Science (IFTToMM)

## How IFTToMM can be reached

- Through your local Member Organization, to become active in IFTToMM
- Through an IFTToMM Technical Committee Chairperson, to participate in a specific activity
- Through the IFTToMM Executive Council
- Through the IFTToMM Secretary General:

Prof. Teresa Zielinska, Warsaw University of Technology, MEiL, ul. Nowowiejska 24, 00-665 Warsaw, Poland



IFTToMM Presidents

From left to right: Giovanni Bianchi (1984-1987 and 1988-1991), Arcady Bessonov representing Ivan I. Artobolevsky (1969- 1971 and 1972-1975), Bernard Roth (1980-1983), Jorge Angeles (1996-1999), Kenneth J. Waldron (2000-2003 and 2004-2007), Leonard Maunder (1976-1979), Adam Morecki (1992-1995), Marco Ceccarelli (IFTToMM Secretary General 2004-2007, President 2008-2011). Yoshiko Nakamura – current President

## Main activities of IFTToMM

- meetings, conferences, publications, direct collaboration
- 47 IFTToMM Members of territory and national Organizations

- 13 Technical Committees:
  - Biomechanical Engineering
  - Computational Kinematics
  - Gearing and Transmissions
  - Linkages and Mechanical Controls
  - Micromachines
  - Multibody Dynamics
  - Reliability
  - Robotics and Mechatronics
  - Rotordynamics
  - Sustainable Energy Systems
  - Transportation Machinery
  - Tribology
  - Vibrations
- 4 Permanent Commissions:
  - Communications, Publications and Archiving
  - Education
  - History of MMS
  - Standardization of Terminology

- 6 affiliated Journals and 2 book series:
  - Mechanism and Machine Theory <http://www.journals.elsevier.com/mechanism-and-machine-theory/>
  - Problems of Mechanics <http://pam.edu.ge>
  - Open-access Mechanical Sciences <http://www.mech-sci.net>
  - Chinese Journal of Mechanical Engineering <http://www.cjmenet.com>
  - Journal of Vibration Engineering & Technologies <http://www.tvi-in.com/>
  - Mechanics Based Design of Structures and Machines <http://www.tandf.co.uk/journals/titles/15397734.asp>
  - Book series on MMS <http://www.springer.com/series/8779>
  - Book series on History of MMS <http://www.springer.com/series/7481>
- A World Congress every 4 years



International Federation for the  
Promotion of  
Mechanism and Machine Science

## Mission

To promote research and development in the field of Machines and Mechanisms by theoretical and experimental methods, along with their practical application

## Vision

To provide leadership for cooperation and development of modern results in the Mechanism and Machine Sciences by assisting and enhancing international collaboration

IFTToMM webpage:

<http://www.iftomm.org>

IFTToMM, April 2014

## **Bodies of IFToMM**

### **General Assembly**

The General Assembly is the supreme body of the Federation and determines its policy. It is composed of the Chief Delegates of IFToMM Members and members of the Executive Council.

### **Executive Council**

The Executive Council manages the affairs of the Federation between the sessions of the General Assembly. It is elected every four years, meets annually, and is composed of the President, Vice- President, Secretary-General, Treasurer, and six ordinary members.

### **Commissions and Committees**

Each Permanent Commission and Technical Committee is composed of a Chairperson, appointed by the Executive Council, a Secretary and members, nominated by the Chairperson and appointed by the Executive Council. A Chairperson shall not serve for more than two terms consecutively. The general goals for the work of the Commissions and Committees are aimed at promoting their fields of interest by attracting researchers and practitioners, including young individuals, in order to:

- define new directions in research and development within their technical areas;
- establish contacts between researchers and engineers;
- initiate and develop bases and procedures for modern problems;
- promote the exchange of information;
- organize national and international symposia,

conferences, summer schools, and meetings.

