REFRESHER COURSE IN THEORETICAL PHYSICS
BISHOP MOORE COLLEGE MAVELIKARA
7-19 DECEMBER 2009
SPONSORED BY
INDIAN ACADEMY OF SCIENCES, BANGALORE,
INDIAN NATIONAL SCIENCE ACADEMY, NEW DELHI,
THE NATIONAL ACADEMY OF SCIENCES INDIA, ALLAHABAD

REPORT

The Refresher Course in Theoretical Physics was conducted at Bishop Moore College, Mavelikara, Kerala during 7-19th December 2009. The Course was sponsored by Indian Academy of Sciences, Bangalore, Indian National Science Academy, New Delhi, and The National Academy of Sciences India, Allahabad under the Educational Program of the Science Academies. Prof. M. Lakshmanan of Bharathidasan University was the Course Director and Dr. Thomas Kuruvilla of Bishop Moore College was the local organizer. The participants were from different parts of the country. There were 45 outside applications for the Course, out of which 30 participants were finally selected. Only 23 of them could actually attend the Course. The others informed their inability to attend the Course during last minute. In addition to the selected outstation participants 10 local participants and 16 M.Sc. students attended the Course making a total of 49 participants.

1. Inaugural Function

Most of the participants and the first group of resource persons had arrived on Sunday 6th December 2009 itself. The Course was inaugurated by Rt. Rev. Thomas Samuel, Manager of Bishop Moore College on Monday 7th December 2009 at the college auditorium. The eminent theoretical physicist and former Vice-Chancellor of Cochin University of Science and Technology, Prof. K. Babu Joseph, gave the keynote address. Prof. P.M. Mathews, Chennai and Prof. M. Lakshmanan, Tiruchirappalli felicitated the function. The welcome address was delivered by Dr. Mathew Koshy, Principal of Bishop Moore College and Dr. Thomas Kuruvilla expressed the vote of thanks. The function was attended by the participants, the resource persons and faculty and students from the college. The inaugural session was covered in local news papers with photographs. Some copies are attached herewith.

After the inaugural session the participants and resource persons had assembled at the seminar hall at the Bishop Moore Counseling Centre for the lecture sessions. The first lecture was given by Prof. M. Lakshmanan from 11.30 am to 1 pm. The after noon session started after lunch at 2 pm. and ended at 5.45 pm with 15 minutes tea break. This schedule of 4 one and half hours sessions per day was continued throughout the course. The time table is attached with the report.
2. Lectures during the First Week (7-12 December)

The resource persons for the first week of lectures were Prof. M. Lakshmanan, Bharathidasan University, Trichy, Prof. R. Simon, IMSc, Chennai, Prof. R. Jaganathan, Chennai Mathematical Institute, Chennai, and Prof. P.M. Mathews, Chennai.

Prof. Lakshmanan gave an overview of Classical Mechanics and its various formulations. He explained the effects of nonlinearities on dynamical systems and explained how to study the nonlinear problems. The models like logistic map and nonlinear oscillators were discussed in depth and he explained the sensitive dependence on initial conditions. He also explained how the nonlinear systems can give rise to solitary waves and solitons and discussed the basic theory of solitons.

Prof. P.M. Mathews gave a series of lectures on how classical mechanics, especially rotation dynamics, can be applied to the earth dynamics and how various geographical phenomena and observational data can be explained systematically through careful theoretical analysis.

Prof. R. Jaganathan discussed how linear partial differential equations can be variable separated and solved. The situations under which ordinary differential equations can be obtained were also discussed. He also explained how homogeneous differential equations with nonhomogenous boundary conditions can be transformed to nonhomogenous differential equations with homogeneous boundary conditions. The solution of nonhomogenous differential equations using Green's function was also explained with examples.

Prof. R. Simon discussed quantum entanglement in two level systems, building the logic of analysis from fundamental postulates of quantum mechanics. He explained how teleportation is not violating the uncertainty principle. He also discussed the polarization optics taking two orthogonally polarized states as qubits and its significance to quantum computation.

3. Excursion on 13th December

The first series of lectures ended on Saturday the 12th December with a small function to express thanks to the first team of resource persons. On Sunday morning all the participants were taken for sight seeing tour to Alapuzha. A KTDC boat was rented for a ride to the back waters of Kuttanad a place below sea level. The beautiful Alapuzha beach and various famous temples were also visited. Everybody enjoyed the trip which ended by 7pm in the evening.

4. Lectures during the Second Week (14-19 December)

Lectures by the second team of resource persons started on Monday the 14 the December at 9.30 AM. The second team of resource persons consisted of Prof. N. Mukunda, IISc, Bangalore, Prof. S. Chaturvedi, University of Hyderabad, Prof. A.V. Gopala Rao, Mysore University and Prof. K.S. Mallesh of Mysore University.

The first lecture was given by Prof. A.V. Gopala Rao of Mysore University on Relativistic Electrodynamics. He gave a series of lectures on the Minkowski space and Relativistic Particle
Mechanics. He explained clearly the basic features of relativity theory and its various consequences. He conducted tutorial sessions also.

