



UGC NETWORKING RESOURCE CENTRE IN PHYSICAL SCIENCES

PROGRESS REPORT FOR THE PERIOD
2008-2010



**INSTITUTE OF RADIO PHYSICS AND ELECTRONICS
UNIVERSITY OF CALCUTTA
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PREFACE

The University Grants Commission intended to set-up ten Networking Centres cum Summer/Winter Schools in five different areas, viz, Physical Science, Chemical Science, Life Science, Mathematical Science and Materials Science. Initially proposals were invited from all departments funded under Special Assistance Program (SAP). After screening by an Empowered Committee, UGC decided to invite a few departments for presentation of their plans in a meeting held on November 20, 2007 at the UGC office, Delhi. In that meeting each of the participating departments was advised to submit a revised proposal indicating specific academic plans with number of Ph.D./PG trainees, number of participants in schools, detailed budget, etc. The revised proposals were again given careful examination by the Empowered Committee, who decided to invite CAS in Radio Physics and Electronics for further discussions on February 5, 2008.

The Empowered Committee, in the meeting held on February 05, 2008, awarded the Institute (Department) of Radio Physics and Electronics, a Centre of Advanced Study, the status of UGC Networking Resource Centre in Physical Sciences (NRCPS) with a grant of Rs. 5.00 crores for five years. The Institute started its activities as NRCPS from April 01, 2008.

The present report gives a brief description of the genesis of the proposal, about the Institute and a brief description of the activities proposed by the Institute in the proposal submitted to EC. Since its inception, the Centre conducted a number of academic activities for the benefit of faculties, research scholars and students. The present report embodies the details of these academic programmes, provides a list of beneficiaries, a list of facilities created, and a statement of expenditure during the 2 years of its existence. The future activities envisaged are briefly mentioned.

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1. Introduction

1.1 Genesis of The Proposal

The recommendation of the task force for Basic Scientific research in Universities set up by the Ministry of Human Resource Development (MHRD), Government of India, stated that “ There is a need to create 10 networking centres in basic science (two centres each in Physical sciences, Chemical sciences, Life sciences, Materials Sciences and Mathematical sciences) in leading departments of Universities in different parts of the country to promote collaborative research, access to advanced facilities and imparting training in frontier areas. These centres should be supported on a long term basis in a substantial manner to enable them to realize internationally competitive status. The system of both Winter and Summer Schools must be supported. Each subject area of basic sciences may offer up to ten programs a year. There should be provision for Visiting Fellowships for faculties within the country”.

The University Grants Commission accepted the guidelines proposed by the Empowered Committee (EC) for establishing the UGC Networking Resource Centres. It has been decided to identify three UGC networking Centres during the year 2007-2008, one each in Life Sciences, Physical Sciences and Chemical Sciences.

Accordingly, proposals were invited from SAP departments indicating the areas of Summer/Winter schools, types of training, infrastructure, laboratories, equipment etc as well as expertise of faculties, awards and honours received by them. The proposals were considered by the Empowered Committee and after their scrutiny Centre of Advanced Study in Radio Physics and Electronics (CASRPE), University of Calcutta, was invited to make a presentation at the UGC office on November 20, 2007. The Experts advised the Centre to submit a revised proposal indicating the types of training, the proposed number of intakes under each category, etc.

The revised proposal submitted by CASRPE was given careful examination by the Empowered Committee, who decided to invite the representatives to meet them for further discussions. The date of the meeting had been February 5, 2008. In the meeting held at the UGC office, New Delhi, CASRPE was awarded the status of UGC Networking Resource Centre and the Institute was asked to send its willingness to follow the guidelines framed by the EC. The Institute gave its consent to undertaking the following activities as the UGC Networking Research Centre:

1. We shall endeavour to help faculty and research scholars to do research, give them training and help them to develop their skill, through periodic discussions, workshop and summer/winter schools.
2. We shall engage in capacity building by adopting faculty and departments for augmenting their research skills and to mentor them.
3. We shall host researchers from other institutes/ universities and facilitate their research to carry out key experiments in our Centre.
4. We shall augment information resource facility of the department to provide quality research information to other institutes/researches.
5. We pledge to enhance and build state-of-the art in-house research infrastructure and other research facilities in the department.

After receiving the consent letter, UGC released an initial grant of 2.50 crores to the University of Calcutta for the said purpose.

The Institute started its activity as the NRCPS on April 01, 2008 and thus it will be completing its second year of activity on March 31, 2010.

The present report gives a brief history of the Institute and includes the proposals submitted to the EC in the meeting held on February 05, 2008. The report describes the activities undertaken so far in various categories, viz, academic including summer/winter schools, conferences/workshops, training of personnel, infrastructure development, outreach programmes, etc. Developments in other areas, like, creation and maintenance of websites, subscription to e-journals, creation of guest house facilities, statement of expenditure during the two

years, etc are also reported. The details of schools, workshops, outreach programmes, etc, organized including the list of participants, of speakers and topics, etc are given in appendices.

1.2 About Centre of Advanced Study

Institute of Radio Physics and Electronics was established in 1949 as the first University department to teach and conduct research in Electronics, Communication, Computers, and all branches of Radio Science. Thanks to the vision of Prof. Sisir Kumar Mitra, FRS, and the dynamic leadership of Prof. J. N. Bhar, the Institute earned the status of CAS from the UGC in 1963. It is perhaps the only department under SAP, which is enjoying the status uninterrupted over the last 45 years. The present phase (Phase IV) will be over in March 31, 2010.

The Institute did many pioneering work in the field of Radio Science, e.g., development of first valve C80, magnetron, first analog computer, recording of ionosonde, fabrication of Gunn oscillator. Later, work by researchers in the Centre in semiconductors including quantum nanostructures, microwaves, devices, communication, computers and system science earned international acclaim.

The students of the Institute worked as faculties in all IITs, and University departments, as scientists/engineers in all National R&D organizations, in Universities and Institutions abroad and in addition worked in private organizations or set up their own industries.

The Institute offers post-B.Sc. B. Tech degrees (3 years) in Radio Physics and Electronics (RPE) and in Information Technology (IT). It also offers 2 years M. Tech in RPE and in VLSI Design. There is a training program on mm waves. In addition several joint courses with a number of national/foreign Universities/Institutions have been proposed and are to be introduced shortly. The courses meet the international standard and may be useful for faculties in Science and Engineering departments as well as Scientists/Engineers.

The Institute as a University department offers Ph.D. programme in a most flexible manner (as and when approached). The recent norm introduced by the UGC for Ph.D. registration, i.e., admission test followed by interview, has been currently in force.

1.3 Plan of Work As A UGC Networking Centre

Frontier Areas of Research in Network Centre

The CAS in Radio Physics and Electronics has the following identified broad thrust areas;

- 1) Solid State Electronics & VLSI Design
- 2) Space Science and Communication

Within these broad areas, work is also conducted in the following three categories:

- (i) Space and Atmospheric Science and Technology
- (ii) Microwave and Lightwave Technology, and
- (iii) Solid State Electronics and Circuits including Nanoelectronics and Nanophotonics.

Based on the above general categories, the research areas in which emphasis will be given in view of current and frontier science and technology are listed below:

Solid State Electronics

1. Transport in Nano-MOSFETs and Carbon nanotubes: conduction, scattering processes, Boltzmann transport, Ballistic transport, Non equilibrium Green's Function approach.
2. Nanoscale MOSFETs and Nanoelectronics: Study of ballistic and drift-diffusion conduction, quantum effect on threshold voltage, high-K dielectric, strained Si FETs, Silicon-on-insulator, Dual Gate and FINFETs, Single Electron Devices.
3. Silicon Photonics: Improvement of emission efficiency in QD structures, high speed modulators and detectors, basic optical processes.

4. Quantum Transport Theory.
5. Modeling of nano scale MOS: EKV model, NGEF and Wigner function model.
6. Design of low power CMOS circuits and novel devices for low power dissipation.
7. Theory and modeling of emerging devices: CNT FET, SETs, etc.
8. Growth and characterization of nanoelectronic and nanophotonic devices: in line with activities of CU's Centre for Nanoscience & Nanotechnology with emphasis on Nanofabrication.
9. Semiconductor Spintronics: theory, device physics and modeling.

Microwave and Lightwave Technology

1. Compact printed antenna for microwaves: fabrication, theoretical modeling and measurements.
2. Dielectric Resonator Antennas (DRAs) for wireless applications : same as above.
3. Planar antennas with defected ground structures: same as above.
4. Metamaterials: New structures, characterization, and application to short antennas.
5. Wireless communication for 4G systems: design, and test.
6. Future Optical Communication and Networking: Link design, estimation of bit error rate, routing: theoretical design to be tested by measurements in collaborating institutions.
7. Optoelectronic Devices for Optical Networking and Optical Logic: Doped fiber, Raman amplifiers, Semiconductor optical amplifiers, etc; basic theory, modeling, experimentation in collaborating institutions.
8. Nanophotonic, nonlinear optical and emerging optoelectronic devices (Transistor Laser, Hetero Bipolar Phototransistors, Nitride Based Devices).
9. Photonic Band Gap Materials and Devices: theory, modeling and simulation.
10. Optical communication systems modeling: Photoreceivers, amplifiers, regenerators.
11. Microwave sources: IMPATT, Gunn, THz sources, optical heterodyning.
12. Microwave Tomography: Development of algorithms for microwave imaging.

Space and Atmospheric Science and Technology

1. Lower atmosphere and pollution; study of methane emission, estimation of level of pollutant gases, etc.
2. Satellite and GPS: Analysis of total electron content
3. Ionospheric scintillation in and around Kolkata.
4. Satellite propagation studies at Ku/Ka bands.
5. Radio Remote Sensing for Atmospheric studies: experiment, modeling, etc.
6. Rain drop size distribution with a Disdrometer.
7. Rain parameter studies: TRMM satellite data.

System Science

1. Image Processing: Medical imaging, algorithms and FPGA implementation.
2. Fuzzy systems: modeling and applications.

1.4 Details of Proposal

The Centre proposes to undertake the following programs under Ph.D. /PG training, Summer/ winter School, Other Networking Activities, Development of Learning Resources, etc. if selected as a UGC Network Centre (NetCenter).

1.4.1 TRAINING OF PH.D. WORKERS/RESEARCHERS

The Institute has its own website www.irpel.org in which all the details about the Institute, courses offered, detailed syllabus, list of faculties and their expertise, publications, collaborations, etc are given. In addition, newsletters are published at regular intervals announcing recent achievements, availability of fellowships, seminar/symposia, etc. The activities of the Institute will be highlighted in the website and in addition, the plan of work will be given wide publicity, once the Institute is recognized as UGC Networking Centre. The proposed activity under this category will be classified into the following five groups.

1. Training of Fresh Ph.D. Workers

The following method is proposed to be adopted:

- a. The interested Research Guide in the Networked Institute (NI) writes to the Networking Centre (NetCenter) seeking help specifying in detail the need, e.g., initial training of Ph.D. scholar, methodology to be followed to solve a specific research problem, background study material, information about equipment and vendors, familiarity with actual experimental methods and/or simulation tools existing in the NetCenter. The request should come in advance, say, about 3 months earlier than the proposed date of visit of the scholar.
- b. The NetCenter identifies the Mentor according to the need specified above and establishes a link between the Guide in NI and Mentor.
- c. The Scholar comes to the NetCenter and spends 2 months.
- d. At the end of the visit, the Scholar submits a short report highlighting the outcome of his visit. This is needed to assess the efficiency of the scholar, the effectiveness of the training and in addition to plan for remedial measures to be taken to improve the process.

1.4.2 GUIDANCE FOR ADVANCED WORKERS

This is intended for Ph.D. workers who have already completed 1 or 2 years of work and need advice, access to equipment, journals, recent work, etc. to complete his work. The same procedure as described in Item 1 above applies.

The contact period may range from 2 to 6 months.

1. Initiation of Young Faculty into Ph.D.

The program is intended for a fresh teacher without Ph.D. degree, who has joined a new institution, and has very little idea about fertile and emerging areas of research. The proposed method to help an intending faculty is outlined below:

- a. The teacher writes to NetCenter indicating his broad area of interest, e.g., semiconductors, photonics, communication, space technology, microwaves, etc.
- b. NetCenter identifies the Mentor.
- c. Faculty spends 2 to 6 months, and he is given overall background, and a list of research topics. After the exact topic is identified, he is given enough study materials in the form of text-books, tutorials, and contemporary research papers. If possible, a research problem may be assigned to him.
- d. The Fellow makes further contacts, reports progress of work and seeks help of the Mentor from time to time.
- e. The Faculty makes further visits during vacations.

2. Training for Guidance of Ph.D. Students

This program aims at Faculties who have already earned Ph.D. and after joining another Institution, wishes to start new Ph.D. programs different from his earlier field of research, but more in line with the activities of the NetCenter. The program is a kind of postdoctoral research for the Faculty, working in a team comprising the Mentor in NetCenter, Faculty in Networked Institution (NI) as the postdoctoral fellow and his student as the Ph.D. worker.

3. Collaborative Research Project

This is the standard collaborative program. The Faculty in NI visits the NetCenter as a Visiting Fellow/Researcher. The Investigator in the NetCenter also reciprocates the visit.

The number of visitors under all the above categories will be 20, 4 candidates spending ~ 2 months on the average covering 10 months of a year, the remaining 2 months are reserved for administrative work /logistics.

1.4.3 TRAINING OF PG STUDENTS

The program is intended to train intending PG students in a most flexible manner. The duration of training may vary from 1 to 2 months to a full semester (~4 months). The area of training may be any one of the courses listed in the B.Tech/M.Tech curriculum of the NetCenter. Otherwise, the training may be in the area specified by the Trainee, e.g., a design problem for a Researcher/Scientist in the NI, or development of work plan in an emerging area of R & D.

The training may also be in the form of vacation training undertaken by M.Sc./B.Tech/M.Tech students in other institutions.

The proposed total number of candidates to be trained under this category is 10 at the first year.

1.4.4 SUMMER/WINTER SCHOOLS

The program will be conducted TWICE a year and the topics may be chosen from the tentative list given in Annexure. Further, depending on the demand and current international interest, the topic may also be revised. The duration of each regular Summer/Winter School will be 3 weeks.

Proposed intake for each school is 30.

Apart from above schools, the NetCenter organizes regular short Workshops/Seminars (less than a week) with resource persons from India as well as abroad. Adequate publicity will be given to accommodate participants from new Universities/ Institutions.

1.4.5 TRAINING OF FACULTIES IN NORTH EAST STATES

A group of faculties will organize short summer/vacation courses in Universities/institutions in the North Eastern India to motivate faculties to undertake/guide research.

1.4.6 JOINT BOOK WRITING/DEVELOPMENT OF LRS

Faculties of NetCenter and of Partner Institution will undertake projects on book writing and development of Learning Resources.

1.4.7 ACCEPTANCE OF Ph.D. WORKERS FROM OTHER INSTITUTIONS

UGC scheme RFSMS will be adequately publicized to attract more number of Ph.D. workers from different states/institutions.

Proposed number of Ph.D. workers is 5 in the first year, with plan to increase the number yearly.

1.5 Detailed Plan for Other Activities for Establishment of Centre

In order to establish the Networking Centre and for its effective operation the following work components are also to be initiated:

1. Launching of Websites
2. Modernisation of Labs
3. Procurement of equipment
4. Recruitment of Scientific/Administrative staff
5. Creation of Guest House and upgradation of retiring rooms to guest rooms
6. Modernisation of class rooms
7. To procure equipment, facilities;
8. To install studio;
9. To record lectures, and to prepare learning resources

1.6 Work Plan and Methodology

Highlights of Activities

In addition to normal academic/training activities including holding Schools, establishment of Networking Centre also involves the activities mentioned above.