### **Member Organizations**

ARMENIA AUSTRALIA  
AUSTRIA AZERBAIJAN  
BELARUS BRAZIL  
BULGARIA CANADA  
CHINA-BEIJING  
CHINA-TAIPEI  
CROATIA CZECH  
REPUBLIC  
DENMARK EGYPT  
FINLAND FRANCE  
GEORGIA GERMANY  
GREECE HUNGARY  
INDIA ISRAEL  
ITALY JAPAN  
KAZAKHSTAN KOREA  
LITHUANIA MACEDONIA  
MEXICO  
NETHERLANDS  
PERU POLAND  
PORTUGAL ROMANIA  
RUSSIA SERBIA  
SINGAPORE SLOVAKIA  
SLOVENIA SPAIN  
SWITZERLAND TUNISIA  
TURKEY UKRAINE  
UNITED KINGDOM USA  
VIETNAM

*Welcome to Taipei,  
China-Taipei, venue of  
the 14th IFToMM World  
Congress, 25-30 October,  
2015,*

[www.iftomm2015.tw](http://www.iftomm2015.tw)

### **IFToMM supported Conferences (selection)**

Int. Symposium on  
History of Machines and  
Mechanisms (HMM)  
Workshop on  
Computational  
Kinematics (CK)  
Rotordynamics  
Conference  
CISM-IFToMM  
Symposium on Robot

Design, Dynamics, and  
Control (ROMANSY)  
Mechanical Transmission  
Applications (MeTrApp)  
Symposium on Robotics  
& Mechatronics (ISRM)  
European Conf on  
Mechanism Science  
(EUCOMES)  
Asian Conference on  
MMS (ASIAN MMS)  
Summer Schools

### **Conferences under IFToMM patronage (selection)**

Local conferences of the  
IFToMM Members  
Symposium on Theory  
and Practice of Robot and  
Manipulators (SYROM)  
IFToMM-FeIbIM Int.  
Symposium on Multibody  
Systems and  
Mechatronics (MUSME)

### **Joining IFToMM Member Organizations gives the following benefits:**

international contacts for  
potential developments of  
joint projects;  
reduced registration fees  
for IFToMM  
supported conferences;  
participation and  
contribution in IFToMM  
activities and  
publications;  
flow of information on  
IFToMM activities.

**You are kindly invited  
to join IFToMM and its  
activities.**

## Control Oriented Modeling of Mechatronic Systems: Present status of research at the Mechatronics Laboratory, Department of Electrical Engineering, Jadavpur University

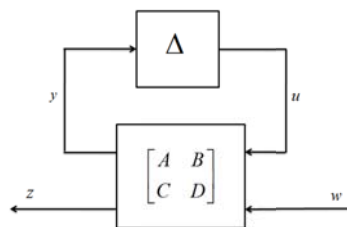
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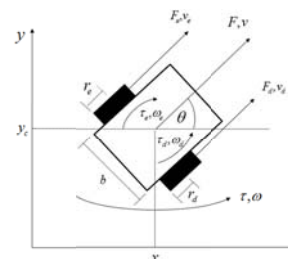
Email: rkbarai@ee.jdvu.ac.in

The synergistic integration of mechanical systems, micro-electronics, and intelligent computer control through information processing technology has rendered Mechatronics as a multi-disciplinary subject in the realm of science and technology [1, 2, 3]. As the various subsystems, like actuators, sensors, controllers, power supply and converters, computers and microcontrollers, mechanisms and transmission systems, wired and wireless communication links, signal processing and computer interfacing circuits of a complete mechatronic system are interconnected in a delicate manner to serve the primary objective of precise and safe motion control [4], the overall closed-loop system is very complex. As a result, any attempt to derive a generalized state-space model for such a nonlinear and highly coupled multivariable system results into a very big and complex mathematical model. Therefore, instead of deriving a generalized mathematical model of mechatronic systems, which is quite often very much complicated and time consuming, control oriented modeling [5, 6] and identification of mechatronic systems is a suitable proposition. Control oriented modeling and identification not only saves much time for the prototype development but ultimately paves the way for the design of a compact and manageable control system that is suitable for its implementation in hard real-time environment like embedded systems.

