

**Report on
Science Academies' 87th Refresher Course in Experimental Physics
at
Department of Physics Goa University
Taleigao Plateau, Goa 403206
(May 10 to 25, 2017)**

The sixth Refresher Course in Experimental Physics (87th of the series) as a part of MoU between Indian Academy of Sciences, Bangalore and Goa University was conducted from May 10 to 25, 2017 at Goa University. The announcement of the course was made well in advance through advertisements in Current Science and Resonance.

In all 122 applications were received within due date out of which 80 were teachers and 42 students. Initially names of 57 participants (43 teachers and 14 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, 29 participants finally attended the course. Barring one, all other who cancelled at the last minute were replaced by local participants who had applied for the course within due date. Of the 29 who attended the course, 21 were teachers and 8 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. Some of the participants even created journals with photographs of experimental setups etc. for their future reference. 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. For the first time in Goa courses, participant's seminars were introduced. All the practical batches 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 Dr. Gaurav Dar of BITS Pilani, Goa Campus on **“Some aspects of Nonlinear Phenomena”**, wherein he talked about realm of nonlinear phenomena beyond Feigenbaum and Chua's experiments that are performed in the course. The second lecture was delivered by Dr. M. T. Babu, Scientist, National Institute of Oceanography, Dona Paula, Goa on **“Understanding natural phenomena through Simulations”**. Herein Dr. Babu discussed about various natural phenomena and disasters that have occurred in the recent past in the Arabian Sea off the coast of

Goa and Gujarat. These included effect of building a marina on coastal flora and fauna due to proposed Marina to be developed in Goa as well as the problem of tar balls found along all west coast beaches.

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. A group photograph of the participants of the course was also arranged with Prof. N. S. Bhat, Dean, Faculty of Social Sciences and Acting Vice-Chancellor, Goa University along with Prof. Gaurav Dar of BITS, Goa. 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. P. R. Sarode, Former Head Department of Physics and Dean Faculty of Natural Sciences, 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. **Electronic Principles** by A. P. Malvino and **Data Reduction and Error Analysis for the Physical Sciences** by P. R. Bevington and D. K. Robinson 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
Course Coordinator

87th REFRESHER COURSE IN EXPERIMENTAL PHYSICS
May 10 to May 25, 2017
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
Wednesday 10 May `17	Registration/ Inauguration	SMS1	MN1	ED1	MN2	ED2
Thursday 11 May `17	SMS2	KRP1	ED3	SMS3	KRP2	ED4
Friday 12 May `17	ED5	SMS4	MN3	ED6	MN4	KRP3
Saturday 13 May `17	MN5	SMS5	KRP4	SMS6	KRP5	KRP6
Sunday 14 May ‘17						
Monday 15 May ‘17	Lab. Instructions	LAB1		LAB2		
Tuesday 16 May ‘17	SPL1	LAB3		LAB4		
Wednesday 17 May ‘17	SPL2	LAB5		LAB6		
Thursday 18 May ‘17	Discussion	LAB7		LAB8		
Friday 19 May ‘17	Participants Seminar	LAB9		LAB10		
Saturday 20 May ‘17	Participants Seminar	LAB11		LAB12		
Sunday 21 May ‘17						
Monday 22 May ‘17	Participants Seminar	LAB13		LAB14		
Tuesday 23 May ‘17	Participants Seminar	LAB15		LAB16		
Wednesday 24 May ‘17	Participants Seminar	LAB17		LAB18		
Thursday 25 May ‘17	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. TCR of Copper and Bandgap of silicon
2. Stefan's constant
3. Thermal and electrical conductivity of Copper and thermal conductivity of a poor conductor.
4. Calibration of Si diode and Thermocouple as temperature sensor
5. Phase sensitive detection and calibration of a lock in amplifier
6. Measurement of mutual inductance and low resistance with a lock in amplifier.