The work plan presented below has been organized in anticipation that the status of UGC Networking, if awarded, will start functioning from April 1, 2008. A monthly work plan is being presented in the following table.

A common component in all months is “Training of Faculties/Researchers (2 months)”, which is a continuous process and therefore is not included in monthly work plan.

Month	List of Work
April	<ol style="list-style-type: none"> 1. Creation of additional folder www.irpel.org/cas/ugc-networking in the existing websites www.irpel.org and in www.caluniv.ac.in announcing the launching of the NetCentre 2. Preparation of photo brochure (print & e-version) for publicizing the activities 3. Start of construction and refurbishment work 4. Initiation of Tele networking Studio 5. Formation of Internal Working Committee and conduct first meeting 6. Ordering of equipment/codes 7. Announcement of 1st Summer School on “ Semiconductor Physics and Devices” to be held in June 8. Announcement of Summer Training for PG students , faculties and researchers 9. Advertisement for recruitment 10. Screening of applications for Summer school/Training and intimation to successful candidates
May	<ol style="list-style-type: none"> 1. Completion of recruitment 2. Procurement and installation of facilities
June	<ol style="list-style-type: none"> 1. Holding of 1st Summer School 2. Follow-up actions for activities listed already 3. Summer Training for PG students
July	<ol style="list-style-type: none"> 1. Completion of Guest rooms, of modernization of class rooms 2. Continuation of academic work 3. Installation and operation of equipment/ facilities 4. Workshop in NE region
August	<ol style="list-style-type: none"> 1. Follow up action of earlier activities 2. Interaction with other Networking Centres and or visits to the Centres for exchange of experience and ideas.
September	<ol style="list-style-type: none"> 1. Announcement of 1st Winter School: call for participation 2. Announcement for training of PG students/ researchers
October	<ol style="list-style-type: none"> 1. Follow up of earlier activities 2. Screening of application for Winter Schools/ Training and intimation to selected candidates 3. Installation of equipment, facilities
November	<ol style="list-style-type: none"> 1. As above 2. Completion of installation of remaining equipment
December	<ol style="list-style-type: none"> 1. Holding of 1st Winter School 2. Follow-up actions for activities listed already 3. Winter Training for PG students
January	<ol style="list-style-type: none"> 1. Follow-up of earlier activities. 2. Compilation of data, comments

	3. Initiation of report writing
February	1. Follow up of academic activities 2. Preparation of report 3. Preparation for Advisory Committee meeting 4. Preparation or statement of accounts 5. Holding Workshop in NE region
March	1. Printing of Report 2. Holding Advisory Committee meeting 3. Planning for next years activities 4. Publication of lectures/LRs 5. Completion of all civil, construction work.

1.7 Administrative Set-Up/Monitoring

The proposed set-up for review, monitoring, and supervision of year-long activities, subject to approval of UGC and University authorities, is as follows:

Vice Chancellor : University of Calcutta	Chairman
UGC Nominated Experts	External Monitoring Experts
One Professor nominated by the Syndicate	Director
Head of the Department of Radio Physics and Electronics	Member
Coordinator of the CAS Program in RPE	Member
One Professor from the Department	Member
One Reader from the Department	Member
One Lecturer from the Department	Member

1.6 SWOT Analysis

Strength

1. Strong knowledge base at par with international standard developed over a few decades
2. Long tradition of conducting research in frontier areas
3. Very strong ties with many national and international institutions
4. Good library and networking facilities
5. Dedicated faculty engaged in teaching and research in many different areas
6. Experience in holding International Conferences (IEEE, IET, SPIE supported), ICTP, Indo-French Workshops, regular seminars, tutorials.
7. Good lab facilities further strengthened by TEQIP and CU-Nano Science & Technology programmes.

Weakness

1. Shortage of Faculty/Researchers in frontier areas of science and technology
2. Inadequacy of guest house facilities in the University of Calcutta
3. Shortage of administrative and official support staff

Opportunities

1. Morale boosting due to recognition;
2. Opportunity to serve as a role model for sister departments/universities

3. Increased interactions with national/international institutions
4. All-India character of the Centre to increase visibility of the Department.
5. Generation of novel ideas, innovations through interaction with more brilliant young researchers.
6. Opportunity begets more opportunities.

Threat

1. More work load for teachers
2. Contractual nature of service for Scientific/administrative personnel and pay packet may not be lucrative enough to retain people over the whole period.

1.9 Budget

Budget (Infrastructure)

Item	Amount in Rs. (lakhs)
Equipment (a)	.00
DSP Lab	15.50
Tele Networking Studio	10.00
Furniture	5.00
Computers	10.00
Webpage development and maintenance	0.50
Subscription to e-journals/ e-books	50.00
Modernisation of class rooms (2)	15.00
Construction of 2 floors in Salt Lake Campus of CU (b)	150.00
Upgradation of 2 Transit rooms to furnished Guest rooms	25.00
Total	367.00

Budget (Recurring)

Item	Rate	Expenditure p.a. in Rs. (lakhs)
Scientific Officer/Lecturer (contract) : 5 nos (c)	25 K x (12 months) x (5 persons)	15.00
Administrative Officer : 1 (d)	25 K x (12 months)	3.00
Office Assistant : 2 (e)	15 K x (12 months)	3.60
Contingency		2.00
Lab. Working Expenses		5.00
Local Travel		1.00
Support to International Visitor	2 p.a.	2.00
Publication of reports/lecture notes/LRs		2.00
Suscription to Science Direct/IEL online		1.40
Total		35.00

Budget (Training)

Item	Rate	Expenditure p.a. Rs. in lakhs
Summer/Winter Training Program : 2 p.a. x 30 faculties	22.5 K x (20 persons) x 2 program	9.00
Ph.D. Training : 2 months x 10 persons p.a.	45 K x (10 persons)	4.50
Faculty/Postdoctoral Training: 6 months x 10 persons	135 K x (10 persons)	13.50

PG Training: 2 months, 10 persons	21 K x (10 persons)	2.10
Resource Persons from other Institutions: 10	30 K x (10 persons)	3.00
Resource persons (local) : 20	5 K x (20 persons)	1.00
Holding Workshop in NE India: 2 p.a.		2.00
		35.00

Budget (Summary)

	Infrastructure Rs. in lakhs	Training Program Rs. in lakhs	Recurring Rs. in lakhs
Expenditure p.a.	--	35.00	35.00
Total of 5 yrs	3,67.00	1,75.00	175.00
GRAND TOTAL (5 years)	7.17 crores *		

* EC advised to limit the budget to Rs. 5.00 crores; the budget has been modified.

JUSTIFICATION, EXPLANATION FOR FUNDS

(a) Most of the equipment and laboratories for Ph.D./PG training are available in the Centre. In addition, CU's Nanofabrication facilities will also be utilized for the training. However, in view of rapid progress of research scenario internationally, a few more equipment/software as detailed below may be needed:

Equipment/Software	Manufacturer/Purpose	Cost Rs. in lakhs
RF and microwave radiation measurement set-up		10.00
Specialised Simulators	AnSoft/MW Studio/Feco for EM Training (multiple user)	50.00
ISE-TCAD softwares (multi user)	Synopsys/ simulation of semiconductor devices	25.00
CAD Laboratory with local server and 20 terminals	for PG/Ph.D.Training	70.00
Augmentation of existing teaching and research labs		45.00
Total		200.00

(b) A Guest House is being constructed in the Salt Lake Campus of the University of Calcutta. A floor in this building may be earmarked for Scholars, Students and other Visitors participating in the Networking Program. The cost ~ 50 lakhs include construction, power, plumbing and furniture.

(c) – (e): Justification of Research and other Staff

Since the teachers in the department are deeply engaged in teaching many subjects, research, administrative and other developmental work of the department and University, a number of young researchers/teachers are needed to help the existing faculties exclusively in the Network activities. Such persons may be recruited on contract basis as Research Associates or Scientific Officers for the duration of the project. Their duty will be to take specialized courses, develop tutorial materials and learning resources and to do administrative jobs exclusively related to NetCentre.

The volume of work involved in the NetCentre requires additional manpower in the form of an Administrative Officer (equivalent to Assistant Registrar of Universities) and an Office Assistant (both contractual services).

2. Faculty & Other Supports

In this section the teaching and research programmes of the department of Radio Physics and Electronics are briefly described. All the faculties of the Department are involved in the program and the names of the faculties with their specialization are given first. The research sub areas of the faculties are then mentioned. Some of the achievements of the faculties, i.e., publications in refereed journals, and peer-reviewed conferences during the last 5 years are given in the tabular form. Finally other Centres established in the Department and their objectives and activities are mentioned. Details of the work done, publications etc are available in the CAS yearly reports (available at www.irpel.org)

2.1 Names and Specialisation of the Faculty in the Centre

Professors

- | | |
|--|--|
| 1. Prof. S. Kar, Fulbright Fellow
M.Tech., Ph.D., FIETE, SMIEEE,
<i>Head of the Department</i> | Microwave and Millimeter-wave Engineering, Optical Heterodyning and THz Technology, High Energy Physics and Technology, Left-Handed Materials (Metamaterials). |
| 2. Prof. B. Bandyopadhyay
M.Tech., Ph.D. | Microwave Electronics, Computer Software |
| 3. Prof. J. P. Bandyopadhyay,
M.Sc., Ph.D. SMIEEE | Millimeterwave Semiconductor Devices, Microelectronics. |
| 4. Prof. P.K.Basu,
M.Tech., Ph.D., FAST (WB) ,
FIETE, SMIEEE
CAS Program Coordinator | Semiconductor Physics, Material Science, Solid State and Optoelectronic Devices, VLSI Design, Optical Communication, Nanoelectronics |
| 5. Prof. D. Biswas
M.Tech., Ph.D. | Solid State Electronics and Devices,
Electronic Circuit Design and Instrumentation |
| 6. Prof. D. Chattopadhyay, M.Tech., Ph.D.,
D.Sc.
<i>(retired on 31.01.2010)</i> | Semiconductor Physics and Devices, Circuit Theory,
Material Science |
| 7. Prof. N. R. Das
M. Tech., Ph.D., SMIEEE | Optoelectronic and Photonic Devices, Semiconductor Nanostructures |
| 8. Prof. G. Ghosh
M.Tech., Ph.D. | Solid State and Microwave Electronics, Digital Electronics |
| 9. Prof. P. K. Goswamy
M.Tech., PhD | Microwave Semiconductor Devices and Circuits,
Digital Techniques, Control Systems, Numerical Analysis, Electronic Engineering Design |
| 10. Prof. D. Guha
M.Tech., Ph.D., SMIEEE | Antenna Engineering, Microwaves, Broadcast Engineering |
| 11. Prof. A. Maitra
M.Sc., Ph.D. FIETE, SMIEEE | Communication, Wave Propagation, Remote Sensing |

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| 12. | Prof. P. C. Rakshit,
M.Tech., Ph.D. | Circuit Theory, Microwave Solid State Devices and Circuits |
| 13. | Prof. J. B. Roy,
M.Tech., Ph.D., MIEEE | Solid State and Quantum Electronics, Optoelectronics, Microprocessor |
| 14. | Prof. P. K. Saha
M.Tech., Ph.D.(Leeds), FIETE, SMIEEE
(retired on July 31, 2008) | Electromagnetic Boundary Value Problems, Microwave Engineering, Optoelectronics, Fibre Optic Communication. |
| 15. | Prof. S. Sen ,
M. Tech, Ph.D., FIE
CAS Deputy Program Coordinator | Quantum and Optoelectronic Devices, OEIC, Instrumentation, VLSI Design |

Readers

- | | | |
|----|--|---|
| 1. | Dr. Abhijit Biswas
M.Tech., Ph.D. | Semiconductor Device Modeling, Circuit and Device Simulation with SPICE, VLSI, optoelectronics, Control Theory, Semiconductor Physics and Devices, TCAD, Analog circuits. |
| 2. | Dr. A. Das Barman,
M. Tech., Ph.D. | Optical communication, Audio & Speech Signal Processing |
| 3. | Dr. S. K. De
M.Tech., Ph.D. | Solid State and Microwave Electronics
Pulse and Digital Technique. |
| 4. | Dr. A. Ghosal
M.Tech., Ph.D., MIEEE | Solid State Electronics, Communication Circuits and Systems, Electron transport in Nanostructures and Superlattices |
| 5. | Dr. R. Ghosh
M.Tech., Ph.D. | Solid State Electronics, Microelectronics, Microwave, Educational Technology. |
| 6. | Dr. Partha Pratim Goswamy
M. Tech, Ph.D. | Computational Geometry, Graph Algorithm, Data Structure & Design and Analysis of Algorithm |
| 7. | Dr. Ashik Paul
M. Tech., Ph.D. | Space Science, Communication Engg. |
| 8. | Dr. (Mrs.) G. Sen (Guha Mazumdar)
M.Tech., Ph.D., MIEEE | Microwave Engineering, TV Engineering, Optoelectronics. |
| 9. | Dr. B. Saha
M.Tech., Ph.D. | Active Circuits, Radio wave propagation |

Senior Lecturers and Lecturers

- | | | |
|----|--|---|
| 1. | Dr. (Mrs.) Soma Barman Mandal,
M. Tech., Ph.D., MIEEE | Mechatronics, Digital Signal Processing |
| 2. | Dr. Anirban Bhattacharya, M. Sc.,
M. Tech., Ph.D. | Crystal Growth and Epitaxy, Semiconductor Device Fabrication, Materials and Device Characterization |
| 3. | Dr. Subrata Chattopadhyay, M. Tech,
Ph.D. | Millimeter wave propagation, Electric Machines |

4.	Ms. Arpita Das, M. Tech	Medical Image Processing, Artificial Intelligence, Pattern Recognition and VLSI Design.
5.	Dr. Pranab Karmakar, M. Sc, Ph.D.	Microwave & Millimeter wave Propagation, Remote Sensing
6.	Sri Anjan Kundu, M. Tech	Microwave Engineering
7.	Dr. Bratati Mukhopadhyay, M. Tech, Ph.D., MIEEE	Physics of Semiconductor Nanostructures, Semiconductor Devices and Modeling, VLSI circuits, Photonics
8.	Dr. Sumitra Mukhopadhyay, M.E.Tel.E., Ph.D., MIEEE	Control Systems Engineering.
9.	Dr. Soumya Pandit, M.Sc., M. Tech., Ph.D., MIEEE	VLSI Circuits and Systems, Analog Design Automation
10.	Dr. J. Y. Siddiqui, M. Tech., Ph.D., MIEEE	Microwave antenna, Computational Electromagnetics
11.	Dr. Sarbani Ray, M.Sc., Ph.D.	Space Science and Satellite Communication
12.	Mr. Sourabh Das, M.Sc.	Remote sensing and Satellite communication

2.2 Teaching Activities of the Department

The department offers the following courses with number of student intakes mentioned. The B. Tech courses accept students with 3 years B. Sc (Honours degree)

- (i) B. Tech in Radio Physics and Electronics : Intake 42 (32 general + 8 SC/ST + 2 outside CU); Qualification : B. Sc. (3 yrs Honours) in Physics or Electronic Science;
- (ii) B. Tech in IT : Intake 20 (course fee @ Rs. 3000/= pm); Qualification : B. Sc (3 yrs Honours) in Physics or Electronic Science or Computer Science.
- (iii) M. Tech : 40 (28 general + 2 outside CU + 8 SC/ST + 8 sponsored @ Rs. 3000/ pm)
- (iv) M. Tech in VLSI Design : 20 (course fee @ Rs. 4000/= pm)
- (v) M. Tech in VLSI Design (6 semester): proposed intake 08.