In order to achieve the intended control performance, research efforts have been directed towards the development of control oriented modeling of two benchmark mechatronic systems, namely, Differentially Driven Wheeled Mobile Robot (WMR) and Twin Rotor MIMO Systems (TRMS), at the Mechatronics Laboratory, Department of Electrical Engineering, Jadavpur University. In both the systems, control oriented LFT model [7] has been developed for the design and implementation of  $H_\infty$  control. The dynamic model of WMR and TRMS contain a substantial amount of nonlinearity as well as uncertainty. Therefore, robust control law like  $H_\infty$  control has been gainfully utilized to achieve the desired control performance. Moreover,  $H_\infty$  control being an optimal control can reduce the noise and disturbance from various channels well below the tolerance. However, for the design of  $H_\infty$  control, the mathematical model of the given mechatronic system has been reduced to a linear multivariable model by appropriately quantizing the discarded nonlinearity part of the model into the model uncertainty part in the framework of LFT. Fig.1 represents the LFT representation. The model parameters of WMR are shown in Fig.2.



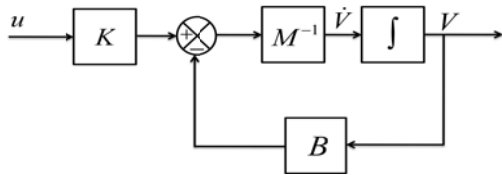
**Fig.1** .LFT representations



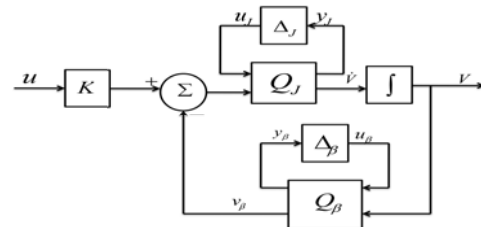
**Fig.2.** Schematic Diagram of Wheeled mobile Robot



The block diagram of the dynamic model of WMR is shown in Fig.3 and the block diagram with uncertain parameters is shown in Fig.4.

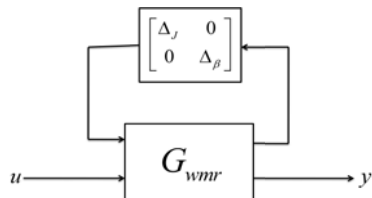


**Fig.3.** Block diagram of wheeled mobile robot

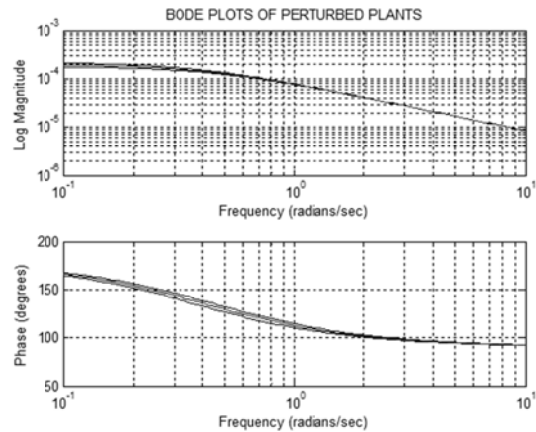


**Fig.4.** System block diagram with uncertain parameter

The LFT representation of the perturbed LFT is shown in Fig.5 and the frequency response of perturbed open-loop Systems is shown in Fig.6.



**Fig.5.** LFT representation of perturbed WMR



**Fig.6.** Frequency response of perturbed openloop Systems

Similar approach has been followed for the development of the control oriented LFT modeling of TRMS. There are few differences between the WMR and TRMS dynamic models. WMR model has nonholonomic constraints and the wheel friction and the wheel slips form a big concern for control oriented modeling. The TRMS, being a laboratory model of helicopter, is subjected to parameter variation and nonlinear coupling of similar nature of aerospace systems. In both the cases, establishing the desired accuracy of the final model is subjected to the availability of the reliable value of the model parameters. In reality, values of many parameters are either unavailable or uncertain. The parameter identification is being carried out by model updating technique from the input-output test data. The control oriented modeling approach for the design of the robust control law has been observed as a very convenient and quite effective approach for control law design.

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## Technical Brief

### Design and Fabrication of a Universal Robotic Arm

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In Engineering and technological fields especially in manufacturing industry, a large fraction of the work is repetitive. Judicious applications of automation will most certainly work in optimum utilization of machine and man power. The basic objective of this project is to develop a versatile and low cost robotic arm which can be utilized in industry for several purposes and applications such as welding, cutting with exact accuracy, and painting and also to lift and grip light and medium loads with the optimum force required without damaging the object. The universal robotic arm considered for fabrication is planned to have 3 links with 4 degrees of freedom.