Prof. S. Chaturvedi gave a series of 8 lectures on statistical mechanics and thermodynamics. In addition he conducted tutorial sessions also. Prof. Chaturvedi explained very lucidly the basic principles underlying the development of statistical mechanics, the methodologies involved and the consequences thereof. He cleared many of the doubts on the fundamentals for both the teachers and students.

Prof. N. Mukunda delivered several illuminating lectures on vector spaces, tensors and group theory. He explained lucidly the various symmetry groups and their significance which the teachers and M.Sc students greatly appreciated.

Prof. K.S. Mallesh gave elaborate account of quantum mechanical perturbation theory, with particular reference to time dependent systems.

The participants and resource persons attended the Christmas carol at the College Women’s hostel on Tuesday 15th December 09. There was a special dinner for the participants and resource persons hosted by the Principal of Bishop Moore College on Thursday 17th December at 7 PM.

5. **Books for Participants**

Two books suggested by the resource persons, Mathematical Methods by Arfken (Rs795) and Quantum Computation by Nielsen (Rs.375/-), were distributed to all the participants. As suggested by Prof. M. Lakshmanan and Prof. N. Mukunda one of the following sets of books were distributed to the M.Sc student participants as per their choice: 1. Feynman Lecture Series 2. University Physics by Zemansky & Sears 3. Vignettes in Physics series by G. Venkataraman

6. **Concluding Session**

The Refresher Course ended on 19th December afternoon with a valedictory program. The participants and resource persons expressed their views on the conduct of the Course. They also thanked the organizers, resource persons and the Academies for arranging such an excellent educative course. From their views it was clear that the course was a great success.

We are thankful to all the three Academies for giving us an opportunity to conduct such a fruitful course and the Bishop Moore College for providing all the facilities. We are grateful to Prof. N. Mukunda for his guidance in organizing the Course and we also greatly appreciate the help rendered by Mr. G. Madhavan at various stages in the organization of the Course.

Prof. M. Lakshmanan  
Course Director  

Dr. Thomas Kuruvilla  
Local Coordinator
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<th>Date</th>
<th>Event</th>
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<td>Evening Session C</td>
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*Teatime Schedule for the Refresher Course on Theoretical Physics, December 7-19, 2009*
List of Participants for the Refresher course in Theoretical Physics
BISHOP MOORE COLLEGE MAVELIKARA
7-19 DECEMBER 2009
SPONSORED BY
INDIAN ACADEMY OF SCIENCES, BANGALORE,
INDIAN NATIONAL SCIENCE ACADEMY, NEW DELHI,
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1. Dr. Suresh V. Vettoor,
   Reader in Physics
   St. Dominic College, Kanjirapally
   Kottayam, Kerala
   PIN 686001
   Email: sureshvettoor@yahoo.co.in

2. Mr. Achole B.P
   Department of Physics.
   Shri Havagiswami College,
   Udgir (Maharastra)
   Pin – 413517

3. Dr. Mohd Sharf Alam,
   Dept. of Physics,
   Jamia Millia Islamia,
   New Delhi – 110025

4. Dr. A. Venkatesan,
   Asst. Professor in Physics
   Nehru Memorial College,
   Puthanampathi – PIN621007
   Thiruchirappalli Dist.,
   Tamil Nadu

5. Mr.R. Prabhu,
   Lecturer,
   Department of Physics,
   K.S.Institute of Technology,
   #14, Raghuvanahalli,
   Kanakapura Main Road,
   Bangaluru- PIN560 062,

6. Dr. L. Senthilkumar
   Reader
   Department of Physics,
   Bharathiar University,
   Coimbatore, PIN 641046
   Email: lsenthilkumar@yahoo.co.in
7. Dr. K. Senthilkumar  
   Asst. Professor,  
   Department of Physics,  
   Bharathiar University  
   Coimbatore, PIN641046  
   Email: pksen217@yahoo.com

8. Mr. V. Veeraganesh,  
   Senior Lecturer,  
   Department of Physics,  
   Thiyagarajar College of Engineering,  
   Madurai - 625 015  
   Email: vsgphy@tce.edu

9. Mr. Arun Harilal Bhinde,  
   Tolani College of Arts & Science,  
   Near Railway station,  
   Adipur, Kutch Dist.,  
   Gujarat – PIN 370110.

