

**Report on  
Science Academies' Refresher Course in Experimental Physics  
at  
Department of Physics Goa University  
Taleigao Plateau, Goa 403206  
(November 12 to 27, 2018)**

The eighth Refresher Course in Experimental Physics as a part of MoU between Indian Academy of Sciences, Bangalore and Goa University was conducted from November 12 to 27, 2018 at Goa University. The announcement of the course was made well in advance through advertisements in Current Science and Resonance.

In all 93 applications were received within due date out of which 45 were teachers and 48 students. Initially names of 45 participants (24 teachers and 21 students) were shortlisted and 35 of them were sent selection letters. Depending on cancellations or no response and equal number were added to the list to maintain the number 35 constant. Out of these 30 participants sent their confirmations by email as well as by post. Though almost all of them either uploaded their travel plans on the web portal or sent information by email, only 22 participants finally attended the course. Of the 22 who attended the course, 12 were teachers and 10 students.

The participants showed keen interest in learning and performing experiments. All of them took interest and completed their calculations of all the experiments and their results were verified by the resource persons. The student participants maintained their own journal of experimental readings and calculations. Some of the participants used to sit till 6.00 pm to complete their calculations and this trend continued until the last couple of days by which they were well versed with the data analysis procedure and computer software. The participants expressed their satisfaction at the way the course was conducted. Some of the participants made inquiries about the kit and were provided by the price list obtained from M/s Ajay Sensors. During the participant's seminar, each batch of participants were asked to give a presentation of about 10 – 15 minutes on their first experiment(s). This activity was well received and participants gave a good seminar detailing their experiences and explaining their results and calculations. There was a short discussion after each seminar which helped them to resolve their doubts and correct their mistakes.

Resource persons also expressed their satisfaction in conducting the course for these participants. All the experiments worked well, the participants were happy to see a very good agreement between theory and experimental results. Their results and calculations were checked and difficulties were discussed.

There were two special lectures. First one was by Prof. D. Bahadur, formerly Professor at IIT Bombay and presently, Dean of Research at IIT, Goa. He spoke on functional nanomaterials for Cancer therapy. One afternoon, a lecture followed by demonstration of various Physics experiments was conducted by Dr. Bhagwan Chakradeo. He gave an excellent demonstration of various physical phenomena using his self-

developed experimental kits. This demonstration session which was initially planned for about 2 hours went well beyond 3 hours mainly on active participation of the participants and our M.Sc. students.

All the participants were housed in Goa University guest house and were provided with all lodging and boarding facilities. They also had access to internet through wifi network of the University. Feedback was collected from all the participants about the experiments and allied facilities and some of them gave their impressions at the valedictory function. Prof. Ramesh Pai, Head, Department of Physics, Goa University, was the chief guest for the valedictory function. Participants were awarded certificates for their successful completion of the course as well as two books, viz. **Data Reduction and Error Analysis for the Physical Sciences** by P. R. Bevington and D. K. Robinson and **Quantum Mechanics, Devanathan** were given as a gift from the three Science Academies. Overall the participants expressed their satisfaction about the experiments, their working, and the availability of resource persons to address their difficulties as well as about the other facilities made available to them.

Statement of Accounts and Utilization Certificate are attached with this report.

K. R. Priolkar  
CourseCoordinator

REFRESHER COURSE IN EXPERIMENTAL PHYSICS

November 12 to November 27, 2018

AT

GOA UNIVERSITY, GOA

Sponsored by

INDIAN ACADEMY OF SCIENCES, BANGALORE

INDIAN NATIONAL SCIENCE ACADEMY, DELHI

NATIONAL ACADEMY OF SCIENCES OF INDIA, ALLAHABAD

TIME TABLE

Day and Date	09.30 - 10.30	10.45 – 11.45	11.45 – 12.45	14.00 – 15.00	15.15 – 16-15	16.15 – 17.15
Monday 12 Nov `18	Registration/ Inauguration	ED1	MN1	SMS1	ED2	MN2
Tuesday 13 Nov `18	SMS2	KRP1	SK1	ED3	SMS3	KRP2
Wednesday 14 Nov `18	KRP3	SK2	SMS4	MN3	ED4	KRP4
Thursday 15 Nov `18	ED5	MN4	SMS5	ED6	MN5	KRP5
Friday 16 Nov `18	KRP6	LAB1		LAB2		
Saturday 17 Nov `18	SPL1	LAB3		LAB4		
Sunday 18 Nov `18						
Monday 19 Nov `18	Discussion	LAB5		LAB6		
Tuesday 20 Nov `18	Participants Seminar	LAB7		LAB8		
Wednesday 21 Nov `18	Participants Seminar	LAB9		LAB10		
Thursday 22 Nov `18	Participants Seminar	LAB11		LAB12		
Friday 23 Nov `18	Participants Seminar	LAB13		LAB14		
Saturday 24 Nov `18	Participants Seminar	LAB15		LAB16		
Sunday 25 Nov `18						
Monday 26 Nov `18	LAB17		LAB18		SPL2	
Tuesday 27 Nov `18	Feedback and Valedictory					