Gripping is a part and parcel of robotic arm. To grip light and delicate objects one should not apply huge force to grip it, which may result in breaking or damaging the object. Moreover, to save energy one must grip the object with optimum force(F) needed that is dependent upon the weight of the body(W) and the co-efficient of friction( $\mu$ ) between the gripper and the body to be gripped as per equation  $W=2\mu F$ . An egg can also be gripped by this gripper without being damaged. This is possible when the object weight is sensed by the sensor beforehand.

Degrees of freedom can be increased by using more servos thus increasing its flexibility. Force Sensitive Resistor (FSR) is the sensor that is a basic need of the project which can sense the weight of the object and also gripping force applied on the object. Using more capable sensors means more capability of the arm. Programming development is needed to fit a situation. This robotic arm can be industrialised in various way if it is fabricated suitably.

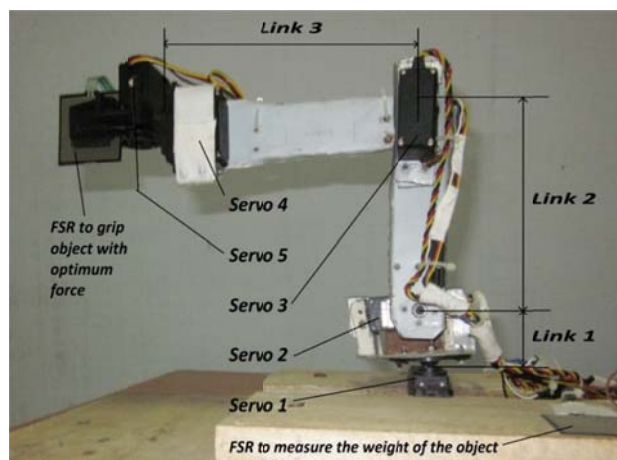


Figure 1: Fabricated robotic arm

Demo of the Universal Robotic Arm Developed is available at:

<https://drive.google.com/file/d/0B0qVC2QTzBBVUWNhXzFXVk14Q2M/edit?usp=sharing>

## Forthcoming Events

### **Kinematics Summer School**

(August 15-16, 2014)

**The University at Buffalo, New York, USA**

(An ASME Mechanisms and Robotics Committee sponsored event)

The ASME Mechanisms and Robotics Committee welcomes to a 2-day Kinematics Summer School being held immediately preceding the ASME IDETC 2014 conference, August 15-16, 2014 on the campus of the University at Buffalo. This summer school will bring together experts from the community to provide two full days of instruction and practical application on topics such as screw theory, quaternions and Clifford algebras, homotopy, continuation methods and algebraic geometry.

#### **Objective**

To provide interested PhD students and faculty access to the fundamentals of these topics, to enable easier entry into the associated research domains and to encourage proliferation of graduate courses in these areas.

#### **Presenters**

##### **J. Michael McCarthy**

Professor, Mechanical and Aerospace Engineering, Henry Samueli Chair and Director of the Center for Engineering Science in Design, University of California, Irvine

##### **Vijay Kumar**

UPS Foundation Professor, Departments of Mechanical Engineering and Applied Mechanics, University of Pennsylvania, NY

##### **Manfred Husty**

Professor, University Innsbruck, Unit Geometry and CAD, Technikerstraße 13, 6020 Innsbruck, Austria

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# MAMM – 2014



## Conference on Microactuators and Micromechanisms

### MAMM-2014

Timișoara, Romania, October 2 - 4, 2014

#### Organized by

University Politehnica Timișoara  
Department of Mechatronics

#### Under the Patronage of IFTOMM

International Federation for the  
Promotion of Mechanism and Machine  
Science

Technical Committee Micromachines  
Technical Committee Linkages and  
Mechanical Controls

#### Conference Chairman

Erwin-Christian Lovasz (Romania)

#### Conference Co-Chairmen

G.K. Ananthasuresh (India)  
Burkhard Corves (Germany)

#### International Scientific Committee

G.K. Ananthasuresh (India)  
Burkhard Corves (Germany)  
Amitabha Ghosh (India)  
Antoni Gronowicz (Poland)  
Karl-Heinz Modler (Germany)  
Viktor Petuya (Spain)  
Anupam Saxena (India)  
Hidetugu Terada (Japan)  
Srikar Vengalattore (Canada)  
Niels Modler (Germany)  
Yao Yan-An (P.R. China)  
Lena Zentner (Germany)