Dual degree program with B. Tech (3 yrs) followed by M. Tech (1 yr) has been introduced.

In addition, decision has been taken to introduce specialization in M. Tech (RPE). Title of the areas, structure and syllabi for each area are being finalized.

2.3 Research Activities of the Department

- Present (New Phase)**
- (a) Solid State Electronics & VLSI Design
 - (b) Space Science and Communication

Proposed New Areas In view of the recommendation by the Advisory Committee made last year the work conducted in diversified areas are grouped into the following three categories:

- (i) **Space and atmospheric science and communication,**
- (ii) **Microwave and lightwave technology) and**
- (iii) **Solid-state electronics and circuits (encompassing VLSI and nanotechnology).**

The faculties conducted research in the following subtopics:

1. Transport and magnetotransport in low dimensional systems
2. Nanoscale MOSFETs: analytical modeling and simulation by ATLAS-MEDICI
3. Quantum Rings : Subband structures and intersubband transitions
4. Photodetectors: Ge Schottky, CMOS, Quantum Dot Infrared Photodetectors (QDIPs), Type II Superlattice.
5. Si and Group IV Photonics: Laser action in strained Ge, Ge/SiGe RCE photodetectors using Quantum Confined Stark Effect (QCSE) and Franz-Keldysh Effect.
6. Transistor Lasers.
7. VLSI Devices: Design of CMOS Opamp, VCO, PLL, statistical study of effect of process parameter variation on digital and analog circuits
8. Growth and Characterization of III-Nitride based bulk films and nanostructures
9. III-Nitride based UV detectors and optical devices
10. Microfluidics
11. Left handed metamaterials
12. Optical signal processing using Semiconductor Optical Amplifiers.
13. Demultiplexing using Terahertz Asymmetric Optical Demultiplexer (TOAD).
14. Measurement of complex microwave conductivity of conducting polymers
15. Dielectric resonator antenna
16. Microstrip Patch Antenna for Wireless Applications
17. Component cross talk in WDM networks
18. Characterization of rain type based on DSD measurements
19. Modeling of rain rate and rain attenuation
20. Modeling of cloud liquid water and cloud attenuation
21. Interrelation between water vapour, cloud liquid water and rain
22. Micro rain cell study
23. GPS total electron content and phase fluctuations
24. Development of ionospheric scintillation method
25. Modeling of traveling ionosphere disturbances
26. AI based computer aided diagnostic systems for clinics
27. Medical Image acquisition
28. Proximity problems, Closing problems, visibility problems
29. Genomic signal processing applied to DNA
30. Encryption of data by digital watermarking.

2.4 Publication in Last 5 years

Year	No. in Refereed Journal	No. in Conference
2005-06	32	61
2006-07	28	66
2007-08	31	54
2008-09	38	52
2009-2010	46 + 08 (under review/ communicated)	100

2.5 Achievements by Faculties (Awards, Distinctions, Editorship, Review work, Fellowship/Membership of Societies etc.)

Name	Distinction
Prof. Susanta Sen	Dean, Faculty of Technology & Chairman – LIPMU of TEQIP – UCT-CU; FIE;

- Fellow CSI, Organizing Chair: VDAT 07; Member of the Governing Council: Saha Institute of Nuclear Physics, Kolkata.
- Prof. B. Bandyopadhyay Website Manager: EPMD5 6; Editor of Centres website : www.irpel.org
Webmaster: CODEC 06: Guest Editor, IEE –CDS (special Issue)
- Prof. A. K. Dasgupta Member of Editorial Board, IJRSP, Member – URSI GA 06
- Prof. P. K. Saha Fellow IETE (FIETE), Senior Member IEEE (SMIEEE), (past) Chairman, AP-MTT Chapter, IEEE – Kolkata; Member of Editorial Board of IEEE Trans. MTT Chairman – CODEC 06. Guest Editor – IET-CDS (special Issue)
- Prof. P. K. Basu Fellow WAST; FIETE; SMIEEE; (past) Chairman, LEOS Chapter, IEEE Kolkata; Member - EPSRC College, UK (*reviewer of projects under EPSRC*) (2006-10) (2010-14) ; Reviewer : APS, AIP Journals, IEEE –EDS, IEE-CDS, OQEL, J Phys Chem Solids; IEEE (India) National Distinguished Lecturer.
- Prof. G. Ghosh Reviewer in AEMC, 2007 and National Conference on Recent Trends in Information Systems (ReTIS-08), February 2008
Life Member, Society of EMC Engineers (India).
Resource person - Workshop on “Frontiers of Electronics and Communication”, Aug. 7-9, 2009, North Eastern Regional Institute of Science and Technology (NERIST), Nirjuli, Arunachal Pradesh.
Reviewer in CODEC-09 and AEMC-2009.
- Prof. J. P. Bandyopadhyay FIETE, SMIEEE, Member, IEEE (LEOS)
Member, Calcutta Chapter of IEEE (LEOS)
Listed in *Marquis Who's Who* in Science and Engineering, Marquis Publication, U.S.A,
External Expert Member of Board of Research studies of (i) BESU, Shibpur and (ii) Burdwan University
Reviewer of IEEE ED, FIETE, Indian Journal of Pure & Applied Physics, Indian Journal of Physics, Journal of Institution of Engineers.
- Prof. S. Kar *Fulbright Fellow, FIETE, SMIEEE, Listed in *Marquis Who's Who* in Science and Engineering, Marquis Publication, U.S.A.

*In Muon Collaboration of Berkeley Lab, U.S, Subal Kar, Fulbright Visiting Scientist (1999 – 2000) is one of the seven scientists of Berkeley Lab named to be involved in the design and development of R.F. cavity of Muon Collider.

*Collaborative research on “Laser-based Ultra-fast X-ray source (LUX) with Berkeley Lab U.S. since 2004 has appeared as news page (December 9, 2005) in State Alumni News (Fulbright) of the Bureau of Educational and Cultural Affairs, U S. Department of State.

*News regarding the development of Plasmonic Metamaterial for **First Time in India** (*with Prof. Kar as the team leader*) has been reported as on-line publication in the esteemed Science Journal **Nature** (India) dated 20th August 2009. The metamaterial was displayed in a National Theme Meeting on LHM held at BARC, Mumbai on 17th August 2009. The effort is a collaborative one involving Institute of Radio Physics and Electronics, Calcutta University, SAMEER Kolkata Center and Reactor Control Division, BARC, Mumbai. The team consisted of Prof. Subal Kar (team leader), Tapashree Roy (C.U), Shantanu Das (BARC), and Arijit Majumder (SAMEER, Kolkata).

*Reviewer of IJETE, Journal of Pure and Applied Physics, International Journal of Electronics; Session Organizer and Session Chair of PIERS in Cambridge, U.S, 2008; Selection Committee Expert of Gauhati University, External Expert of the P.G Council of North Eastern Hill University etc.

- Prof. A. Maitra FIETE, SMIEEE, General Chair, IEEE AEMC, Kolkata, 19-20 December 2008; Member of Editorial Board, Indian Journal of Radio & Space Physics, NISCAIR, CSIR, New Delhi
Referee of the Journals- Indian Journal of Radio and Space Physics, CSIR Indian Journal of Physics, IACS, Calcutta, Journal of Institution of Engineers, Calcutta, Radio Science, USA, IEEE Transactions on Vehicular Technology, USA.
IEEE National Distinguished Lecturer
Member, Scientific Advisory Committee, Space Physics Laboratory, Vikram Sarabhai Space Centre, ISRO, Thiruvananthapuram
Official Indian Member in URSI Commission F, 2008-11
- Prof. J. B. Roy MIEEE, Program Chair: EPMD5 06; Secretary: IEEE-LEOS, Calcutta Chapter.
- Prof. N. R. Das FIETE, SMIEEE, Vice Chairman: LEOS, IEEE Kolkata,
Reviewer of IEEE PTL, IEEE-JQE
Organizing Chair of the IEEE Lasers and Electro-Optic Society (LEOS) Chapter of the IEEE Calcutta Section for the year 2004, Secretary 2005
Program Chair : CODEC 06; Guest Editor : IJCITE (Special Issue)
Editor of an International journal IJCITAE, Reviewer of IEEE Transactions on Instrumentation and Measurement, IEEE J. of Quantum Electronics, IET Circuits, Devices and Systems.
- Prof. D. Guha SMIEEE, Reviewer of IEEE Trans MTT, IEEE Trans. Antennas and Propagation, IEEE Antennas and Wireless Propagation Letters, IET Microwave, Antennas and Propagation, IET Electronics Letters, International Journal of RF and Microwave Computer-Aided Engineering, International Journal of Antennas and Propagation, Journal of Microwaves and Optoelectronics, IETE Technical Review , Indian Journal of Physics
- Dr. Gopa Sen Member IEEE; Secretary, IEEE Photonic Society: Kolkata Chapter; Secretary, CODEC-09.
- Dr. A. Biswas Reviewer :IEEE Trans. on Electron Devices, Optical and Quantum Electronics Biographical Profile selected for inclusion in MARQUIS Who's Who in the World 2010 Edition, NJ, USA
- Dr. J. Siddiqui MIEEE, Reviewer of IEEE Antenna & Wireless Propagation Letters, Reviewer of IET Microwaves, Antennas & Propagation.
- Dr. Abhirup Das Barman Reviewer, IEEE/OSA J Lightwave Technol.
- Dr. A. Ghoshal Reviewer, Ind J Physics, Member of IEEE photonics society
- Dr. P. P. Goswami Reviewer of papers for the Third Annual Workshop on Algorithms and Computation(WALCOM 2010) to be held during February 10-12, 2010
- Dr. Bratati Mukhopadhyay Member, IEEE.
- Dr. Soumya Pandit MIEEE, Reviewer, IEEE Indicon 2009.
- Dr. Anirban Bhattacharya Reviewer, CODEC 09
- Dr. Ashik Paul Coordinator, M. K. Dasgupta Memorial Symposium

In addition, the faculties serve as Experts in selection committees, invited speakers, chairpersons in various national/ international conferences I India and abroad.

The number of events in which faculties gave invited talks/ chaired sessions in 2009-2010 only is 76.

2.6 Collaborations

	Name	Name of the Collaborating Scientist/Institution	Nature of collaboration
1.	Prof. A. K. Dasgupta	NPL, GMRT, NMRF-Tirupati, Andhra U, SAC, Boston U, Boston College, USA, ICTP-Trieste	Joint research
2.	Prof. N. Purkait	NPL, PRL	Joint research
3.	Prof. P. K. Saha	RMC, Kingston, Canada, SAMEER-Kolkata	Joint research and book writing
4.	Prof. P. K. Basu	McMaster Univ, Canada	As above
5.	Prof. S. Sen	TIFR	Joint research
6.	Prof. D. Biswas	U Valencia, Spain	Joint research
7.	Prof. Subal Kar	Lawrence Berkeley National Laboratory, University of California at Berkeley, U.S.A	Laser based Ultrafast X-ray source LUX) for ultrafast studies in human cells. Nano structures etc.
8.	Prof. Subal Kar	Yamaguchi University, Japan	Design and Development of low phase-noise metamaterial based IMPATT Oscillator and Power Combiner
9.	Prof. A. Maitra	i) Bose Institute, Kolkata ii) Satellite Application Centre, ISRO, Ahmedabad iii) Rutherford Appleton Laboratory, UK iv) Strathclyde University, UK v) Microwave Laboratory, University vi) Catholique de Louvain, Belgium	Joint research, collaboration in sponsored projects
10.	Dr. D. Guha	Royal Military College of Canada, Kingston, Ontario.	Joint works on developing new Planar Antennas
11.	Dr. D. Guha	CSIR Regional Research Laboratory (RRL), Trivandrum	Dielectric Resonators for wideband Wireless Antennas
12.	Dr. D. Guha	Spotwave Wireless Inc., a North American Wireless Industry	Design of dual band high gain wireless antenna.
13.	Dr. N. R. Das	McMaster University	Joint research
14.	Dr. Abhijit Biswas	IMEC-Belgium, IIT-Kharagpur	Joint research
15.	Dr. Pranab K	CPTEC-INPE, Brazil; CNRS- France;	International Collaborative research

	Karmakar	IRD, France).	
16.	Sri Sourabh Das	ISRO	Joint Research
17.	Dr. Pranab K. Karmakar	Instotuto Nacinal de Pesquisas Espaciais, Brazil.	Joint collaboration with Centre for Research and Training in Microwaves and Millimeter waves, Institute of Radio Physics and Electronics

2.7 Other Centres/Programs in the Department

No	Centre/Program	Support	Year of Establishment
Centres			
1.	Centre of Advanced Study in Radio Physics and Electronics	UGC	1963
2.	S.K. Mitra Centre for Research in Space Environment	ISRO	2003
3.	The Centre of Millimeter-wave Semiconductor Devices and Systems (CMSDS) : A joint venture of DRDO and CU	DRDO	2006
4.	Centre für TeleInFrastruktur (CTIF) – India	CTIF (Headquarter: Aalborg University, Denmark)	2007
5.	UGC Networking Resource Centre in Physical Sciences	UGC	2008
6.	Centre for Research & Training in Microwave and Millimeterwave Technology	WB Government	2008
7.	ISRO Program on Strengthening of Space Science Activities in University of Calcutta	ISRO	2008
8.	DST Centre for ST RADAR	DST	2009
9.	MEMS Design Centre supported by NPMASS-ADA	NPMASS-ADA	2009
Programmes			
1.	EEE Department, University of Sheffield, UK	Indo-UK Leadership Programme	2009
2.	Ecolé Polytechnique, Paris, France	EP-Paris	2006
3.	Aalborg University, Denmark and other European Universities	Erasmus Mundus	2009

3. Report on Activities

In this section a brief description of various academic and other activities with relevant information about dates, resource persons, no of attendees, etc are given. Detailed report of the activities is given in the Appendices.

3.1 Summer and Winter Schools : Short Report on Activities

Organization of Summer/Winter School (2 per year) is the most important activity of the Centre. The present Centre organized the first Summer School in June 2, 008, immediately after the status was awarded and the Centre started functioning from April 1, 2008. Since then, these schools are being held regularly. So far 4 such schools, each of 3 weeks duration have been held and preparations are being made for two more schools in the year 2010-2011.

The following method is adopted for holding the schools. A teacher or a group of teachers submit a proposal to the Director, NRCPS, giving the title, dates, list of topics to be covered, list of probable speakers, a list of equipment/software to be procured for giving training to the participants and a tentative budget. In a meeting convened thereafter, the departmental committee comprising all teachers attends the presentation by the intending School Coordinators, critically examines and suggests modifications of the proposal and gives final approval to the proposal.

