1. **Brief Report of the Lecture Workshop**

A Two day Lecture Workshop on “Frontier Topics in Physics” fully sponsored and supported by the Science Education Panel of the Consortium of the Three Leading Science Academies of the Nation namely

1) Indian Academy of Sciences, Bangalore
2) Indian National Science Academy, New Delhi
3) The National Academy of Sciences, Allahabad

Was organized by the Department of Physics, Chikkanna Government Arts College, Tiruppur, Tamilnadu on 26th and 27th of February, 2009 under the Convenorship of Prof. M. Lakshmanan, Professor of Eminence and DST Ramanna Fellow, Centre for Non Linear Dynamics, Bharathidasan University, Tiruchirapalli. Prof. P.R.Kumar, Head, Department of Physics, Chikkanna Government Arts College, Tiruppur acted as the Local Organizing Secretary for the event getting guidance from both the Convenor Prof. M. Lakshmanan and Principal Prof. Dr. S. Panayappan, of the host college.

Based on the suggestions and guidance of Prof. M. Lakshmanan, a formal proposal was submitted to the Coordinator, Science Education Panel, Indian Academy of Sciences, CV Raman Avenue, Sadashivanagar, Bangalore on January 24, 2009 for organizing this workshop and it was promptly approved by the Panel of the Academy on January 27, 2009. The Panel then recommended the Organizing committee of the Host College to go ahead with the necessary arrangements for the conduct of the same.

Subsequently arrangements by the host department started in right earnest and invitations with the necessary brochures (Annexure I: Workshop Poster and Application Form) were sent to all nearby colleges in and around Tiruppur offering M.Sc. Physics. The target audience selected was First and Final Year M.Sc. Physics students as well as Teaching community of the colleges. Prof. M. Lakshmanan guided and helped the Organizing committee at every step and also selected a highly enlightened and world renowned cum experienced panel of Subject Experts/Resource Persons to deliver pedagogical talks on a variety of advanced topics in Physics at the Introductory level mainly keeping in mind the rural nature of the participant student community. As such arrangements were made to host a target audience restricted to 125. Invitation letters were sent to the Resource Persons well in advance and depending on their choice Lecture Slots were allotted.

The Distinguished Resource Persons invited and their suggested topics were

1. Prof. G. Baskaran,  
   Institute of Mathematical Sciences  
   C.I.T. Campus, Taramani,  
   Chennai - 600113  
   Email: .................................. ; Phone: (044) 22541856 (Extn.233)  
   Topic: Condensed Matter Physics
2. Prof. H.S. Mani  
Institute of Mathematical Sciences  
Taramani, Chennai  
Email: hsmani@imsc.res.in  
Phone: (044) 22541856 (Extn.363)  
Topic: Any suitable topic in Elementary Particle Physics

3. Dr. R. Sankaranarayanan  
Lecturer in Physics  
National Institute of Technology  
Tiruchirapalli - 620 015  
Email: sankar@nitt.edu  
Suggested Topic of Talk: Quantum Computing

4. Prof. K. Ganesan  
School of Computing Sciences &  
Coordinator, TIFAC-CORE in "Automotive Infotronics"  
VIT University, Vellore - 632 024, India  
Mobile: 09443311348  Phone: +91 416 2202186  
Email: kganesan@vit.ac.in  
Suggested Topic: Chaotic Dynamics and Secure Communication

5. Prof. D. Mangalraj  
Department of Nanoscience and Technology,  
Bharathiar University,  
Coimbatore - 641 046  
Phone: 0422-2428421; 0422-2425 458; 98941 62141  
Email: dmraj800@yahoo.com  
Suggested Topic: Nanophysics/Spintronics

6. Prof. M. Lakshmanan  
Professor of Eminence and DST Ramanna Fellow,  
Centre for Non Linear Dynamics,  
Bharathidasan University,  
Tiruchirapalli  
Topic: Introduction to Solitons/ Nonlinear Dynamics