#### Local Organising Committee

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Ioșif Cărăbaș  
Valer Dolga  
Valentin Ciupe  
Nicolae Mircea Dehelean  
Dan Mărgineanu  
Liăna Maria Dehelean  
Cristian Moldovan

#### With the support of the Romania

IFTOMM National Committee -

#### AktoMM

Ioșif Vișă  
Victorian Mătieș  
Erwin-Christian Lovasz  
Cătălin Alexandru

#### Aim

The aim of the conference is to bring together researchers, scientists, industry experts and students to provide, in a collegial and stimulating environment, the opportunity for know-how exchange and build up of collaboration in various disciplines referring to micro systems technology. MAMM-2014 is the first event of this kind at the University Politehnica Timișoara.

#### Topics

**Microactuators**  
Micro sensors involving movable solids  
Micro-opto-mechanical device  
Mechanical tools for cell and tissue studies  
**Micromanipulation and micro-stages**  
Micro-assembly  
Micro-scale flight and swimming  
**Micro-robotics and surgical tools**  
Micro-scale power generation  
Miniature manufacturing machines

#### Submission, presentation and publication

Authors are invited to submit a full paper to e-mail address: [mamm-2014@mec.upt.ro](mailto:mamm-2014@mec.upt.ro). The official language of the workshop is English. Overhead projectors and beamers for personal computers will be available. Each paper will be reviewed and the papers reviewed by the Scientific Committee will be published in a book edited by Springer in MMS Series.

#### Deadlines

Full paper submission: February 28, 2014  
Acceptance notification: April 15, 2014  
Final paper submission: June 15, 2014

#### Registration

The registration fee includes the complete program of the conference MAMM 2014 and paper publication. The registration fees are:  
Early Registration/IFTOMM Members: 300 Euro  
Registration after April 30, 2011: 400 Euro  
Students/Accompanying Person: 200 Euro

Registered participants will receive a copy of the workshop book.

#### Venue

The conference will be held in Timișoara at the University Politehnica. Timișoara is a city with long European tradition. It is the first city in Europe with electrically night illumination (1884). Timișoara is located in SW Romania (region Banat) and because there are many gardens in the city, it is known as the city of flowers. It is easily accessible from all countries by plane, train or car.

#### Accommodation

Timișoara provides accommodation in several hotels of different categories. Early reservation is recommended by contacting directly the Organising Committee. A list of hotels will be soon available on the site of the conference.

#### Further information

This is the first call for papers intended to inform about the aim, topics and important dates of the conference. Detailed information on venue, accommodation, social program and other issues will be posted on the conference website.

#### Correspondence Address

Assoc.Prof.Dr.-Ing. Erwin-Christian Lovasz  
Conference MAMM-2014  
University Politehnica Timișoara  
Bv.Mihai Viteazu nr.1  
RO-300222 Timișoara, Romania

#### Secretariat

For any specific information please use the e-mail address of phone below.

For general information please visit our website.

Website: <http://mamm-2014.mec.upt.ro/>

E-mail: [mamm-2014@mec.upt.ro](mailto:mamm-2014@mec.upt.ro)

Phone: +40-256-403551

Fax: +40-256-403569



## IFTOMM 2015 World Congress Oct. 25-30, 2015, Taipei, Taiwan

<http://www.iftomm2015.tw>

### Call for Paper

The 14<sup>th</sup> IFTOMM World Congress will be held in Taipei, Taiwan, on Oct. 25-30, 2015. IFTOMM World Congress is held every 4 years and is the largest congress on mechanism and machine science. It will provide opportunity for researchers, scholars and students with interests in the theory and practice of mechanisms and machines for new ideas, sharing experiences, and discussing future developments.