LECTURES BY Mr. MANOHAR NAIK (MN)

7. Constant Current Source
8. Signal Generator and power amplifier
9. AC Experiments
10. Verification of Curie Weiss Law for a ceramic capacitor
11. B-H curve

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

12. DC differential amplifier
13. Capacitance meter – measurement of capacitance
14. Dielectric constant of benzene and dipole moment of acetone.
15. Passive filters and AC Bridges
16. High Resistance by leakage and k/e using transistor
17. Inversion temperature of Fe-Cu thermocouple

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

18. Young's Modulus and Rigidity Modulus of brass bar
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. Error Analysis

SPECIAL LECTURES

SPL1 – Dr. Gaurav Dar, BITS-Pilani (Goa Campus), Dabolim, Goa – Some aspects of Nonlinear Dynamics

SPL2 – Dr. M. T. Babu, National Institute of Oceanography, Dona Paula, Goa – Applications of Coastal Mapping and Simulations for Environmental Understanding.

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.

S.No	Name & Affiliation	Contact Address	Email	Phone
1	ALEX MATHEW , Union Christian College, Aluva, Kerala	Dept. of Physics, U.C. College, Aluva, Kerala 683102	alexmathew1@gmail.com	9446220280
2	ARUN HARILAL BHINDE , Tolani College of Arts & Science, Adipur, Gujarat	Tolani College of Arts & Science, Near Railway Station, ADIPUR (Kachchh)-Gujarat 370205	arun.bhinde@rediffmail.com	9427411270
3	ASHA A.S , Maharaja's College Ernakulam, Kochi, Kerala	Department of Physics Maharaja's College Ernakulam Park Avenue, Kochi, 682011 Kerala	ashaas@gmail.com	9495042275
4	ASLOB MENEZES , Parvtibai Chowgule College of Arts and Science, Margao, Goa	H.NO. 598 Davordxeth Xeldem Quepem Goa 403705	aslobmenezes@gmail.com	7774838783
5	BHOLANATH PAHARI , Goa University, Goa	Department of Physics, Goa University, Taleigao Plateau, Goa 403206	bholanath.pahari@unigoa.ac.in	9764983739
6	DHANAJI DALAVI , Krishna Mahavidyalaya, Rethare (Bk) Shivnagar, Maharashtra	Department of Physics, Krishna Mahavidyalaya, Rethare (Bk) Shivnagar-415108 Tal:Karad, Dist: Satara	ghanuphysics@gmail.com	9527350402
7	DHANRAJ C. , Dr. R. K. Shanmugam College of Arts and Science, Indili, Kallakuichi	PG RESEARCH DEPARTMENT OF PHYSICS, Dr.R.K.S COLLEGE,INDILI, KALLAKURICHI, VILLUPURAM DIST, Tamil Nadu, 606213	ghanshan03@gmail.com	7373956604
8	DR. NANDKUMAR DHARMADHIKARI , Sinhgad Academy of Engineering, Kondhwa, Pune	176/4 Hind Colony, Trimurtinagar, Bhekrainagar, A/P-Phursungi, Tal-Haveli, Pune-412308.	sejalrohit2007@gmail.com	9975563900
9	EINSTEIN GOMES , Parvatibai Chowgule College of Arts and Science, Margao, Goa	H.No 148, Orcotto- sanguem, Goa 403704	einsteinfloydgomes@gmail.com	9763528841
10	HARISH SHETTY , A. R. Kalsekar Technical Campus, Panvel, Maharashtra	Rose Garden, Flat No A-403 Sector 19,Plot No 35,Kalundre,Panvel,Raigad District,Maharashtra,Pin No 410206	harishshetty108@gmail.com	9769522913