A list of the schools already held, to be held along with the name of coordinators, broad area of specialization, dates and duration are given in Table 3.1

Table 3.1 : List of Summer/Winter Schools held/ announced for the 3rd year

No	Title	Dates	Coordinator	Area
1.	Summer School Physics of Semiconductor Nanostructures (SemiNano)	June 2-20, 2008	P. K. Basu	Semiconductors
2.	Winter School on Broadband Microwave Systems and Communication (MiSCom-2009)	Feb. 9 -27, 2009	D. Guha	Microwaves & Communication
3.	Summer School on Physics and Simulation Techniques for Nanoscale Electronic Devices (NanoDev-2009)	June 1 – 19, 2009	A. Biswas	Devices, Nanotechnology, VLSI
4.	Winter School on DSP Algorithms, Architecture and Applications (DSPA ⁺⁺ - 2010)	Jan 4-22,2010	A. Das Barman & Arpita Das	Signal Processing, Communication
5.	Summer School on Photonics : Systems, Modeling Approach and Recent Trends (PhotoSmart-2010)	June 1-19, 2010	N. R. Das/and B. Mukhopadhyay	Photonics
6.	Winter School on Semiconductor Growth & characterization	December, 2010	A. Bhattacharyya	Materials Technology

Announcement/Selection

The school with its title and other details are announced through the website www.irpel.org as well as by sending posters to all leading institutions in India. The intended participants are advised to registrar online giving their contact details, research background mentioning how his research has relevance to the theme of the school and a brief write up describing motivation. The list of applicants is carefully scrutinized by the Coordinator of Course, Director of NRCPS and other faculties and the final selection is made. The successful candidates are intimated by e-mail. The organizers make every effort to give the participation all-India colour and at the same time encouraging local participation. Applicants from NE states are given more preference. The number is limited to 30.

Speakers

Speakers are chosen from the Institute, sister departments, other institutions in Kolkata and neighbourhood and last but not least from Centres of Excellence in the country. The percentage of speakers coming from institutions other than the Centre always exceeds 50% (see Table 3.4).

Presentation/Talks/ Lab

Most of the speakers prefer power point presentation. The presentations are collected and distributed to the participants in the form of CD. Ample time is given for interaction between speakers and attendees. Hands-on-training are imparted in all the schools. Visit to different laboratories in the campus and in neighbouring institutions like SINP, IIT-Kharagpur, BSNL Satellite Centres etc are arranged. Seminar lectures by local Experts and Scientists visiting the Institute from abroad/India are arranged.

TA/DA

All participants are given travel allowances. The outstation participants are accommodated in Guest houses nearby and transport is provided to bring them to the venue and to return them. Lunch and snacks are provided during the day. The participants are given a token DA.

Feedback

Feedback forms are given to the participants to asses the impact of the course. A sample form is given in Appendix.

Certificates

Certificates to all the registered participants are awarded at the valedictory function.

Detailed Reports of all the Schools held so far are included in the Appendices

3.2 Seminars/Workshops

Apart from schools, the Centre arranges seminars and Workshops, the list of which is given in Table 3.2 below

Table 3.2 List of Seminars/ Workshops arranged

	Title	Dates	Coordinator/ Chairman	Remarks
1.	One day Seminar M.K. DasGupta Memorial Seminar (<i>International Year of Astronomy</i>)	September 01, 2009	Dr. Ashik Paul	No. of Participants : 74
2.	India Antenna Week	April 27- May 04, 2010	Prof. D. Guha	To be held at Mayfair Puri

3.3 International Conferences/Workshops

The NRCPS supported four International events in the Diamond Jubilee Celebration year of INRAPHEL (2009-10).

The International Conference Computers and Devices for Communication (CODEC) was first held in the year 1998 to commemorate the golden jubilee of the Institute. The event was sponsored by a number of societies of IEEE, namely Electron Devices Society (EDS), Lasers and Electro Optic Society (LEOS), Antenna & Propagation Society (APS), Microwave Theory and Technique (MTT) Society, Institution of Electrical Engineers (IEE) of UK and Society for Photo Instrumentation Engineers (SPIE) of USA. All these societies agreed to technically co-sponsor CODEC with the condition that the event should be held at regular intervals. INRAPHEL committed to hold CODEC every three years and accordingly CODEC was held in 2004, and 2006. Pre conference workshops on different themes are organized each time.

The present CODEC is the fourth in the series. One important deviation in this years conference is that the AP/MTT Societies of IEEE decided to hold a parallel conference Applied Electromagnetic Conference (AEMC) concurrently with CODEC at the same venue, i.e., Hyatt Regency Hotel Kolkata.

This year two pre-conference Workshops were held on December 13, 2009. The first one was organized jointly by the Department of Electronic and Electrical Engineering of the University of Sheffield and the INRAPHEL. Following a bilateral agreement between the Governments of UK and India, two Institutions, one from each country, form a partnership. Universities of Sheffield and Calcutta are one amongst such partners. As an initiation of the partnership program, both the departments agreed to hold a one day workshop on a common theme and then chalk out future programmes. The one day workshop Photonic Devices and Systems for Mid and Long Wavelength Infrared Applications was held accordingly. The second Workshop was titled “Future Generation ICT and its Standards” and was organized by the Centre, CTIF-India and CTIF-Denmark and GISFI of India.

Details of the Conferences CODEC, AEMC and Workshop are given in Appendices 6.7-6.10. The salient features of these events are summarized in Table 3..3

Table 3.3 International Scientific Programmes Organized

No	Title of Program	Dates/venue	Institutions providing technical support	No of participants
1.	Photonic Devices and Systems for Mid and Long Wavelength Infrared Applications	December 13, 2009, INRAPHEL	Dept. EEE, Univ. Sheffield, UK, & NRCPS-CU, CAS in RPE, UPE of CU, Indo-UK Collaboration, IEEE Photonics Society	60
2.	Workshop on “Future Generation ICT and its Standards	December 13, 2009, INRAPHEL	Global ICT Standardization Forum of India (GISFI), CTIF, Aalborg University, Denmark	36
3.	4 th International Conference Computers & Devices for Communication (CODEC 09)	December 14-16, 2009, Hyatt Regency Kolkata	CAS in RPE, NRCPS, CSIR, BRNS, INSA, ISRO, DRDO, Govt. WB, IEEE-EDS, IEEE-PS, IET (UK), SPIE (USA)	300 (jointly with AEMC 09)

4.	2nd International Applied ElectroMagnetic Conference (AEMC 09)	December 14-16, 2009, Hyatt Regency Kolkata	CAS in RPE, NRCPS, CSIR, BRNS, INSA, ISRO, DRDO, Govt. WB, IEEE-EDS, IEEE-AP, IEEE-MTT, IEEE-Calcutta	300 (jointly with CODEC 09)
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3.4 Outreach Programme

In the proposal submitted to the Empowered Committee, the Institute intended to hold workshops/seminars in institutions in North Eastern India every year. The first such program, a 3 day Workshop entitled Frontiers in Electronics and Communication was held in North Eastern Regional Institute of Science and Technology (NERIST), Nirjuli, Arunachal Pradesh, during August 7-9, 2009.

Six teachers of INRAPHEL acted as resource persons. The attendees in the event were teachers, researchers and M. Tech students of NERIST, Rajib Gandhi University of Arunachal, NEHU and few other institutions in Assam.

A detailed report of the workshop is given in Appendix.

3.5 Adoption of College

There was a suggestion by the Empowered Committee for Strengthening Basic Scientific Research in Universities that the UGC-Networking Resource Centres (NRCs) should adopt a few colleges.

Accordingly the UGC-NRC in Physical Sciences, Institute of Radio Physics and Electronics, (IRPE), University of Calcutta, started a dialogue with the Physics Department of the Scottish Church College (SCC), Kolkata, a . College with Potential for Excellence (CPE) status, to establish an academic collaboration. The following areas of activities were identified to begin with:

1. To extend laboratory and library facilities of IRPE to teachers of SCC and their Ph.D. scholars;
2. to provide guidance to prospective Ph.D. supervisors;
3. to organize joint Workshops/ Seminars/ Colloquia for the benefit of students;
4. to involve faculty members of SCC as resource persons in the academic programme of IRPE;
5. to explore the possibility of setting up video conferencing facilities for remote instructions;
6. to provide academic support for future expansion programmes of SCC.

The progress of joint activities will be reviewed from time-to-time and necessary measures will be taken to improve upon.

The above proposal was approved by the SCC and also by the Vice Chancellor of CU in principle, who recommended that the proposal should be placed before the Syndicate of the University of Calcutta for formal approval.

As an initiation activity, both the departments organized a three day workshop entitled *Teaching of Electronics in Colleges* during November 6 – 8, 2009. The workshop was intended for B. Sc. (Physics Honours) students of SCC. Hands-on-training was given to the participants by B. Tech student volunteers of RPE under the supervision of the teachers. A detailed report of the programme is given in Appendix.

3.6 Training and Scholarships

From the very beginning, the NRCPS received request from faculties, researchers and students to conduct research and summer projects under the faculties of the Centre. The applicant first identifies a willing mentor and after discussing with him about the duration of the project, applies to the Director, who after approval from

the department gives him an offer. The candidates are given travel and daily allowances during their stay in the Centre.

A list of participants benefited so far under this scheme is given in Table 3.4

Table 3.4 List of candidates receiving training in the Centre

No	Name	Affiliation/ Position	Position	Guide	Area	Duration
1.	Sourabh Das	SAC, ISRO, Ahmedabad	SRF	A. Maitra	Space Science	27 Dec 08- 10 Jan 2009
2.	Chandra Kanta Kumar	ISRO Satellite Centre, Bangalore	Scientist/Engineer SE	D. Guha	Microwaves	April 06- 17, 2009
3.	Ishani Raychaudhuri	Nil	Ph.D. Scholar	P. K. Basu/ S. Sen	Electronics Development	April 0- May 15, 2009
4.	Rajshri Sen Jaiswal	Sona College of Technology, Salem 636005	Professor	A. Maitra	Space Science	1 May – 10 June, 2009
5.	Sanchari Sen	Delhi Univ	M.Sc. Student	A. Maitra	As above	1 June – 15 July, 2009
6.	Hallappa Gajera	Mysore Univ	Lecturer	D. Guha	Microwaves	
7.	Ishani Raychaudhuri	nil	Ph.D. Scholar	P. K. Basu/ S. Sen	Electronics	Dec. 13, 2009 – Jan. 30, 2010
8.	Selected Participants in Indo-UK Workshop, CODEC, AEMC	All India	Faculties, Scientists, Research Scholars	n.a.	All branches	Dec 13-16, 2009
9.	Sumesh George	National Institute of Interdisciplinary Science & Technology NIIST, Trivandrum	SRF	D. Guha	Microwave	March 01, 2010 ~ 3 months
10.	Chandra Kanta Kumar	ISRO, Bangalore	Scientist SE	D. Guha	Microwaves	April 01 ~ 2 weeks
11.	Hallappa Gajera	Mysore Univ	Lecturer	D. Guha	Microwaves	Applied
12.	Dr. Naveen Kumar S. K.	Mysore Univ.	Lecturer in Electronics	D. Guha	Microwavers	Applied

The participants submit a report of the work done and results obtained at the conclusion of their stay.

3.7 Summary of Academic Programmes

The following Table 3.5 summarizes the academic activities including schools, seminars/workshops, international conferences and outreach programmes. The number of speakers and participants are shown specifying the numbers coming from institutions other than the department.

Table 3.5 Summary of Academic Programmes (date wise from April 1, 2008)

No	Title	Date/Venue	Category	Speakers			Participants		
				In	Out	Total	In	Out	Total
1.	Summer School Physics of Semiconductor Nanostructures (SemiNano08)	June 2-20, 2008	HoT	9	8	17	1	18	19
2.	2-day Workshop Nanotechnology: Fabrication & Characterization Techniques (NanoFact)	June 13,14, 08	Talk	X	11	11	70	50	120
2.	Winter School Broadband Microwave Systems & Communication (MiSCom 09)	Feb. 4-24, 09	HoT	7	14	21	1	15	16
3.	Summer School Physics and Simulation Techniques for Nanoscale Electronic Devices (NanoDev 09)	June 1-19, 2009	HoT	9	15	24	5	11	16
4.	3-day Workshop Frontiers of Electronics & Communication	Aug 7-9, 09 NERIST, Arunachal	OP at NE State,	06	Nil	06	06	43 (NE states)	49
5.	M.K. DasGupta memorial seminar (International Year of Astronomy)	Sept 01, 09	Workshop	Nil	04	04	46	30	76
6.	Teaching of Electronics in Colleges	Nov. 6-8, 09 Scottish Church College	Joint activity with adopted College	06 +10	01	17	17	53	70
7.	One day Workshop Photonic Devices and Systems for Long and Mid Infrared	Dec. 13, 09	Indo- UK International Workshop	02	03	05	18	16	34
8.	Workshop on Future Generation ICT and its Standards	Dec. 13, 09	CTIF-India International Workshop	X	09	09	16	20	36

9.	International Conference Computers & Devices for Communication (CODEC 09)	Dec. 14-16, 09	International Conference						170
10.	International Conference Applied ElectroMagnetic Conference (AEMC 09)	Dec. 14-16, 09	International Conference	X	15	15			150
11.	Winter School DSP Algorithm, Architecture and Applications (DSPA ⁺⁺ -2010)	Jan 04-22, 2010	HoT	12	4	16	2	12	14

Abbreviation : OP (Outreach Programm); HoT (Hands-on-Training).

3.8 Future Programmes

- i) A week long Workshop India Antenna Week (May 27 – June 04, 2010) at Mayfair Puri has been announced. NRCPS will give support to 10-15 participants.
- ii) Outreach Programme at an Institution in North Eastern India is being planned.
- iii) Themes of two more schools have been finalized (please see Table 3.1)

4. Facilities Developed

4.1 Equipment, Softwares, Infrastructural Support

The following equipment, softwares, and other infrastructural facilities have been procured during the last two years.

No	Item	Quantity	Make/Party	Cost	Purpose
1.	Computers: HP DX 2480 Intel P, UPS, Antivirus, DVD, Scanner	8	HP/Webel	3,65,622.00	Semiconductor Lab/NanoDev
2.	Ansoft HFSS v11.1	2 user	Ansoft Corpn	21,75,599.00	MiSCom WS
3.	TCAD Package	Single license	Integrated Microsystems	3,41,600.00	CAD Lab./NanoDev 09
4.	TCAD 3408-0-L	3 license	Synopsys International	6,09,801.00	Sem. Dev. Lab/ PhotoSMART 2010
5.	Computers: HP DX 2480 Intel P, UPS, Antivirus, DVD, Scanner	6	HP/Webel	3,28,355.00	Lab, school
6.	AC (1.5 T) with installation charges	4	Carrier/Calcutta Cooling Corp	84,200.00	lab
7.	DSP kit, full version CCS, latest platinum edn	1		3,05,760.00	DSPA++
8.	AC (2 T) with installation charges	8	Carrier/ Calcutta Cooling Corpn.	2,97,650.00	Lab/class rooms
9.	Spartan III based DSP in VLSI Photoboard	1	Mechatronics Test Equip.	4,82,040.00	VLSI Lab/DSPA++
10.	Wooden working tables		Ramakrishna & Co.	35,800.00	Labs
11.	Agilent 3062 A oscilloscopes	5	Agilent/ Elmax Projects & Services	3,77,000.00	Lab
12.	MW Matlab, user manual etc	5	Designtech Systems Ltd.	3,05,610.00	DSP Lab/DSPA++
13.	Ethernet Cards (10/100), etc	16	D-Link/ Webel	46,134.00	Server
14.	Optisim v 5.1 software	5 user	Optisim/Fiber Optic Services	15,44,400.00	OE Lab/ PhotoSMART
15.	Computer Systems , CPU Quad Core, etc		Suntronic Systems	1,16,766.00	Computer Lab
16.	Atlas Framework	1	Synopsis/Integrated Microsystems	5,50,000.00	NanoDev 09
17.	Computer: Compaq Desktop		COMPAQ/Arpan Electronics	1,92,379.00	MEMS Lab.