However, of the above invited speakers Prof. H.S. Mani from Chennai and Prof. D. Mangalraj from Coimbatore intimated to the Host College their inability to attend the Lecture Workshop and therefore subsequent additional names were suggested by Prof. M. Lakshmanan. They were

Prof. Rahul Sinha  
Institute of Mathematical Sciences  
Taramani, Chennai  
Suggested Topic: Elementary Particle Physics
And

Prof. Dr. K. Jeganathan
Department of Nano Sciences
School of Physics
Bhananchi Asan University
Tiruchirapalli
Email: kjeganathan@yahoo.com
Suggested Topic: Introduction to Nano Science/Technology

Both Prof. Rahul Sinha and Prof. K. Jeganathan were kind enough to readily accept the invitation of the Host College, thanks also to the personal communication between the Convener Prof. M. Lakshmanan and the Resource Persons.

Finally in the Second week of February 2009, on specific written request from the Host Organizing Secretary, funds to the tune of Rs.46,500/= (Annexure II: Workshop Proposal) were electronically transferred to the Host Institution to carry out the final preparations and arrangements for the Lecture Workshop.

At the Host Institution, various student committees were formed to carry out all the necessary activities of the Lecture Workshop in a smooth fashion with an Organizing Committee staff member to supervise and guide the students.

P.R. KUMAR, M.Sc., M.Phil., PGDCA,
Selection Grade Lecturer &
Head of the Department of Physics,
Chikkanna Govt. Arts College,
Tirupur.

PRINCIPAL
Chikkanna Government Arts College,
TIRUPUR - 641 601.
2. Time Table of the Workshop

February 27th, 2009
Day 1 of the Lecture Workshop

09:30 AM Registration

Day 1’s activities started at the Host College at 09:30 am first with Registration of Student and Teacher Participants. There was an overwhelming response from the invited colleges and as many as 155 participants (Students and Teaching Staff) turned out for registration from various Government, Government Aided and Private Colleges from Tiruppur, Erode, Ooty, Coimbatore, Udumalpet, Chennai, Tiruchirappalli and Perundurai. Participants were given a file containing a scribbling pad, pen and an identification card. No registration fee was collected from the delegates.

The break up of registered delegates is as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>I M.Sc. and II M.Sc. Students from Host Institution and other Colleges</td>
<td>99</td>
</tr>
<tr>
<td>Teaching Staff from Host Institution and Other Colleges</td>
<td>18</td>
</tr>
<tr>
<td>III B.Sc. Students from Host Institution and other Colleges</td>
<td>34</td>
</tr>
<tr>
<td>Research scholars/B.Ed.</td>
<td>04</td>
</tr>
<tr>
<td><strong>Total Registered Participants</strong></td>
<td>155</td>
</tr>
</tbody>
</table>

It is to be noted here that even though the Lecture Workshop had been organized only for M.Sc. Physics Students, many of the invited colleges also sent their B.Sc. Final Year Physics Students who were very keen to attend the workshop.

10.15 AM Inauguration of the Lecture Workshop

The inaugural function began 15 minutes behind schedule with a Prayer and Lighting of the traditional Lamp ‘Kuthuviillaku’ by the Principal and the Invited Dignitaries. This was followed by the “Welcome Address” delivered by Prof. P.R. Kumar, Head, Department of Physics, Chikkanna Government Arts College & Organizing Secretary of the Workshop, Tiruppur. In his address he delved on and highlighted the formation of the UG and PG Department of Physics at the college and the strenuous efforts of the past Head of the Department Prof. N. Kandasamy (Presently Re-employed Staff in the Host Department) sincere efforts to retain the Physics Department in the College in a period of crisis. He emphasized that with a dynamic Principal interested in the academic upliftment of the Student Community and the hard work of the Teaching Staff, the Department of Physics had even achieved 100% results. He went on to welcome the Principal, Prof. M. Lakshmanan, Convenor and the invited Resource Persons.
In his **Presidential Address** Dr. S Panayappan, Principal, Chisakanna Government Arts College, Tirupur highlighted the importance of Higher Education and Research to the Student Community and also the formation of new infrastructural facilities in the college like Open Air theatre, Indoor Auditorium and a Rupees 8.5 Lakh grant from the UGC for development of the College. He also stressed his resolve to make the college achieve Autonomous Status and thus convert the college into a premium institution.