LUNCH

13-14 HRS

COFFEE/TEA BREAK

10-30 TO 10-45 HRS

15-00 TO 15-15 HRS

## LECTURES

### LECTURES BY Dr. EFREM DESA (ED)

1. Constant Current Source
2. TCR of Copper and Bandgap of silicon
3. Stefan's constant
4. Thermal and electrical conductivity of Copper and thermal conductivity of a poor conductor.
5. Calibration of Si diode and Thermocouple as temperature sensor
6. Young's Modulus and Rigidity Modulus of brass bar

### LECTURES BY Mr. MANOHAR NAIK (MN)

7. Signal Generator and power amplifier
8. Verification of Curie Weiss Law for a ceramic capacitor
9. Phase sensitive detection and calibration of a lock in amplifier
10. Measurement of mutual inductance and low resistance with a lock in amplifier
11. B-H curve

### LECTURES BY Ms. SHRAVANI KALE (SK)

12. AC Experiments
13. AC Bridges and Passive Filters

### LECTURES BY PROF. S. M. SADIQUE (SMS)

14. DC Differential Amplifier
15. Capacitance meter – measurement of capacitance
16. Dielectric constant of benzene and dipole moment of acetone.
17. High Resistance by leakage and k/e using transistor
18. Inversion temperature of Fe-Cu thermocouple

### LECTURES BY Dr. K. R. PRIOLKAR (KRP)

19. Thermal Relaxation of a Light bulb
20. Thermal diffusivity of brass
21. Non-linear dynamics – Feigenbaum circuit
22. Non-linear dynamics – Chua circuit
23. Optics – Diffraction/Polarization
24. Error Analysis

## SPECIAL LECTURES

**SPL1** – Professor D. Bahadur, IIT Goa

**SPL2** – Demonstration by Dr. Bhagwan Chakradeo (2:00 pm – 4:00 pm)

## PARTICIPANTS SEMINAR

Seminar by participants on the first experiment/s they do in the course. A group of two participants will do one or more experiments per session. Details will be explained during the course.

Names and Affiliation of Participants who attended the course

Sr. No.	Name
1	<b>Dr. A SARAVANAN</b> , Sri Ramakrishna College of Arts and Science, Coimbatore
2	<b>Ms. BAMBHANIYA KRISHNA GOVINDJI</b> , Tolani College of Arts and Science , Adipur
3	<b>Ms. BHAVIKA MAKANI</b> TOLANI COLLEGE OF ARTS & SCIENCE , Adipur
4	<b>DR. PAULOSE THOMAS</b> , Mar Thoma College for Women, Perumbavoor
5	<b>Mr. D R GIRI</b> , St. JOSEPH'S COLLEGE , Trichy
6	<b>Ms. HEMANGI OZA</b> , TOLANI COLLEGE OF ARTS & SCIENCE , Adipur
7	<b>Dr. JAYANT V. JOSHI</b> , UGC - DAE Consortium For Scientific Research, Mumbai
8	<b>Dr. JAYARAM P</b> , MES Ponnani College, Ponnani
9	<b>Dr. KATRAPALLY VIJAYA KUMAR</b> , JNTU Hyderabad College of Engineering Sultanpur, Sangareddy Dist.
10	<b>Dr. P NARESH KUMAR</b> , SNS COLLEGE OF TECHNOLOGY, Coimbatore
11	<b>Ms. RUCHA DESAI</b> , Parvatibai Chowgule College of Arts and Science , Margao
12	SADHANA KATLAKUNTA, OSMANIA UNIVERSITY, HYDERABAD
13	<b>Dr. SAKTHIVEL PALANISAMY</b> , Dr.N.G.P Artes and Science College, Coimbatore

14	<b>Mr. SANJAY KUMAR TARAI</b> , Parvatibai Chowgule College of Arts and Science, Margao
15	<b>Dr. SATISH KUMAR RAJOURIA</b> , Zakir Husain Delhi College(University of Delhi) , New Delhi
16	<b>Ms. SNAHEL PEREIRA</b> Parvatibai Chowgule College of Arts and Science , Margao
17	<b>Ms. SRINIDHI PAWAR</b> , Parvatibai Chowgule College of Arts and Science , Margao
18	<b>Dr. SRINIVASAN P</b> Chikkaiah Naicker College Erode
19	<b>Dr. SULFIKKARALI NEECHIKKAD</b> , Farook College, Kozhikode
20	<b>Ms. VALENCIA FERNANDES</b> Parvatibai Chowgule College of Arts and Science , Margao
21	<b>Dr. VENKATESHA RAMA HATHWAR</b> Goa University, Goa
22	<b>Mr. XAVIER ALLY QUADROS</b> , Parvatibai Chowgules College of arts and science, Margao