18.	High back Executive Chair	14	Arpan Electronics	70,987.00	Conference room
19.	MATLAB, Simulink, etc	5	Designtech	8,54,393.00	DSPA++
20.	Computer		Webel	1,44,352.00	
21.	Optical Fiber Training Kit	1	Elmax Projects & Services	12,46,752.00	OE Lab/PhotoSMART 10
22.	IBM Blade Server	1	IBM/Shiva Business Machines	4,04,629.00	Department
23.	Dell Vostro Mini Tower Desktop	5	Dell/Webel	2,57,400.00	
24.	DSP Kit	01	Systems & Services	41,080.00	
25.	Installation of TCAD bundle		Forte	1,10,300.00	
26.	Waveguides, horns etc	01	Scientific Instruments	3,61,161.00	
	Total			1,26,49,770.00	

4.2 Launching of Websites

The Institute has its own website www.irpel.org, apart from the University's website www.caluniv.ac.in in which some information about courses, faculties etc are given.

Since its inception, a dedicated site ugc.network has been included in www.irpel.org. All the announcements related to NRCPS, schools, etc are regularly posted there. Interested candidates can submit online application for schools and other programmes via the website.

A major revision of the website is now under way.

4.3 Other Facilities Developed

4.3.1 MODERNISATION OF LABS

The method of selection of the school has already been described in Sec. 3.1. The Centre supports modernization of those particular labs which are related to Summer /Winter schools. In this way, several existing teaching cum research labs have been modernized.

In addition, some support has been extended to develop a MEMS Design lab, to accommodate a few softwares donated by NPMAS-ADA for establishing a MEMS Design Centre in the Institute.

A list of equipment/software procured and infrastructure developed is given in Table 4.1.

4.3.2 PROCUREMENT OF EQUIPMENT

The method followed has been narrated above.

4.3.3 RECRUITMENT

So far, no recruitment in the scientific or other categories have been made. A proposal to recruit an Office Assistant with a fixed pay to work till the end of the project has been approved by the Vice Chancellor. Advertisement will soon appear in newspapers and websites.

4.3.4 GUEST HOUSE

The University possesses a guest house in its Ballygunge campus (Tarak Nath Palit Siksha Prangan), which however is inadequate. A new guest house is being constructed in the Salt Lake campus of the University. The NRCPS has contributed to the construction of one floor in this building with the approval of the Syndicate. The participants in the programmes conducted by the NRCPS will be given first preference for accommodation in this floor. Unless there is demand by NRCPS, the facilities would be open for all other guests of the University. In addition, some planning is made to renovate the retiring rooms in the Centre of Advanced Study building of the department.

4.3.5 MODERNIZATION OF CLASS ROOMS

A few class rooms are being modernized

4.3.6 INSTALLATION OF STUDIO

A video conferencing facility is being planned to be installed in the meeting room of the department.

4.3.7 RECORDING OF LECTURES

All presentations in the schools are stored in computers and distributed to the participants in the form of CD.

4.3.8 LIBRARY AND INTERNET FACILITIES

The NRCPS subscribed to INDEST programme by which teachers, students and visitors including participants in schools can access IEL (IEEE+IET) journals.

5. Financial Report

The list of equipment, and softwares procured is given in Table 4.1. In this section the overall expenditure till March 31, 2010 is mentioned.

5.1 Equipment, Softwares, etc

The items purchased/ordered and the amount spent are given in Table 4.1.

5.2 Expenditure on Summer/Winter Schools, Workshops, etc

5.3

No	Title	Course Director	Amount
1.	Summer School SemiNano 08	P.K. Basu	2,28,934.00
2.	Winter School MiSCom 09	D. Guha	3,47,336.00
3.	Summer School NanoDev 09	A. Biswas	4,41,639.00
4.	Outreach Workshop at NERIST	P. K. Basu	86,701.00
5.	Seminar in Memory of M. K. Dasgupta	A. Paul	1,50,838.00
6.	Workshop at Scottish Church College	P. K. Basu	41,453.00
7.	Indo-UK Workshop	N. R. Das	32,897.00
8.	Winter School DSPA++	A. Das Barman	3,10,000.00
	Total		6,39,798.00

5.3 Training, Fellowships, etc

No	Name of Trainee	Supervisor	Amount spent
1.	Sri Saurabh Das	Prof. A. Maitra	11,803.00
2.	Sri Chandra Kanta Kumar	Prof. D. Guha	8,802.00
3.	Ms. Isani Raychaudhuri	Prof. P. K. Basu & S. Sen	22,748.00
4.	Smt. Sanchari Sen	Prof. A. Maitra	5,000.00
5.	Prof. (Ms.) Rajasri Sen Jaiswal	Prof. A. Maitra	26,328.00
6.	Mr. Halappa Gajera	Prof. D. Guha	20,022.00
7.	Selected participants in CODEC, AEMC and Indo-UK Workshop	RPE	95,933.00
8.	Ms. Isani Raychaudhuri	Prof. P. K. Basu & S. Sen	27,248.00
	Total		2,17,884.00

5.4 Expenditure on construction, etc

No	Description	Location	Amount
1.	Construction of Guest House	CU's Salt Lake Campus	60,00,000.00
2.	Renovation work at A K Choudhury Lecture	CAS Building of the Department	9,97,609.00

Hall	
Total	69,97,609.00

5.5 Library, Journal

No	Description	Remarks	Amount
1.	Subscription to IEL Online to INDEST – AICTE Consortium	One user : 2008-09	3,43,860.00
2.	As above	2009-10	3,43,860.00
	Total		6,87,720.00

5.6. Contingency, Daily Wages for Office Work

No	Description	Remarks	Amount
1.	Contingency	Overall	33,647.00
2.	Daily wages	Typing, office work	10,600.00
3.	Daily wages	As above	6,800.00
4.	Daily wages	As above	4,000.00
5.	Daily wages	As above	4,200.00
6.	Daily wages	As above	3,400.00
7.	Contingency	Department	15,701.00
8.	Daily wages	As above	3,600.00
	Total		81,948.00

5.6 Summary of Expenditure

No	Head	Amount
1.	Equipment, Softwares, etc	1,12,88,609.00
2.	Schools, Workshops	16,39,798.00
3.	Training	2,17,884.00
4.	Construction	69,97,609.00
5.	Library, e-journal	6,87,720.00
6.	Contingency	81,948.00
	Total	2,09,13,588.00

6. Appendices: Reports on Academic Programmes

6.1. A Report on the Summer School on Physics of Semiconductor Nanostructures SemiNano 2008 (June 2-20)

Genesis of UGC Networking Resource Centre

Ministry of Human Resource Development set up a committee to examine the current status of research and education in India. Following the recommendation of the committee to set up ten Centres, two each in Physical, Chemical, Life, Mathematical and Materials Science, the UGC invited proposals from University Departments under UGC's Special Assistance Program. After scrutiny of the proposals by an Empowered committee, shortlisted departments were invited for further discussion and revision of the proposals. The Institute of Radio Physics and Electronics, a Centre of Advanced Study since 1963, was finally selected as a UGC Networking Resource Centre in Physical Science in 2007-08.

About the Summer School

As a UGC-NRC, the Centre is to conduct 10 Summer/Winter Schools in 5 years, and to give training to UG, PG students, researchers, postdoctoral workers and faculties of Universities and college to conduct research, develop learning resources, allowing the participants to share the infrastructure, equipment, library, internet and all other facilities.

INRAPHEL decided to initiate the program under UGC-NRC by holding a 3 week summer school entitled "Physics of Semiconductor Nanostructures" (SemiNano 2008) to give an in depth training on Semiconductor Materials, Devices and Nanostructures. The targeted participants are University/College teachers, researchers and M. Tech students.

The aim and scope of the Summer School was detailed in a poster displayed in the Institute's website (www.irpel.org), in which the registration form was included for intending participants for online registration. The printed poster and its soft copies were sent by post and e-mail to more than 100 institutions in India. The intending participants were asked to write a few lines in the registration form how they are involved in teaching and research in the topic of school and their motivation to undertake the course.

Selection of Candidates

The submitted registration forms were examined and a list of selected fellows was published in the website to enable them to reserve train/air tickets. Due consideration was given to select participants from all over India and to give preference to candidates from North Eastern regions. The following Table 1 may provide an idea how the objective was fulfilled.

Table 1. List of selected fellows

No	Name	Position	Institution
1.	Sri Niladri Pratap Maity	Lecturer & HoD	Mizoram University
2.	Smt. Reshmi Das	Lecturer	Mizoram University
3.	Sri N. Basant Singh	Sr. Lecturer	Manipur Inst Technology
4.	Sri Susahanta K. Dutta	Asst. Prof	NEHU, Shillong
5.	Smt. Sweety Sarma	Lecturer & Ph.D. worker	Lalit Ch Bharali College, Maligaon & Scholar, Elec. Sc, Gauhati Univ

6.	Sri Jayanta Barman	Ph.D. scholar	USIC, Gauhati Univ.
7.	*Smt. Jumi Kakati	Do	Dept El Sc, Gauhati Univ.
8.	*Smt. Moumita Mazumdar	Lecturer	Tripura University
9.	Sri Nikhil Raj	M. Tech student	NIT, Kurukshetra
10.	Sri Abhilash M. T.	Lecturer	BITS-Pilani, Goa Campus
11.	* Dr. Nilanjan Halder	Postdoc Fellow	IIT-Bombay
12.	Sri Sudheer Nune	M. S. Worker	IIT-Madras
13.	Sri M. Nagarajan	Ph.D. worker	Crystal Growth Centre, Anna University
14.	Sri M. Balaji	Do	Do
15.	Munawar Basha S.	Do	Do
16.	* Smt. Sangeeta Palo	Lecturer & Ph.D. worker	Rowland Inst. Tech & Berhampur University
17.	Dr. Ranajit Ghosh	Lecturer	Haldia Inst Technology, WB
18.	* Sri Goutam Paul	Lecturer	Do
19.	*Sri Falguni Sinha Babu	Lecturer	BESU, Shibpur WB
20.	Sri Soumyen Banerjee	Lecturer	Inst Engg Management, Kolkata
21.	Sri Subhro Ghosal	Lecturer	Acharya Prafulla Ch. College, Kolkata
22.	Dr. Upendra Nath Nandi	Reader	Scottish Church College, Kolkata
23.	Dr (Smt) Madhumita Das Sarkar	Reader	WB Univ. Technology, Kolkata
24.	Smt. Poulami Rakshit	Research Scholar	INRAPHEL, CU
25.	*Sri T. R. Lenka	Lecturer/ Ph.D. worker	NIST-Berhampur, Orissa/IIT-B
26.	* Sri Das	Do	do

The persons with * could not attend due to examination and other duties. In addition to above, more than 25 M. Tech/M.Sc. students of different departments of the University and researchers also attended the lectures regularly.

Inaugural Function

The inauguration of the Summer School was held at 10 AM on June 2, 2008 at the Meghnad Saha auditorium of the University with Professor Suranjan Das, the Vice Chancellor of the University, as the President. Professor Debes Das, the Minister-in-Charge of Information Technology, Govt of West Bengal, delivered the inaugural address. Prof. D. J. Chattopadhyay, the Pro Vice Chancellor (Academic Affairs) of the University spoke about the initiatives taken by the Nanofabrication Centre of the University with support from MHRD. Professor Susanta Sen (Dean, Faculty of Technology) introduced the participants to the long heritage of research and education in the University and faculty of technology. Professor Goutam Ghosh, Head of the Department, gave the introductory address narrating the achievements of the department and Professor P. K. Basu, CAS Coordinator, described how the department was selected as the UGC-NRC and what the proposed activities of the NRC are. Dr. D. Guha offered a vote of thanks.

Course Structure and Faculty

The aim of the school was to start from the very fundamental topics related to physics of semiconductor materials and devices and at the end to make the participants aware of the latest developments in the area of Semiconductor based nanoscience and nanotechnology. For this purpose the initial classes were devoted to

fundamental principles that are introduced to first year B. Tech students of INRAPHEL. Since these students come with B. Sc. (Physics Honours) background, the level is higher than what is taught in most Engineering Institutions in India offering 4 year B. Tech degree after higher secondary. One of the objectives to develop the course in the manner described is to make the participants aware of the need for fundamentals to initiate M. Tech courses and to undertake basic research in nanoscience and nanotechnology. The following table 2 gives the list of topics covered and the names of faculties conducting the courses.

Table 2. List of Topics and Speakers

Topics of Theoretical courses	Name of Speaker	Affiliation of Speaker
Overview of the course	Prof. P. K. Basu	INRAPHEL, CU
Quantum theory, band structure, transport, Excess Carriers	Prof. P. K. Basu	Do
Growth of Materials	Dr. Kuntal Chakrabarty	SNBNCBS, Kolkata
Fabrication of materials and devices	Dr. Abhijit Mallik	Dept El. Sc, CU
p-n junction theory	Dr. Bratati Mukhopadhyay	INRAPHEL
Bipolar Junction Transistors	Dr. Gopa Sen	Do
MOSFET: Fundamentals, Threshold voltage, Short Channel Effects, Low power Design, Nanoscale FETs	Dr. Sanatan Chattopadhyay	Dept El Sc, CU
CMOS Circuits	Prof. Susanta Sen	INRAPHEL, CU
Photonic Devices	Dr. N. R. Das	Do
Fundamentals of Nanostructures, and their applications	Prof. P. K. Basu	Do
Characterization of materials and Devices	Prof. S. Dhar	Dept El Sc, CU
Nanophotonics: Surface Plasmon Waves	Prof. P. K. Saha	INRAPHEL, CU
Topic of Lab Courses	Supervisor	Affiliation
Simulation Programmes: SPICE	Dr. Sumitra Ghosh	INRAPHEL, CU
Simulation of Nanoelectronic Devices with Silvaco softwares	Dr. Abhijit Biswas	Dept. E&TCE, Jadavpur University
Photoluminescence characterization	Prof. S. Dhar	Dept El. Sc, CU
Scanning Electron Microscopy	Dr. P. K. Maity	Dept. Chem Tech, CU/ Central Facility under TEQIP

Seminars

The participants were also exposed to the latest developments in the emerging area of semiconductor nanotechnology through seminar lectures delivered by experts from India and abroad. The titles and lecturers of the seminars are given in the following table 3.

Table 3. List of Seminars and Speakers

Title	Speaker	Affiliation
<i>Photonic Engineering of THz Quantum Cascade Lasers with Aperiodic Lattices</i>	Dr. Subhasish Chakrabarti	Dept E& EE, Univ. of Manchester, UK
<i>Explanation of strange PL observed on annealing of III-V semiconductor nanostructures</i>	Prof. Dipankar Biswas	INRAPHEL, CU
<i>Single electronics- a prospective substitute beyond CMOS for VLSI circuits</i>	Prof. Subir Sarkar	E&TCE, JU
<i>Nanofluidics and biochips</i>	Prof. Bhargab Bhattacharya	ISI, Kolkata
<i>Carbon Nanotubes</i>	Dr. Kuntal Chakrabarti	SNBNCBS, Kolkata
<i>Terahertz electronics and communication</i>	Prof. P. K. Basu	INRAPHEL, CU

The participants were preregistered for a 2 day Workshop entitled “Nanomaterials and Devices: Fabrication & Characterization Techniques” (Nano-Fact) held during June 13 and 14. The topics covered and speakers and their affiliation are entered in the following table 4.