Prof. M. Lakshmanan, Professor of Eminence and DST Ramanna Fellow, Centre for Non Linear Dynamics, Bharathidasan University, Tiruchirapalli, in his inaugural address explained the role of the three sponsoring Academies in organizing Workshops/Seminars in colleges and in their dissemination of Science Education throughout the country and the need for students to take a research career in Physics. The following are excerpts from his inspiring speech

“New ideas are emerging in Physics. Physics is the gate way to understand Nature and the World. In other fields there are only limited areas for study. But in Physics we have wide areas for study and research”

This was followed by felicitations by the Invited guests on the dais. Prof. G. Bhaskaran, Institute of Mathematical Sciences, Taramani, Chennai stressed on the joy of doing research. Prof. Rahul Sinha also from the same institution was overwhelmed by response of the student community at the college. Prof. Sankaranarayanan, National Institute of Technology, Tiruchirapalli also felicitated the delegates.

The inaugural session came to an end at **11.15 AM** and it was followed by a Tea Break for 10 Minutes

**11:30 AM**  
**Lecture I: Introduction of Non Linear Dynamics & Chaos**

**By Prof. M. Lakshmanan, Professor of Eminence & DST Ramanna Fellow, Centre for Non Linear Dynamics, Bharathidasan University, Tiruchirapalli**

The first lecture of the Workshop began at 11:30 am and was delivered by Prof. M. Lakshmanan. He gave an impressive and thought provoking talk on the basics of the topic starting from Classical Dynamical Systems with finite number of degrees of freedom to Continuous systems and moving on to Evolutionary problems in Non Linear Dynamics, Solitons and its applications to Deep Ocean Waves-Tsunami and Energy Saving in Quantum Computing. A sample excerpt from his talk is as follows

“When we come to a physical limitation, Quantum Mechanics will begin to help us” and “Linear Harmonic Oscillator Problems-have solutions whereas An-harmonic Oscillator Problems never have a solution. Only with computational analysis (using computer) we can get a solution”

Later questions were asked by the delegates and Prof. M. Lakshmanan answered all their queries. The First Lecture therefore came to an end by 01:15 PM after which the gathering had a sumptuous and relishing working lunch.
02:00 PM    Lecture II: "Quantum Computing - A New Paradigm"

By Prof. Dr. R. Shankaranarayanan, Department of Physics, National Institute of Technology, Tiruchirapalli

After the lunch break the second lecture started by 02:00 PM. Dr. R. Shankaranarayanan, gave an illuminating talk on an “Quantum Computing – A New Paradigm”

He started his talk with an introductory note on Classical Physics and its failure to answer many new discoveries in the beginning of 19th century and then went on to acquaint students with the concepts of Quantum Physics to explain Modern Physics. He then presented in an exhaustive manner the fundamentals of Quantum Computing highlighting the fact that it is simply a conglomeration of the ideas of Quantum Mechanics and Computer Science shown in a new perspective. He went on to elaborate on the finer details of the interesting topic in a simple and neat manner touching on topics like Models of Computation, Church-Turing Thesis, Qubits, Qubit Gates etc.

The delegates had a very open interaction with the Subject Expert after the talk. The talk ended by 03:30 PM on a very positive note after which refreshing Tea/Coffee were served to the delegates.