#### TOPICS OF THE CONGRESS

Papers are welcome on the general areas of the theory and practice of machines and mechanisms, but not limited, to the topics of the IFTOMM Technical Committees and Permanent Commissions, namely:

- Biomechanical engineering
- Computational kinematics
- Design methodology
- Dynamics of machinery
- Education
- Gearing and transmissions
- History of MMS
- Linkage and mechanical controls
- Mechatronics
- Micromechanisms
- Multibody dynamics
- Reliability of machines and mechanisms
- Robotics
- Rotor dynamics
- Standardization of terminology
- Sustainable energy systems
- Transportation machinery
- Tribology
- Vibration

#### ORGANIZING COMMITTEE

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Secretary General: Tyng Liu  
(National Taiwan University)

Contact: [iftomm2015@elitepc.com.tw](mailto:iftomm2015@elitepc.com.tw) /

IFTOMM Web: [www.iftomm.org](http://www.iftomm.org) / Conference Web: <http://www.iftomm2015.tw>

#### PRESENTATION AND PROCEEDINGS

The official language is English. Registered participants will receive one Digital Proceedings which will be Engineering Index (EI), DOI and ISBN numbered.

#### PAPER SUBMISSION

All papers must be submitted electronically and they will be reviewed. Authors are requested to submit a full length paper, 4 pages (minimum) to 10 pages (maximum). The abstracts are NOT acceptable. The format will follow the IFTOMM template that is available in the congress webpage. Best Paper awards will be given.

#### IMPORTANT DATES

Full version of the paper should be submitted through the Conference Web site.

On-line Submission System Open: 01 Sep. 2014

Full Paper submission: 15 Jan. 2015

Provisional decision: 15 Apr. 2015

Final version submission: 31 May 2015

Final decision: 15 Jul. 2015

#### REGISTRATION FEES

Early registration will be before 25 August 2015.

	Early Reg.	Regular Reg.
Delegate from IFTOMM MO:	US\$500	US\$600
Delegate from non-IFTOMM MO:	US\$350	US\$650
Student:	US\$150	US\$200
Accompanying Person:	US\$150	US\$200

IFTOMM Young Delegate Program will provide support to young researchers as ruled in IFTOMM webpage.

#### CONGRESS LOCATION

The island of Taiwan lies about 180 Km off the southeastern China. Taipei City, the capital of Taiwan is a city of fascinating contrasts – a mix of modern and traditional with a generous dash of energy and friendly smile.

It will be held in Taipei International Convention Center which situated in central Taipei, Xinyi District, near Taipei 101, with convenient transportation. For more information, please visit the Tourism Bureau site at: <http://www.taipeitravel.net/en/scene/>

#### ACCOMMODATION

A variety of hotels with special rate in different standards with the room rate ranging from US\$133 to US\$387 will be listed on the IFTOMM 2015 website.

#### TRAVEL INFORMATION

Taipei can be reached by flight from all around the world to Taiwan Taoyuan International Airport (TPE) and Taipei Song Shan Airport (TSA). TIIC is located on Xinyi line of MRT.

Taiwan Taoyuan International Airport:  
<http://www.taoyuan-airport.com/english/index.jsp>

Taipei Song Shan Airport:  
<http://www.tsa.gov.tw/tsa/en/home.aspx>

#### ORGANIZED BY

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Metal Industries Research & Development Centre (MIRDC), Taiwan  
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**2nd International and 17th National Conference**  
on  
**Machines and Mechanisms**  
(iNaCoMM-15)  
**December 16-19, 2015**  
organized by  
**Department of Mechanical Engineering**



**IIT Kanpur**

Under the aegis of



**Association for Machines and Mechanisms**

&



**International Federation**  
for the Promotion of  
**Mechanism and Machine Science**

**Introduction**

The **Department of Mechanical Engineering**, IIT Kanpur, under the aegis of the Association for Machines and Mechanisms (AMM), and International Federation for the Promotion of Mechanism and Machine Science (IFTOMM) is hosting the 2<sup>nd</sup> International and 17<sup>th</sup> National Conference on Machines and Mechanisms (iNaCoMM 2015). The convention will be held on campus during December 16<sup>th</sup>-19<sup>th</sup>, 2015.

**Highlights of iNaCoMM-15**

iNaCoMM 2015 is the 17<sup>th</sup> National and 2<sup>nd</sup> International in the series of biennial conferences on Machines and Mechanisms organized under the aegis of AMM and IFTOMM. The convention aims at bringing together researchers, industry experts and students, working on various aspects of design and analysis of machines and mechanisms, to deliberate via oral and poster presentations on recent, novel advances.

iNaCoMM 2015 will feature eminent researchers from India and overseas, as plenary speakers. The Conference is planned to commence with an introductory lecture on history and evolution of machines and mechanisms followed by a series of workshops on haptics, static balancing, precision mechanisms, and/or smart material-based mechanisms.