Table 4. Topics and Speakers in 2 day Workshop Nano-Fact

Topic	Speaker	Affiliation
MBE Growth and Characterization of InGaAs/GaAs nanostructured Quantum Dot based heterostructures	Prof. Subhananda Chakraborty	Dept. EE, IIT-Bombay, Mumbai
Semiconductor Nanostructures for Device Applications	Prof. Samit Kumar Roy	Dept of Physics & Meteorology, IIT-Kharagpur.
Gold Nanoparticles in Biosensors and Medicine	Prof. Chanchal Mitra	School of Chemistry, University of Hyderabad
Nanoscience and Nanotechnology	Prof. Prasenjit Sen	School of Physical Science, JNU, New Delhi
Industry Exposure	Dr. Arup Chatterjee:	ICAN-NANO, Kolkata
Nanomedicine: Nanoparticles of Biodegradable Polymers for Cancer Diagnosis and Treatment at its earliest Stage	Prof. S. S. Feng	National University of Singapore, Singapore
Nanotechnology: Application in Medicine for better Therapy	Prof. R. N. Saha	BITS, Pilani.
Enantiomeric Synthesis of Chiral Drugs and Drug Intermediates through Biotechnological Routes	Prof. U. C. Banerjee	NIPER, Mohali
Semiconductor nanowires: synthesis, characterization, and devices	Dr. Arnab Bhattacharya	TIFR, Mumbai

Brick-by-Brick assembly of Nanoparticles for Electronic Devices and Sensors

Prof. Joydip Datta

Asia Institute of Technology, Thailand

Journey through Micro to Nano scale: Materials Science using Ion Beams

Prof. D. C. Kothari

Dept. of Physics and Centre of Nanotechnology, University of Mumbai, Mumbai

Visits to Other Institutions

All the participants, some of the faculties and M. Tech students participating in the school made a one-day visit to the Saha Institute of Nuclear Physics, Kolkata, where the scientists showed the visitors their growth, fabrication and characterization facilities. These include the following:

1. Molecular Beam Epitaxy for Si based Quantum Structures;
2. Secondary Ion Mass Spectroscopy;
3. X-ray diffractometer;
4. Dektak set-up;
5. TEM and SQUIDS;
6. Ion Implantation facility.

Distribution of Lecture Materials

All the speakers made powerpoint presentation of their lectures and all of them were stored in a dedicated computer. The registered participants were given a 2 GB pendrive, in which they copied all the lecture materials and other information they downloaded from internet. The participants were provided reading room facilities in the departmental library.

Feedback from Participants

A carefully prepared questionnaire form was distributed amongst all the participants inviting comments about course content, method of presentation, choice of speakers, whether the course material would be helpful for their research and/or development of curriculum in UG/PG levels, overall performance of the school and whether they would encourage their colleagues and students to visit the UGC-NRC in INRAPHEL. Questions were also asked about the hall management, distribution of notes, access to other facilities, etc.

The participants were highly satisfied with the activities of the school and the method of distribution of learning resources. The balance between theory and lab work, in their opinion, was right. Some participants however expected more lab exposure, assignment of brief but research oriented problems and seminar by participants. A few suggested that a more focused topic could be chosen.

Tests and Certificates

A few teachers gave assignments based on their lectures. However, due to time constraint, especially since two days were lost due to bandh, the tests could not be conducted.

The registered participants were awarded Participation Certificates signed by the Head of the Department and the Coordinator : CAS Program cum Director of Seminano at the Valedictory session.

6.2. A Report on the Winter School on Broadband Microwave Systems and Communications MiSCom-2009 (February 9-27)

Genesis of UGC Networking Resource Centre

Ministry of Human Resource Development set up a committee to examine the current status of research and education in India. Following the recommendation of the committee to set up ten Centres, two each in Physical, Chemical, Life, Mathematical and Materials Science, the UGC invited proposals from University Departments under UGC's Special Assistance Program. After scrutiny of the proposals by an Empowered committee, shortlisted departments were invited for further discussion and revision of the proposals. The Institute of Radio Physics and Electronics, a Centre of Advanced Study since 1963, was finally selected as a UGC Networking Resource Centre in Physical Science in 2007-08.

About the Winter School

As a UGC-NRC, the Centre is to conduct 10 Summer/Winter Schools in 5 years, and to give training to UG, PG students, researchers, postdoctoral workers and faculties of Universities and college to conduct research, develop learning resources, allowing the participants to share the infrastructure, equipment, library, internet and all other facilities.

INRAPHEL initiated the program under UGC-NRC by holding a 3 week summer school SemiNano during June 2-20, 2008. The second one of the series was focused on **Microwave Electronics** to give an in depth training specially on broadband microwave systems and communications. The targeted participants were University/College teachers, researchers and M. Tech students.

The aim and scope of the Winter School was detailed in a poster displayed in the Institute's website (www.irpel.org), in which the registration form was included for intending participants for online registration. The printed poster and its soft copies were sent by post and e-mail to more than 100 institutions in India. The intending participants were asked to write a few lines in the registration form how they are involved in teaching and research in the topic of school and their motivation to undertake the course.

Selection of Candidates

The submitted registration forms were examined and a list of selected fellows was published in the website to enable them to reserve train/air tickets. Due consideration was given to select participants from all over India and to give preference to candidates from North Eastern regions. The following Table 1 may provide an idea how the objective was fulfilled.

Table 1. List of Participants

No.	Name	Designation	Affiliation
1.	Pranjal Borah	Project Student, GMRT, TIFR	C/O, Head Of the Department, Department of Electronics Science, Gauhati University, Assam, Guwahati, 14.
2	Halappa Ramappa Gajera	Lecturer in DOS Electronics, Post Graduate Center,	University of Mysore , Hassan, Karnataka, India-573220
3	Sanjib Kumar Mandal	Scientist "C"	DEAL – DRDO, Dehradun
4	Ms. Payal Majumdar	Ph.D. student & Cooperative Teacher	Department of Electronic Science, University of Delhi South Campus (UDSC), New Delhi
5	Yogendra Kumar Awasthi	Lecturer cum Research Scholar	Microwave Research Laboratory, UDSC, New Delhi

6	Ayan Karmakar	Project Engineer	Semi-Conductor Laboratory, S.A.S. Nagar, Sector-72, Mohali, Near Chandigarh
7	Paramjeet Singh	Research Fellow	Department of Electronic Science, UDSC, New Delhi
8	Himanshu Singh	Ph.D. student cum Lecturer, Aurobindo College	Microwave Research Laboratory, Dept. of Electronic Science, UDSC, New-Delhi-21
9	Ashwani Kumar	Lecturer, Sri Aurobindo College	Ph. D. Student in Microwave Research Laboratory, University of Delhi, New-Delhi
10	Somak Bhattacharyya	Lecturer	Academy of Technology, Hoogly, WB
11	Dhrubajyoti Bhaumick	Project Student	GMRT, TIFR
12	Subhadeep Banerjee	Student	Techno India, Salt Lake, Kolkata
13	Ankit Ladha	Student	Techno India, Salt Lake, Kolkata
14	Ms. Poulomi Gupta	Student	Acharya Prafulla Chandra College, New Barackpur, Kolkata
15	Ms. Ruma Mandal	Student	Acharya Prafulla Chandra College, New Barackpur, Kolkata
16	Ms. Archita Banerjee	Ph.D. Student	Registered Ph.D. student of INRAPHEL, CU

In addition to above, about 5 Ph. D. and M. Tech. students of the department also attended the lectures.

Inaugural Function

The inauguration of the Winter School was held at 10 AM on February 9, 2009 at the B. R. Nag auditorium of the Institute with Professor P. K. Basu, the Director of UGC-NRC, as the President. Professor S. Sen, Dean, Faculty of Technology, introduced the participants to the long heritage of research and education in the University and faculty of technology. Dr. K. P. Ray, Head, RF & Microwave Power System Division, SAMEER-Mumbai gave the introductory address narrating the basic theme, importance and relevance of the Winter School in view of the growth and need of broadband microwave communications in both civil and defence applications. Prof. P. K. Basu described how the department was selected as the UGC-NRC and the proposed activities of the NRC. Prof. D. Guha offered a vote of thanks.

Course Structure and Faculty

The aim of the school was to start from the fundamental topics to the state-of-the-art technology. The topics covered are: Broadband microwave communication, devices, circuits, and antennas. Other related areas like propagation through troposphere and ionosphere, microwave materials, EMI-EMC etc. have also been covered. Real experts from Universities, IITs, and Govt. Laboratories were invited to share their views and knowledge with the participants. About 16 resource persons participated in MiSCom-09. Some of them came from different parts of the country, e.g. Trivandrum, Mumbai, Guwahati, and Delhi. The following table 2 gives the list of topics covered and the names of resource persons conducting the courses.

Table 2. List of Speakers and Topics

No	Speaker	Affiliation	Title of talk
1.	Prof. P. K. Saha	Director, CTIF-India	Keynote address : Half a Century of Research in Microwaves in INRAPHEL

			i) Horns and Feeds-I & II ii) Broadband Transmission Media
2.	Dr. K. P. Ray	Head, RF & Microwave Power System Division SAMEER, Mumbai	Printed Transmission Lines and Radiating Structures
3	Dr. P. Hari Krishna	V istech Information Systems Pvt. Ltd., Basavanagudi, Bangalore - 560 004	FEM: Commercial Simulator and Applications (I) FEM: Commercial Simulator and Applications (II)
4	Prof. J. P. Banerjee	INRAPHEL	i) Microwave Semiconductor Devices ii) Laboratory Works
5	Dr. M.T.Sebastian	National Institute of Interdisciplinary Science & Technology NIIST, Trivandrum, 695 019	Dielectric Materials for Wireless Communication
6	A. Maji	GM, BSNL, Calcutta Telephones, Kolkata	Satellite Link and Communications
7	Prof. D. Guha	INRAPHEL	Broadband Dielectric Resonator Antennas
8	Sri S. Biswas	Dept. of E& C Engg Institute of Technology & Marine Engineering Jhinga, P.O Amira, South 24 Parganas	CAD Design and Lab (I)
9	Prof. A. Maitra	INRAPHEL	Broadband Microwave Radio-I
10	Prof. P. K. Goswami	INRAPHEL	Broadband Amplifier
11	Prof. S. K. Koul	IIT, DELHI	Integrated Antennas
12	Prof. B. N. Biswas	Academy of Technology, Adisaptogram, Hooghly, WB.	Microwave Photonic Link
13	Prof. A. K. Mishra	Department of Electronics and Communication Engineering (ECE), IIT, Guwahati	Radar Imaging: An Introduction
14	Dr. M. Biswas	INRAPHEL/ WBSU	Hand on Training for Printed Antennas
15	Prof. B. Gupta	ETCE dept., Jadavpur University, Kolkata 700 032	Broadband matching network
16	Prof. D. R. Poddar	ETCE dept., Jadavpur University, Kolkata 700 032	EM Interference and Compatibility
17	Dr. R. Ghatak	Dept. of Physics, The University of Burdwan, WB	Virtual Microwave Measurements
19	Prof. R. Garg	IIT-KHARAGPUR	Ultra Wideband Antennas
20	Prof. R. K. Mishra	Electronic Science Department Berhampur University Berhampur, ORISSA	Optimization Techniques in Electromagnetics

21	Prof. P. K. Basu	INRAPHEL	Broadband Communications
22	Dr. A. Pal	INRAPHEL	MW Propagation through Ionosphere

Visits to Other Institutions

Visit I:

All the participants made a one-day visit to the **BSNL Satellite Earth Station** located at Kulpi, about 30 Km away from the city. The Engineers scientists showed the visitors their Laboratory, Transmit-Receive Instruments and Execution Units.

Visit II:

Another visit was arranged to the **Haringhata Ionosphere Fields and Research Centre**, CU. Dr. A. Pal described the centre activities, satellite receiver, recording system and related studies. Good lunch in typical Bengali style was served.

Distribution of Lecture Materials

All the speakers prepared their lecture materials as power point presentation and provided those as PDF file. Those materials recoded on CD, were distributed amongst the participants.

Feedback from Participants

A carefully prepared questionnaire form was distributed amongst all the participants inviting comments about course content, method of presentation, choice of speakers, whether the course material would be helpful for their research and/or development of curriculum in UG/PG levels, overall performance of the school and whether they would encourage their colleagues and students to visit the UGC-NRC in INRAPHEL. Questions were also asked about the hall management, distribution of notes, access to other facilities, etc.

The feedback response indicates that the participants are fully satisfied with the school activities. The balance between theory and lab work, in their opinion, was proper. Some participants however expected more research oriented problems and seminar by participants. A few suggested organizing a similar one on a focused topic, like antennas.

Tests and Certificates

The registered participants were awarded Participation Certificates signed by the Head of the Department, Director of the Centre and the Course Director. The certificates were distributed by Prof. P. K. Saha at the end of the valedictory session.

6.3. A Report on the Summer School on Physics and Simulation Techniques for Nanoscale Electronic Devices NanoDev-2009 (June 1-19)

About the Summer School

As a UGC-NRC, the Centre is to conduct 10 Summer/Winter Schools in 5 years, and to give training to UG, PG students, researchers, postdoctoral workers and faculties of Universities and college to conduct research, develop learning resources, allowing the participants to share the infrastructure, equipment, library, internet and all other facilities.

INRAPHEL is continuing the program under UGC-NRC by holding two schools each having 3- week duration – one summer school SemiNano during June 2-20, 2008 and one winter school MisCom during February 9-27, 2009. The third one of the series was focused on **Nano Electronics** to give an intensive training especially on Physics of nanostructures and modeling and simulation of electronic devices particularly in the areas of nanoelectronics. The targeted participants were University/College teachers, researchers and M. Tech students.

The aim and scope of the second Summer School was detailed in a poster displayed in the Institute's website (www.irpel.org), in which the registration form was included for intending participants for online registration. The printed poster and its soft copies were sent by post and e-mail to more than 100 institutions at different parts in India. The intending participants were asked to write a paragraph in the registration form regarding his/ her interest, field of teaching and research, if any, and also their motivation to undertake the course.

Selection of Candidates

The submitted registration forms were examined and a list of selected candidates was published on the website to enable them to book for train/air tickets. Due consideration was given to select participants from all over India and to give preference to candidates from North Eastern regions. The following Table 1 may provide an idea how the objective was fulfilled.

Table 1. List of Participants

No	Name	Designation	Affiliation
1.	K. Sivasankaran	Lecturer	School of Electronic Sciences, VIT University
2.	Swanirbhar Majumder	Lecturer	Department of Electronic and Communication Engg., NERIST, Aurunachal Pradesh
3.	Shuvham DasGupta	Research Scholar	On leave from Inter University Research Center, IMEC, Belgium
4.	Jitendranath Patra	Professor, Head of the Department	Berhampur University, Orissa
5.	Arun Kumar Singh	Lecturer	Punjab Engineering College, Chandigarh
6.	Amit Banerjee	Ph. D. student	Institute of Radiophysics & Electronics, C. U
7.	Swagata Bhattacharjee	Ph. D Student, RFSMS Fellow	Institute of Radiophysics & Electronics, C. U
8.	Swarup Kumar Neogi	Research Scholar	Department of Physics, C. U
9.	Srirupa Goswami	M. Tech student	Institute of Radiophysics & Electronics, C. U
10.	Damayanti Ghosh	M. Tech student	Institute of Radiophysics & Electronics, C. U
11.	Rikmantra Basu	M. Tech student	Institute of Radiophysics & Electronics, C. U

12.	Srabanti Pandit (Sinha)	Ph. D. Student, CSIR SRF Fellow	Department of ETCE, Jadavpur University
13.	Susmita Sen	Lecturer	Birla Institute of Technology, W. B
14.	Sheershendu Bhattacharya	Lecturer	Institute of Technology & Marine Engineering, W.B.
15.	Rupa Karmakar	Research Scholar	Department of Physics , C. U
16.	Subindu Kumar	Associate Professor	Department of ECE, Siliguri Institute of Technology

In addition to above, about 7 Ph. D. and M. Tech. students of the department also attended the lectures.