03:45 PM    Lecture III: "Condensed Matter Physics"

By Prof. G. Bhaskaran, Institute of Mathematical Sciences, Taramani, Chennai

An energizing and stimulating lecture on “Condensed Matter Physics” was delivered by Prof. G. Bhaskaran in an eloquent manner. He started with a call and a need for young scientists in the interests of the Nations growth and highlighted the numerous opportunities available to present students in the areas of research in Physics. His dynamic talk then went on and touched various aspects of Condensed Matter Physics with beautiful illustrations like Gravitational Pressure, Fermi Degeneracy Pressure, Nano Sciences, Condensed Matter Physics in Textiles/Fabrics, Low and Room Temperature Conductivity, Magneto static Bacteria etc.

Even at 5.30 PM the delegates were feeling fresh and interacted with the Subject Expert with a lot of queries. The first day of the workshop came to an end by 5.40 PM.
February 28th, 2009
Day 2 of the Lecture Workshop

09:30 AM Lecture IV: “The Quest for Building Blocks of the Universe- The Story of Elementary Particle Physics”

By Prof. Rahul Sinha, Institute of Mathematical Sciences, Taramani, Chennai.

Prof. Rahul Sinha presented his brain storming talk on “The Quest for the Building Blocks of the Universe- The Story of Elementary Particle Physics” with a smiling, eager face and attracting tone and took all the delegates along with him throughout his exhaustive two hour lecture on the basics of Elementary Particle Physics with a lot of examples and stunning slides containing actual pictures of experiments and scientists. He started his talk gliding from the Atomic Model to Particle Behaviour, the concept of Nucleons and their binding, Antimatter, Leptons, the story of the amazing discovery of Neutrinos, Strange Particles and concluded with the concept of Quarks, their discovery, leading to Unification Schemes in Particle Physics and the present day problems concerning Broken Symmetries etc. It is very important to note at this point that Prof. Rahul Sinha in addition to his all inclusive talk on Particle Physics was exclusively available to all student participants for guidance and encouragement throughout the entire duration of the two day Lecture Workshop with a smiling face and eager intention to help the student community.

The stimulating morning lecture by Prof. Rahul Sinha made an indelible mark in the young minds of the delegates. His lecture came to an end by 11.30 AM after which the delegates and guest were served refreshing Tea/Coffee and biscuits for 10 Minutes

11:40 AM Lecture V: “Chaos Based Data Security Systems”

By Prof. K. Ganesan, School of Computing Science and Director, TIFAC-CORE in Automotive Infrotonics, VIT University, Vellore

Dr. K. Ganesan started his talk “Chaos Based Data Security Systems” by introducing the basics of Cryptography in a very simple and profound manner starting from different types of data, and emphasizing the importance and the need for their storage for processing purposes and subsequent usage. He elaborately touched on different facets of the topic like Chaotic Systems, Cryptographical and Logistic Maps, Text Encryption, Baptista Techniques for the same, Multilingual Encryption etc. While introducing he gave simple examples and explanations to understand the new topics which were easily understood by the student community even though the topic of his talk was new to them. The talk was then followed by an active question-answer session and it finally concluded at 01:00 PM.

The gathering then had a break for Lunch.
01:50 PM  Lecture VI:
"Introduction to Nano Structures: Nano Particles and Nano Wires"

By Prof. K. Jeganathan, Department of Nano Sciences, School of Physics, Bharathidasan University, Tiruchirapalli

The concluding lecture of the Workshop started at 01:50 PM and was delivered by Prof. K. Jeganathan on the topic "Introduction to Nano Structures: Nano Particles and Nano Wires". He introduced the topic in a skillful manner with the famous quotation of the world renowned Physicist Feynman namely “There is plenty of room at the bottom” and then went on to touch many subtle facets of the interesting topic like Colours in a Butterfly’s wings, Photonic crystals, Zero dimensional Nano particles, Surface Plasmons, Quantization effects, Nano Molecular Imaging, Nano Therapy, Nano Electronics etc.

The participating M.Sc. Physics students keenly observed his lecture as most of them also have a compulsory paper on Nano Sciences in their Syllabi as a Diploma Paper. The session ended at 03:30 PM after which the gathering had a tea break.