Each day thereafter will commence with a plenary talk by an eminent scientist followed by interesting morning and afternoon presentation/poster sessions on analysis and design of rigid body and compliant mechanisms, advances in biomedical devices, dynamics/control/vibration analysis of multi-body systems (special session) and machines, health monitoring, applications for rural environment and agriculture, mechatronic, micro- and nano- systems, and numerous other topics.

The day will culminate with another plenary lecture followed by soothing, recreational performances by our students from Music, Dance and Dramatics Clubs. Professional and Classical, music and dance nights are also planned.

Numerous industry representatives will also showcase recent technological advances in hardware and software.

**Scope**

The conference will cover following broad areas, but not limited to

- Agricultural and Industrial Applications
- Analysis and Synthesis of Mechanisms
- Compliant Mechanisms
- Design and Analysis of Biomedical Devices
- Dynamics and Control of Multi-body Systems
- Dynamics and Vibration Analysis in Machines
- Fault Diagnosis and Health Monitoring
- History of Machines and Mechanisms
- Mechanisms and Machines for Rural, Mechatronic Systems
- Micro-, Nano-Machines and Mechanisms
- Modeling and Simulation
- Robotics
- Theoretical and Computational Kinematics
- Tribology
- Vehicle Dynamics

**Call for Papers**

Authors are invited to submit a two-page extended abstract at the conference website

([www.inacommm2015.org](http://www.inacommm2015.org))

by **May 1<sup>st</sup>, 2015**. The official language is English. Acceptance of the abstracts will be communicated by **May 15<sup>th</sup>, 2015**. Full paper submissions followed by the camera ready prints in the Conference template are expected by **November 15<sup>th</sup>, 2015**.

**Important Dates**

- Submission of Abstract **May 1, 2015**
  - Acceptance of Abstract **May 15, 2015**
  - Submission of Full Paper **July 1, 2015**
  - Notification of Decision **Oct. 1, 2015**
  - & reviewer comments.
  - Final submission of Camera-Ready Prints **Nov. 15, 2015**
  - addressing of reviewer comments.
  - Registration **Nov. 15, 2015**
- (one author must register for inclusion of paper in Conference Proceedings)**

**Registration Fees**

Delegates from	India (INR)	Others (USD)
Full time research scholar	2000	200
Research Organizations	5000	300
Others (Academic Institutions)	7000	450
Concession (IFTOMM Members)	500	50

### Advisory Committee

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### Accommodation

On campus accommodation is available on payment basis at IIT Kanpur guest house/student hostels on first cum first served basis.

### Organizing Committee

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**Organizing Chairs**  
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P K Panigrahi (Head, Mechanical Engineering)

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### Webpage Development

Nikhil Gupta

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Fax : +91-512-2597408  
e-mail: [inacomm2015@gmail.com](mailto:inacomm2015@gmail.com)

### For updates, please visit

[www.inacomm15.org](http://www.inacomm15.org)

### About IIT Kanpur



IIT Kanpur is a mini-academic city, a self-sustained, lush green campus spread across 1055 acres hosting about 14,000 inhabitants. The campus is well-equipped with infrastructure catering to our academic, culinary, residential and recreational requirements. It offers an innate picturesque ambience that is consistently energizing and calming.

IITK experiences all seasons – the scorching heat of the summer, the wet, humid afternoons of the rainy season, and the chilly and hazy nights of the winter. Our hallmark is the presence of peacocks on campus, often lurching on the green grounds or resting on high branches.

### Tourism sites in and around Kanpur



India is an experience! A visit to IIT Kanpur comes with a unique advantage of exploring the rich and diverse heritage of Northern India. Kanpur is home to several historical sites, e.g., Bithoor, Ghatampur and Shivrājpur. Visits to the mystic ghats of Varanasi, ancient ruins of Kaushambi, architectural splendor of Khajuraho, clouds touching down in Nainital, moonlit Taj and the transcendent beauty of the Himalayas are bound to leave one enriched and craving for more.



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