Inaugural Function

The inauguration of the Summer School was held at 10 AM on June 1, 2009 at the B. R. Nag auditorium of the Institute with Professor P. K. Basu, the Director of UGC-NRC, as the President, Professor S. Sen, Dean, Faculty of Technology, as the Chairman, Dr. B. M. Arora, IIT-Bombay, as the Guest of Honour and Prof. S. K. Lahiri, former Deputy Director, IIT- Kharagpur, as the Chief Guest and Prof. G. Ghosh, as the Head of the Department. Prof. P. K. Basu introduced the participants to the glorious history of research and teaching in the Department followed by an introductory lecture emphasizing on various innovative landmarks in Semiconductor Physics and Electron Devices. Prof. Arora and Prof. Lahiri mentioned various emerging areas of research and development in the field of electronic, optoelectronic and power devices in India and abroad. Prof. G. Ghosh presented in a nutshell different areas of activities going on and opportunities available in our Department. Prof. Sen narrated the importance of the school in connection with teaching and research and also a brief outline of the activities going on in the Technology faculty of the University of Calcutta. Dr. A. Biswas, the Course Director of NanoDev-09, delivered a talk on the Summer School NanoDEV-09 and offered a vote of thanks.

Course Structure and Faculty

The aim of the school was to start from the basics of the Semiconductor Physics and Devices to the emerging areas of nanotechnology, nanodevices and their simulation techniques. The topics covered are: Physics of Semiconductor Devices, MOSFET models, High mobility channel materials, MOS devices with innovative architectures, TCAD: Process and Device Simulation, Circuit simulation. Other related topics like novel electronics transport properties of nano-materials, organic Semiconductor Devices, etc. Renowned experts from Universities, IITs, SINP, IACS, TIFR and also from a famous university of the USA were invited to share their views and knowledge with the participants. About 16 resource persons.

participated in NanoDev-09. Resource persons came from different parts of the country, e.g. Kharagpur, Mumbai, Chennai, Kharagpur and also from the USA. The following Table 2 gives the list of topics covered and the names of resource persons conducting the courses.

Table 2. List of Speakers and Topics

No	Speaker	Affiliation	Title of talk
1.	P. K. Basu	Director, UGC-NRC and CAS Co-coordinator, INRAPHEL	i) A Journey from Valves to Nanodevices ii) Basics of Device Physics
2.	Dr. B. M. Arora	IIT, Bombay Mumbai	Semiconductor Materials and Devices Some Recent developments

3.	Dr. N. DasGupta	IIT, Madras Chennai	CMOS Technology, Problems and Possible Solutions
4.	Dr. A. DasGupta	IIT, Madras Chennai	Silicon on Insulator (SOI) Based Devices
5.	Prof. M. K. Sanyal	Director, SINP, Kolkata-700064	Novel electronics transport properties of nanomaterials
6.	Prof. S. Krishna	New Mexico University, USA	Infra Red NanoDevices
7.	Prof. S. Sen	Dean, Faculty of Technology and Engineering, CU	i) MOS circuits-I ii) MOS circuits-II
8.	Prof. C. K. Maiti	Head, Dept. Electrical and Telecommunication Engineering, IIT, Kharagpur	Novel strained -Si (Ge) Technology and Devices
9.	Dr. A. Biswas	INRAPHEL	i) Strength of strained-Si ii) Process and device simulations iii) TCAD Lab.
10.	Prof. A. Kottantharayil	Dept. of Electrical Engineering, IIT Bombay	Low Power CMOS Devices
11.	Prof. T. K. Bhattacharya	Dept. Electrical and Telecommunication Engineering, IIT, Kharagpur	RF Modeling of MOS devices
12.	Dr. A. Bhattacharyya	INRAPHEL	i) Nano structures in Devices for Solid-State Lighting ii) Gallium Nitride based High Electron Mobility Transistors
13.	Dr. S. Chattopadhyay	Dept. of Electronic Science, Calcutta University	Nano - scale CMOS: <i>Device, Technology and challenges</i> Part I: Device technology and Operation Part II: Short Channel Effects and advanced CMOS
14.	Dr. S. Pandit	INRAPHEL	CMOS Device Modeling for Analog & Digital Circuits
15.	Prof. P. K. Saha	Director, CTIF-India	i) Plasmonics - I ii) Plasmonics – II
16.	Dr. A. Mallik	Dept. of Electronic Science,	i) CMOS Scaling & Its Limitations

	Calcutta University	ii) Advanced CMOS Architectures
17.	Prof. S. K. Ray Dept of Physics, IIT, Kharagpur	Gate Oxides and Shallow Junction for SiGe Heterostructure Devices
18.	S. K. Sarkar Dept. of Electronics and Telecommunication Engineering, Jadavpur University	Beating Ohm's Law with Nanodevices
19.	Prof. S. Dhar Dept. of Electronic Science, Calcutta University	Growth and Characterization of Semiconductor nanostructures
20.	Prof. A. J. Pal Indian Association for cultivation of Science, Kolkata-700032	Organic Semiconductors
21.	Prof. N. R. Das INRAPHEL	High Electron Mobility Transistors
22.	Dr. B. Mukhopadhyay INRAPHEL	PSpice (Schematics): An Overview
23.	Dr. S. Ghosh INRAPHEL	PSpice Lab
24.	Dr. S. Mukhopadhyay INRAPHEL	Lasi Lab

Visits to Other Institutions

Visit I:

All the participants, 8 students from IRPEL, one faculty member and Head of the Department made a one-day visit to the **IIT, Kharagpur** which is about 120 km away from Kolkata by a reserved AC Bus. Prof. S. K. Ray, Dept of Physics and researchers showed the MBE operation, material and device characterization Laboratory. Apart from this RF sputter unit, XPS characterization techniques are also demonstrated to the visitors.

Visit II:

Another visit was arranged to the **Saha Institute of Nuclear Physics (SINP), Kolkata** in which Dean, Faculty of Technology, Course Director and Dr. A. Bhattacharyya, IRPEL accompanied the participants. Prof. P. Chakraborty, SINP and other Research Scholars and Scientists demonstrated various instruments and techniques including SIMS, AFM, TEM, MBE, Ion Implantation Techniques, etc. in the Surface Science Division of SINP.

Distribution of Lecture Materials

All the speakers prepared their lecture materials as power point presentation and the materials were stored in a Pen Drive and handed over to the Participants in the valedictory session.

Feedback from Participants

Various questionnaire form was distributed amongst all the registered participants inviting comments about course content, choice of speakers, method of presentation, whether the course material would be helpful for their research and/or development of curriculum in UG/PG levels, visits at different premier institutions, overall

performance of the school and whether they would encourage their colleagues and students to visit the UGC-NRC in INRAPHEL. Questions were also asked about the hall management, food, accommodations, etc. Also in the valedictory session all the participants are asked to give suggestions regarding the school.

The participants were fully satisfied with the summer school as evidenced by their feedback response. Some participants wanted to learn more regarding TCAD simulation programming. Some participants suggested organizing a similar school focused on characterization and simulation of nano-devices in the valedictory session.

Tests and Certificates

The registered participants were awarded Participation Certificates signed by the Head of the Department, Director of the Centre and the Course Director. The certificates were distributed by Prof. S. Sen, Dean, Faculty of Technology, CU at the end of the valedictory session.

6.4 . 3-Day Workshop Frontiers in Electronics and Communication
At North Eastern Regional Institute of Science and Technology (NERIST)
Nirjuli, Arunachal Pradesh (August 7 – 9, 2009)

Introduction and Inaugural Programme

The Institute of Radio Physics and Electronics made a proposal to the Empowered Committee that it will hold academic programmes in an Institution in North Eastern States at least once a year under the aegis of UGC-NRCPS. Since a Summer and a Winter School were held during the first year, it was not possible to arrange the said program in the first year of the NRCPS. After discussing with several institutions about the possibility of holding such Workshop, the ECE Department of NERIST, Nirjuli, accepted the proposal and the details of the event were chalked out. The three day lecture program entitled **Frontiers in Electronics and Communication** was held in North Eastern Regional Institute of Science and Technology (NERIST), Nirjuli, Arunachal Pradesh, on August 7, 8 and 9, 2009. The programme was held under the auspices of the UGC Networking Resource Centre in Physical Sciences, Institute of Radio Physics and Electronics, and of National Distinguished Lecture Program (NDLP) of IEEE-India.

The Inaugural Programme was held on August 7, 2009 with the Director, of NERIST, Dr. Joram Begi, in the chair. Prof. P. K. Basu, was the guest of honour. The welcome address was given by Prof. Anwar Hussain, Head, ECE Department and the Local Coordinator. Prof. P. K. Das, Dean (Academic) of NERIST, introduced the multiple-entry, multi-disciplinary course structures followed in the Institute. Prof. P. K. Basu, as the Director of UGC Networking Resource Centre in Physical Sciences in his Institute, which gave main financial support to the program, gave an outline of the activities of the Centre. As well as about the benefits of IEEE-NDLP. Prof. Goutam Ghosh, Head, Department of Radio Physics and Electronics, spoke about the past and present activities of the Department. Prof. Susanta Sen, Dean (Technology) of University of Calcutta, informed the participants of an International Conference CODEC 09 to be held in December, 2009, which is technically sponsored by UGC-NRCPS and several IEEE Societies like EDS, PS, AP, MTT, and SPIE, IET.

Technical Programme

The following table gives the names of speakers and the title of their presentations:

No	Name of Speaker	Title of Talk	Date/Time
1.	Prof. P. K. Basu <i>IEEE-NDLP</i> <i>Speaker</i>	Keynote address: Advances in Electronics	Aug. 07, 11.00- 12.00 AM
2.	Prof. N. R. Das <i>IEEE-NDLP</i> <i>Speaker</i>	Advances in Semiconductor Photonic Devices: Part I	Aug. 07; 12.00- 1.30 PM
3.	Prof. N. R. Das <i>IEEE-NDLP</i> <i>Speaker</i>	Advances in Semiconductor Photonic Devices: Part II	Aug. 07; 2.30- 4.00 PM
4.	Prof. P. K. Basu <i>IEEE-NDLP</i> <i>Speaker</i>	Modern Semiconductor Materials And Devices: Physics, Technology and Challenges”	Aug. 07; 4 .15- 5.45 PM
5.	Prof. Susanta Sen	Digital CMOS Circuits: Part I	Aug. 08; 9 .00-10.30 AM
6.	Dr. Anirban Bhattacharya	Growth and Characterizatop Processes of Electron Devices	Aug 08; 10.45- 12.45 PM

6.	Prof. Susanta Sen	Digital CMOS Circuits: Part II	Aug. 08; 2.00 – 3.30 PM
7.	Dr. Soumya Pandit	Analog Design Automation	Aug. 08; 3.45 – 5.30 PM
8.	Prof. Goutam Ghosh	Microwave Characterization of Synthetic Metals	Aug. 09; 9.00-10.45 AM
		Response from Participants	Aug. 09; 10.45- 11.30 AM
		Valedictory programme	Aug. 09; 11.30 - 12.00

Each talk was of nearly 90 minutes duration including questions and answers. The participants were requested to ask questions during the session as well as during tea and lunch breaks.

Participants

The programme was attended by faculties, researchers and PG students of NERIST, a faculty from Rajiv Gandhi University, Nirjuli, Arunachal Pradesh, two faculties from NEHU, Shillong and a faculty from an institution in Assam, who is working as a Ph.D. worker in NERIST. (A list of participants is attached).

Feedback

Questions were asked mostly by faculties as well as PG students. The participants also interacted with the resource persons during tea and lunch breaks and during dinner.

An informal session was organized before the Valedictory session, in which many participants expressed their satisfaction over the course content and the method of presentation. The participants were deeply impressed by the keen interest of the speakers to travel to a very remote place braving the trouble of long and tiresome journey.

A request was made by the participants to organize another seminar/workshop covering at least two days on topics related to student's interest.

Valedictory

The valedictory function held on August 9, 2009 was presided over by Prof. P. K. Das (Dean-Academic, NERIST). Prof. Anwar Hussain, Prof. Susanta Sen, Prof. Goutam Ghosh and Prof. P. K. Basu also spoke. Certificates were distributed to the participants.

List of Participants

No	Name	Affiliation	Position
1.	Ms. Mozmin Ahmad	CIS	Vice Principal,
2.	Mr. Rajkishur Mudoj	NEHU, Shillong	Lecturer,
3.	Mr. Juwesh Binong	NEHU, Shillong	Lecturer,
4.	A. D. Singh	NERIST	Lecturer,
5.	L. Lolit K Singh	NERIST	Lecturer,
6.	P. Mohanta	“	Lecturer,
7.	H. Sharma	“	Lecturer,
8.	Manish Kumar	“	M. Tech student
9.	K. Kiran Singh	“	M. Tech student

10.	Kaushik Mitra	“	M. Tech student
11.	Angshuman Modak	“	M. Tech student
12.	M. Marjit Singh	“	M. Tech student
13.	P. K. Dutta	“	Lecturer
14.	K. Magdalene	“	Lecturer
15.	E. Bui	“	Lecturer
16.	Alokojjwal Das	“	M. Tech student
17.	Debabrata Debnath	“	M. Tech student
18.	Swanirbhar Mazumdar	“	Lecturer,
19.	Y. L. Singh	“	Lecturer,
20.	Ishita Chakrabarty	“	Asst. Prof.
21.	A. R. Devi	“	AP
22.	R. Deb Barman	“	Lecturer
23.	P. Puspa Devi	“	Lecturer
24.	Ms. G. Tangkeswari	“	Lecturer
25.	Gauri Shankar	“	Lecturer
26.	T. Sharan	“	AP
27.	N. D. Singh	NERIST	AP
28.	A. K. Ray	“	AP
29.	R. K. Mehta	“	AP
30.	Sudipta Mazumdar	“	M. Tech student
31.	M. Goga	“	M. Tech student
32.	L. S. Singh	“	Lecturer
33.	O. P. Ray	“	AP
34.	P. D. Kashyap	“	Lecturer
35.	M. Saikia	“	Lecturer
36.	S J Borah	“	Lecturer
37.	Md. Anwar Hussain	“	Professor
38.	Ms. Joyatri Borah	“	M. Tech student
39.	J. Abudin	“	M. Tech student
40.	K. M. Maring	“	M. Tech student
41.	S. Chatterjee	“	Assistant Professor
42.	N. Achulin	“	M. Tech student
43.	M. Sora	Rajiv Gandhi Univ., Doimukh, Arunachal Pradesh	Lecturer

Support from UGC-NRCPS

The travel and other costs of the 4 speakers were supported by UGC-NRCPS. The related costs of 2 IEEE-NDLP speakers were borne by funds under IEEE-NDLP. NERIST contributed some amount from its own budget that covered costs for lunch, dinner and tea for all the participants and resource persons.

All the local participants were given DA and all the outstation participants were given TA, DA etc from UGC-NRCPS funds.