11	HARISHCHAND NISHAD , Siddharth College of Arts, Science & Commerce, Mumbai	1st floor,Raghavji pitamber trust chawal, Sambhaji chowk, New mill road kurla (w), Mumbai 400070	nishadharish12@yahoo.in	8898951387
12	JAYEETA LAHIRI , University of Hyderabad, Hyderabad	School of Physics University of Hyderabad Hyderabad 500046	jlsp@uohyd.ac.in	9985961566
13	JYOTI AKKI , JSS Banashankari Arts, Commerce and Gubbi Science College, Dharwad, Karnataka	401 Rishika Heights Lingarajnagar North Hubli, Karnataka, 580031	jyoti18779@gmail.com	9964809790
14	LALIT THAKRE , Dayanand Science College, Latur, Maharashtra	Department of Physics Dayanand Science College, LATUR (MS) 413512	thakrelalit@yahoo.com	9421868589
15	NAMITHA S. N. , St. Philomena's College, Bannimantap, Mysore	D/O Nandish S. S. D.No. 43, 9th Block Behind St. Joseph's Convent Madikeri, Karnataka 571201	namitha.sn21@gmail.com	9972808620
16	NEHA DSOUZA , Yashwantrao Chavan Institute of Science Satara, Satara, Maharashtra	Plot no. 14, Mhsave road, near Kalishwari mandir, Karanje Peth Satara 415002	nehadsouza10@gmail.com	9637684969
17	PALLAVI GARDE , Yashwantrao Chavan Institute of Science Satara, Satara, Maharashtra	At-Post-Velang Tal-Koregoan Distric-Satara 415501	pallavigarde96@gmail.com	7057017613
18	PRAKASH.D Dr. R. K. Shanmugam College of Arts and Science, Indili, Kallakuichi	s/o Dhandapani. No. 27, MJJ nagar,Emapper,Kallakurichi(tk), Villupuram(dt), Tamil Nadu 606213	prakashsiva6616@gmail.com	8098124690
19	PRAVANJAN MALLICK ,North Orissa University, Baripada, Odisha	Department of Physics, North Orissa University, Takatpur, Baripada- 757003, Odisha	pravanjanphy@gmail.com	9437656274
20	RESHMI R. , Union Christian College, Aluva, Kerala	Assistant Professor Dept Physics U C College Aluva 683102 Kerala	rreshmi@gmail.com	9446127331

21	RUVWELL VALEN COLACO, Parvatibai Chowgule College of Arts and Science Margao Goa	Hs.no 507/A, Mazilvado, Nagoa Salcete 403722 Goa.	ruvelcolaco@ymail.com	7507641159
22	SANJAY PATIL, K. M. Agrawal College of Arts, Commerce and Science, Kalyan, Maharashtra	Flat No 704, B wing, Phase 2, Mangeshi Shrushti, Behind heena garden Hsg Society, Vasant Valley Road, Kalyan West, Maharashtra, 421301	pratinjay7668@gmail.com	9867789385
23	SHANMUGAPRIYAN B., Loyola College, Chennai	OLD NO 1040/11 T.H ROAD, RAMANUJAM STREET, THIRUVOTTIYUR, Chennai, 600019 Tamil Nadu	shanmugapryn@gmail.com	9444867752
24	SIDHESWAR BEHERA Veer Surendra Sai University of Technology, Burla, Sambalpur, Odisha	Department of physics ,Veer Surendra Sai University of Technology,Odisha,Burla ,76801	beherasidheswar246@gmail.com	9776835364
25	SOPAN BHAMARE, BNN College, Bhiwandi, Bhiwandi Thane	203/3, Triveni Park CHS, Wayale Nagar, Khadakpada Road, Kalyan (W) Maharashtra 421301	sopan719@gmail.com	9029058226
26	SUBHAS JADHAV, Karnataka University Dharwad, Karnataka	At mulawad Lt2 Post mulawad Tq-b.bagewadi Dist-Vijaypur 586108	subhasjadhav1@gmail.com	8971217893
27	SUDHIR CHERUKULAPPURATH, Goa University, Goa	Department of Physics, Goa University, Taleigao Plateau, Goa 403206	sudhir.c@unigoa.ac.in	8805239234
28	USHA M. K., St. Philomena's College, Bannimantap, Mysore	D.No. 788/170, Mainhouse 19th Cross, Ramanuja Road Chamundipuram Mysore 570004	usha.rao.mk@gmail.com	9880778930
29	CARMELIN ROSY FERNANDES, Loyola Higher Secondary School, Margao, Goa	House No. 68, Seraulim, Duncolim, Salcette, Goa 403708	rsyfrnnds12@yahoo.com	9923044707



Group Photo with participants, Prof. N. S. Bhat, Acting Vice-Chancellor, Dr. Gaurav Dar, BITS-Pilani, Goa Campus and Resource persons – Prof. S. M. Sadique, Dr. Efrem D’Sa, Mr. Manohar Naik and Prof. K. R. Priolkar