03:45 PM  Short Paper Presentations by M.Sc. Students

A unique feature in this workshop was the short paper presentations by M.Sc. Physics students of Chikkanna Government Arts College, Tiruppur many of which were maiden presentations. This feature was incorporated in the Lecture Workshop so that students get a feel of research atmosphere and develop their communication and presentation skills. The following students gave short paper presentations in the following topics

1. Ms. R. Amirthavalli, I M.Sc. - CT Scan in Lung Cancer Treatment
5. Mr. M. Manivannan, I M.Sc. - Thin film solar cells
7. Mr. Santhakumar, II M.Sc. - Chandrayaan-I

The talks were very much appreciated by the Convenor Prof. M.Lakshmanan and Prof. Rahul Sinha.
The concluding part of Lecture Workshop namely the Valedictory address started at 04:45 PM with Prof. P.R. Kumar, Organizing Secretary and Head, Department of Physics, Chikkanna Government Arts College presiding over the function.

Prof. A. Rathnasamy, Department of Physics Chikkanna Government Arts College, Tiruppur, gave the Valedictory address. He expressed that all the six lectures on a variety of topics by the Subject Experts/Resource Persons were of a highly stimulating and exhilarating nature. He highlighted the fact that these lectures made an indelible mark among the participating delegates and created a true and deep desire in them for pursuing research. He stressed the need for attending many such seminars by the student community during their PG course study and also to present papers. He concluded by giving valuable suggestions to make the PG course study to be much more effective.

This was followed by a short felicitation by Prof. N. Kandasamy, Former Head and Presently Professor, Department of Physics, Chikkanna Government Arts College, Tiruppur.

Later Prof. M. Lakshmanan, Convenor of the Workshop, made a clarion call to students to take up research as a career and stressed upon the intellectually satisfying nature of a research career when done with real interest, hard work and determination.

Prof. Rahul Sinha also gave a brief felicitation address and congratulated the student participants for showing a keen desire in Physics in the last two days particularly in a Workshop of this kind at a Rural Location.

Participation Certificates were then distributed as an encouraging gesture to all attending delegates by the dignitaries on the dais.

As is customary, student feedback about the Lecture Workshop was presented by three participants from other colleges and all of them heart fully thanked the Sponsors and the Organizers for exposing them to a fruitful and highly useful national level Workshop at Chikkanna Government Arts College, Tiruppur. “We have now got the Seeds of Research with us and we will develop it surely” assured a delegate with joy mirroring the sentiments of the student community.

Finally Prof. Haresh M. Pandya, Department of Physics, Chikkanna Government Arts College presented the Vote of Thanks. Highlighting the important fact that this Lecture Workshop was the first of its kind in the entire history of the college as well as for the Young Department of Physics, and that it had acted as a catalyst and stimulant in all departments of the college to rise academically and intellectually. He also pointed out the importance of 28th February celebrated as National Science Day in India in memory of birthday of Sir C.V. Raman and the need for hard work and persistence in research. He went on to profusely thank the three academies and Prof. M. Lakshmanan for his untiring efforts in the successful conduct of the Lecture Workshop right from the beginning and for all his help in arranging world class Resource Persons/Subject Experts to visit Chikkanna
Government Arts College, Tiruppur. He also requested Prof. M. Lakshmanan to consider the Physics Department of Chikkanna Government Arts College has its own department and guide the students and staff alike to achieve greater heights and at least convene one such workshop/seminar in a year for the betterment of Physics Education in and around Tiruppur.

He also thanked the Principal Dr. S. Panayappan and Prof. PR. Kumar for all their encouragement in alleviating the academic standards in the institution by permitting the conduct of such workshops and seminars.

Prof. Haresh M. Pandya also thanked all the Invited Resource Persons for sparing their valuable time with the students at the college and all others involved including student volunteers for making the Lecture Workshop memorable and a grand success.

The two day workshop finally came to an end with the National anthem at 5.45 PM.