10. Dr. Roshni Dave,  
    Lecturer,  
    Dungarpur College of Engineering,  
    Udayapur, Rajasthan.

11. Dr. Sudha,  
    Lecturer in Physics,  
    Department of Post-Graduate studies in Physics,  
    Kuvempu University,  
    Shankaraghatta PIN577 451  
    arss@rediffmail.com

12. Ms. Veena Adiga,  
    Lecturer,  
    Department of Physics,  
    St. Joseph's College (autonomous),  
    Bangalore.  
    Res: #882, 'PADMAJA', 25th Cross, 50th main  
    Kumaraswamy Layout 1st stage. Bangalore-PIN560078.  
    Email: vadiga11@gmail.com

13. Dr. R. Radhakrishnan,  
    Asst. Prof (Sel. Gr.) in Physics,  
    Jamal Mohamed College,  
    Thiruchirapalli PIN640020  
    Email: rrk68@yahoo.com
14. Ms. Sindu Jones,
   BCM College,
   Kottayam.Kerala
   PIN 686001
   Email: sindu.jones@gmail.com

15. Ms. Sheeja P.,
   Lecturer Sel. Gr.,
   Dept. of Physics,
   D. B. Pampa College,
   Parumala,
   Kerala.

16. Mr. Krishnakumar S.,
   Institute of Mathematical Science,
   Chennai.

17. Ms. Lakshmi Parameswar,
   Dept. of Physics,
   D. B. Pampa College,
   Parumala,
   Kerala.

18. Mr. Amarnadh R. U.,
   Lecturer,
   Dept. of Physics,
   University College,
   Thiruvananthapuram., Kerala

19. Dr. Shajo Sebastian,
    Reader,
    Department of Physics,
    St Berchmans' College,
    Changanacherry,
    Kerala.
    Pin: 686 101
    Email: shajo@rediffmail.com

20. Ms. K.S. Sreelatha,
    Amrita Vishwa Vidyapeetham,
    Amritapuri Campus,
    Clappana,
    Kollam. PIN 690518

21. Mr. Syam Kishore K. S.,
    Lecturer,
    Amrita Vishwa Vidyapeetham,
    Amritapuri Campus,
    Clappana,
    Kollam. 690518

22. Mr. Gopalakrishna Panicker E. G.,
    Lecturer Se. Gr.,
N. S. S. Hindu College,
Changanacherry 686101
Kerala.
23. Dr. G. Sudhakaran,
S. N. College,
Kollam,
Kerala.

Local Participants

24. Mr. George Kurian
   Lecturer Sel Gr.
   Dept. of Physics,
   Bishop moore college,
   Mavelikara
   PIN 690110
25. Ms. Valsam John
   Lecturer Sel Gr.
   Dept. of Physics,
   Bishop moore college,
   Mavelikara
   PIN-690110
26. Ms. Lysa Varkey
   Lecturer Sel Gr.
   Dept. of Physics,
   Bishop moore college,
   Mavelikara
   PIN 690110
27. Mr. Chandy N George
   Lecturer Sel Gr.
   Dept. of Physics,
   Bishop moore college,
   Mavelikara
   PIN 690110
28. Mr. George Mathew
   Lecturer Sel Gr.
   Dept. of Physics,
   Bishop moore college,
   Mavelikara
   PIN 690110
29. Dr. Thomas Kurvillla
   Lecturer Sel Gr.
   Dept. of Physics,
   Bishop moore college,
   Mavelikara
   PIN 690110
30. Dr. D Sajan  
   Lecturer Sel Gr.  
   Dept. of Physics,  
   Bishop moore college,  
   Mavelikara  
   PIN 690110

31. Ms. Linett Joseph  
   Lecturer Sel Gr.  
   Dept. of Physics,  
   Bishop moore college,  
   Mavelikara  
   PIN 690110

32. Ms Sasikala  
   Lecturer Sel Gr.  
   Dept. of Physics,  
   Bishop moore college,  
   Mavelikara  
   PIN 690110

33. Mr Umesh T.S.  
   Research Scholar  
   Dept. of Physics  
   M.G. University  
   Kottayam.  
   PIN : 686560

**Student Participants (M. Sc. Physics)**

34. Aiswarya mol S.  
35. Babitha K. B.  
36. Soumya S.  
37. Mekha Surendran  
38. Malini M. Nair  
39. Kalyani Krishnan  
40. Ambily R.  
41. Prakash A. P.  
42. Sangeetha G.  
43. Keerthana R.  
44. Sini S.  
45. Anumol  
46. Nithya Mohan  
47. Jacob Ninan  
48. Nikhil  
49. Sheeba A. K.
List of Resource Persons for Refresher course in Theoretical Physics
BISHOP MOORE COLLEGE, MAVELIKARA
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THE NATIONAL ACADEMY OF SCIENCES INDIA, ALLAHABAD

1. Prof. S. Chadurvedi, University of Hyderabad, Hyderabad
2. Prof. A.V. Gopala Rao, University of Mysore, Mysore, Karnataka
3. Prof. K. S. Mallesh, University of Mysore, Mysore, Karnataka
4. Prof. R. Jagannathan, Chennai Mathematical Institute, Chennai, Tamilnadu.
5. Prof. P.M. Mathew, Chennai
6. Prof. N. Mukunda, Indian Institute of Science, Bangalore, Karnataka
7. Prof. M. Lakshmanan, Bharathidasan University, Thiruchirapally
8. Prof. R. Simon, Institute of Mathematical Sciences, Chennai.