6.5. Report on the M.K. DasGupta memorial seminar held on September 1, 2009

The Institute of Radio Physics and Electronics, University of Calcutta, the first University Department in India to conduct post-graduate teaching program in Electronics, Communication, Computers and Radio Science organized a one day seminar in memory of late Professor Mrinal Kumar DasGupta, the doyen of radio astronomy in India, on his birthday, September 1, 2009 as part of its Golden Jubilee celebrations and the International Year of Astronomy. This seminar was planned in accordance with the suggestion of Prof. N.K. Dadhich, UGC nominated expert in the CAS Advisory Committee in the Department. The seminar was held under the auspices of the UGC Networking Resource Center, a distinction earned by the Institute in 2008. This Institute has a long tradition of research in the area of Space Sciences and Astronomy with late Professor Sisir Kumar Mitra being the pioneer. Professor Dasgupta, a Faculty of this Institute from 1954-1988, made pioneering contributions in radio astronomy along with his co-researcher Roger Jennison of Jodrell Bank Observatory. They were the first to design, fabricate and successfully operate a radio intensity interferometer. Dasgupta and Jennison found the first evidence of a “radio galaxy” which was a galaxy with two radio emitting lobes on both sides of it with a separation of a few hundred light years, on two strong radio sources – *Cygnus A* and *Cassiopeia A*. This discovery of the double radio source in Cygnus A by Dasgupta and Jennison in 1953 is now regarded as one of the ten classical discoveries in radio astronomy.

The seminar was originally planned with five invited speakers, namely, Professor Govind Swarup, Ex-Director, Giant Meterwave Radio Telescope (GMRT), Professor S. Ananthkrishnan, Ex-Observatory Director, Giant Meterwave Radio Telescope (GMRT) and presently associated with Pune University, Dr. Rajaram Nityananda, National Center for Radio Astrophysics (NCRA), Professor Ashok Ambastha, Udaipur Solar Observatory and Professor N. Udaya Shankar, Raman Research Institute. However, Professor Swarup could not attend the meeting because of health problems. The detailed program of the seminar is enclosed with this report.

The seminar started with the welcome address being delivered by Prof. G. Ghosh, the then Head of the Department. Prof. Ghosh spoke about the glorious history of the Department which had made significant contributions in areas related to Upper Atmospheric studies. The next speaker was Prof. S. Sen, the then Dean of the Faculty of Engineering and Technology who spoke about existing collaborations of the University with centres like National Centre for Radio Astrophysics (NCRA) and Indian Institute of Astrophysics (IIA) for teaching as well as research in different areas of radio astronomy. The Presidential address was delivered by Prof. P.K. Basu, Director, UGC Networking Resource Centre in Physical Sciences who briefed the participants about the various activities of the Centre. Dr. A. Paul, Convenor of the seminar presented the vote of thanks.

The inaugural session was followed by Reminiscences where family members of Prof. DasGupta, namely his wife, son and daughter-in-law spoke about different aspects of his towering personality and recited some of his poems which revealed an unknown façade of his character. Prof. P. Bandyopadhyay and Prof. A. DasGupta, retired teachers of the Institute of Radio Physics and Electronics spoke effusively on the pioneering contributions of Prof. DasGupta towards Space Science in India. A message from Dr. Santimay Basu, Senior Research Physicist, Boston College, USA who was Prof. M.K. DasGupta’s first graduate student was read out by Dr. A. Paul. It contained several anecdotes of memories of working with Prof. DasGupta on solar radio astronomy that have not faded despite the intervening decades. Dr. D.P. Duari, Director, Research and Academics, M.P. Birla Institute of Fundamental Research shared his early interactions with Prof. DasGupta as an examiner. Prof. Amalendu Bandyopadhyay of the same Institute recalled his experience of working in close quarters with Prof. DasGupta during his last days. The session was chaired by Prof. P.K. Basu.

The first speaker in the pre-lunch technical session was Prof. S. Ananthkrishnan who was the Observatory Director of the Giant Meterwave Radio Telescope (GMRT) and is presently associated with the Electronic Science Department of Pune University. Prof. Ananthkrishnan traced the evolution of radio interferometry including Very Long Baseline Interferometry (VLBI) techniques and also described a recent proposal that aims to locate two triaxial radio antennas, one each on a lunar orbiter and a lunar rover respectively. Such an experiment will form a simple interferometer with a few hundred to a few thousand kilometre baseline using the VLBI technique and will provide a unique new window to the low frequency Universe from the Moon, between 1 MHz to 20 MHz which is inaccessible from the Earth.

The next speaker was Prof. Rajaram Nityananda, Director, National Centre for Radio Astrophysics (NCRA) who spoke about the key ideas which have driven the imaging of radio emission from the universe by astronomers, in which Prof. Dasgupta's work with Jennison was an early breakthrough. He reviewed the current capabilities and critical issues with emphasis on the low frequencies at which the GMRT, located in Khodad, near Pune, represents some of the best current capability in the world.

The post-lunch technical session started with the talk by Prof. Ashok Ambastha, Udaipur Solar Observatory who spoke about helio- and coronal seismology. The solar interior is not visible by direct means, and until a few decades back its understanding was based only on the surface observations coupled with theoretical models. Helioseismology which uses global solar oscillations, trapped in the solar interior, has provided a tool to probe the Sun's internal structure and dynamics. Coronal seismology, on the other hand, exploits the coronal waves and oscillations as a diagnostic tool for determining the physical conditions of the magnetized coronal plasma. MHD wave theory forms the basis for coronal seismology. While the helioseismic techniques have reached a fairly advanced stage, they are predominantly based on purely hydrodynamical models. He commented that in the coming years, the inclusion of magnetic effects in the local helioseismic techniques is likely to become an important issue.

The final speaker of the day was Prof. N. Udaya Shankara from Raman Research Institute. He said that early radio observations were severely limited both by the poor angular resolution and by the limited sensitivity. It was usually impossible to obtain any information about the structure of a source, and adjacent sources could often not be properly separated. This motivated Martin Ryle, Nobel Laureate in 1974, and his colleagues to develop the method of aperture synthesis which in the early days helped to avoid the severe structural problems of building very large and accurate paraboloids and allowed both high resolving power and large effective collecting area to be obtained with a minimum of engineering structure and therefore cost. In this lecture he discussed dipolar arrays, a version of modern Michelson Stellar interferometers, in which beam-forming networks are used to combine signals from antenna elements. Quasi-optical antennas such as parabolic reflectors are considered more appropriate for milli-meter and centi-meter wavelengths. At the other end of the radio spectrum, for meter and deca-meter wavelengths, multi element arrays of dipole antennas have been preferred.

The seminar was attended by Faculty Members, Research Scholars and some B.Tech. and M.Tech. students of the Institute of Radio Physics and Electronics and S.K. Mitra Center for Research in Space Environment, Department of Electronic Science, Department of Statistics, Department of Applied Optics and Photonics, Bose Institute, Indian Institute of Science Education and Research, St. Xavier's College, Raja Peary Mohan College, M.P. Birla Institute of Fundamental Research, Jadavpur University, Burdwan University and some private engineering colleges like Academy of Technology and Institute of Technical and Marine Engineering. A list of the participants is enclosed.

Program

Time	Topic	Speaker	Affiliation
10:00- 10:05	Welcome Address	Prof. G. Ghosh	Head of the Department of Radio Physics and Electronics
10:05- 10:10	Address	Prof. S. Sen	Dean, Faculty of Technology, University of Calcutta
10:10 - 10:15	Presidential Address	Prof. P.K. Basu	Director, UGC Networking Resource Centre
10:15 - 10:20	Vote of Thanks	Dr. A. Paul	Convenor
10:20 - 11:00	Reminiscences		
11:00 - 11:15	Tea/Coffee Break		
11:15 - 12:15	Very Long Baseline Interferometry on the Moon	Prof. S. Ananthakrishnan	Department of Electronic Science, Pune University

12:15 - 13:15	The Development of Radio Imaging	Prof. Rajaram Nityananda	National Centre for Radio Astrophysics, Tata Institute of Fundamental Research
13:15 - 14:30	Lunch		
14:30 - 15:30	Science of Oscillations from the Deep Solar Interior to the Outer Corona: Helio - and Coronal - Seismology	Prof. Ashok Ambastha	Udaipur Solar Observatory, Physical Research Laboratory
15:30 - 16:30	Dipole Arrays for Radio Astronomy	Prof. N. Udaya Shankar	Raman Research Institute
16:30 - 17:00	Concluding Remarks		

List of Participants

1	Dr. P.P. Goswami	IRPE-CU	40..	Ms. Arpita Adhikary	SKMC
2	Ms. Arpita Das	Do	41.	Mr. Anirban Bhattacharyya	SKMC
3	Ms. Sumitra Mukhopadhyay	Do	42.	Mr. Tanmay Das	SKMC
4	Prof. S. Sen	Do	43.	Mr. Dhuba Jyoti Bhaumik	SKMC
5	Dr. Anirban Bhattacharyya	“”	44.	Mr. Rikmantra Basu	M. Tech student
6	Prof. P.K. Basu	“”	45.	Mr. Kanishka Mazumdar	
7	Prof. P.K. Saha	“	46.	Mr. Soumyadeep Mishra	B. Tech student
8	Prof. A. DasGupta	S K Mitra Centre (SKMC)	47.	Mr. Indranil Datta	Do
9	Dr. A. Paul	IRPE	48.	Mr. Abhinandan Madhu	
10	Prof. N. R. Das	IRPE	49.	Dr. D. P. Duari	M P Birla
11	Prof. D. Guha	IRPE	50..	Dr. Amalendu Bandyopadhyay	Do
12	Prof. G. Ghosh	IRPE	51	Prof. Narayan Banerjee	IISER-Kolkata
13	Prof. D. Biswas	IRPE	52	Dr. Anindya Bose	Burdwan University (BU)
14	Dr. A. Biswas	IRPE	53	Dr. R. Ghatak	BU

15	Prof. J. B. Roy	IRPE	54	Mr. J. Chakraborty	BU
16	Dr. Gopa Sen	IRPE	55	Ms. Shreya Sarkar	BU
17	Dr. Bratati Mukhopadhyay	IRPE	56	Mr. C. Bandyopadhyay	
18	Dr. Soma Barman Mandal	IRPE	57	Dr. Shyamal Chakrabarty	Raja Peary Mohan College, CU
19	Mr. Anjan Kundu	IRPE	58	Mr. Rajkumar Hajra	
20	Dr. A. Das Barman	IRPE	59	Dr. Amitava Mitra	Bose Institute
21	Prof. A. Maitra	IRPE	60	Mr. Somak Bhattacharyya	Academy of Technology
22	Dr. B. Saha	IRPE	61	Prof. Ashish Kumar Chattopadhyay	Dept. of Stats, CU
23	Prof. P. C. Rakshit	IRPE	62	Saptarshi Mondal	do
24	Dr. Subrata Chattopadhyay	IRPE	63	Tuli Dey	do
25	Dr. Pranab Karmakar	IRPE	64	Prof. Ajoy Ghosh	Dept of AOP, CU
26	Dr. A. Ghoshal	IRPE	65	Mrs. Koyel Ganguli	St Xaviers College
27	Prof. S. Kar	IRPE	66	Prof. S. N. Sarkar	Dept. Electronic Sc., CU
28	Prof. N. Purkait	IRPE (retd)	67	Ms. Sanchita Pramanik	do
29	Prof. D. Chattopadhyay	IRPE	68	Mr. Pratap Bandyopadhyay	do
30	Prof. A. K. Datta	IRPE (retd)	69.	Mr. Partha Chowdhury	Dept. Physics, CU
31	Prof. P. Bandyopadhyay	Do	70	Prof. R. Bandyopadhyay	Dept. of Maths., JU
32	Prof. P. K. Goswamy	IRPE	71	Dr. Sailen Pal	do
33	Dr. R. Ghosh	IRPE	72	Ms. Zinia Bose Sarkar	do
34	Dr. S. K. De	IRPE	73	Mr. Sheershendu Bhattacharyya	IMTE, Kolkata
35	Dr. Soumya Pandit	IRPE	74	Prof. Kalipada Chakrabarty	Surendra Nath College (retd)
36	Dr. Sumitra Ghosh	IRPE	75	Prof. S. Ananthakrishnan	Pune University

37	Dr. Sarbani Ray	SKMC	76	Prof. A. Ambastha	Udaipur Solar Observatory, PRL
38	Ms. Aditi Das	SKMC	77.	Prof. R. Nityananda	NCRA-TIFR
39	Mr. Kaustav Chakravarty	SKMC	78.	Prof. N. Udaya Shankara	Raman Research Inst. Bangalore

6.6. 3 Day Workshop TEACHING OF ELECTRONICS IN COLLEGES Held at Scottish Church College, Kolkata (November 6-8, 2009)

INTRODUCTION AND OBJECTIVES

One of the activities pledged to be undertaken by the UGC-NRCPS is to adopt one or two colleges and to help the faculties and students to augment the academic cum research activities of the adopted colleges.

The UGC-NRCPS in the CAS in Radio Physics and Electronics (RPE), after careful considerations, decided to start a dialogue with the Physics Department of the Scottish Church College (SCC), an old institution in India (established in 1830). The College has been awarded the status “College with Potential for Excellence” by the UGC. After a few round of discussions between the faculties of RPE and of the Physics Department of SCC, the areas of collaboration were identified. The program was then approved by the Principal of SCC and the Department of RPE and the final terms of agreement was submitted to the Vice Chancellor and Syndicate of the University of Calcutta.

It was decided that as a first step of collaboration a joint Workshop should be organized on a common area of interest to both the institutions. In choosing the theme the organizing committee considered the expertise of the teachers of RPE in Electronics and also took note that some misconception prevails amongst the mind of college students about the coverage of the subject. It was decided that the workshop should be based on a theme that might impress upon the students, mostly 2nd year Physics Honours students, that electronics is not devoid of fundamental physics, covers interdisciplinary areas and at the same time has tremendous application potentials. The topics covered are listed elsewhere in this report.

The dates of the Workshop were chosen to coincide with the Reunion of the past and present students of the Physics Department of SCC.

INAUGURATION

The Inaugural Program was held at the Urquhart Lecture Hall, with the Principal of SCC, Dr. John Abraham in the Chair, who gave a welcome address. Prof. G. Ghosh, Head of the Department of RPE, narrated the history of the department and its glorious past and present achievements. Prof. P K Basu, Director-UGC-NRCPS, apprised the audience of the activities of the Centre and of the genesis of the program. Prof. Susanta Sen, Dean (Technology) of CU and an alumnus of SCC, outlined the course structure and purpose of holding such training. Prof. K. Pal, President of Alumni Association described the activities of the Association and its involvement in the program and Sri R. Roy, another ex-student informed students how his training in Physics helped him develop innovative methods in bank accounting. Prof. U. Nandi moved a vote of thanks.

PROGRAM

The program included both theoretical lectures and hands-on-training. The resource persons were derived from both the departments. The following programme outlines the topics covered, the speakers and their affiliations. Student volunteers from the Dept of RPE helped the faculties in conducting the practical work. In all lectures and practical training pedagogy was given the top priority, in view of the fact that all the students had just entered their 2nd year class and subjects like Quantum Mechanics and Statistical Mechanics are unknown to them. All the speakers employed animation in their power-point presentations, used analogies and practical examples to illustrate their presentations.

TOPICS, COVERAGES, LECTURERS

No	Topic	Brief coverage	Resource Person
1.	Measurements with Multimeter	Galvanometer, conversion to multimeter, input impedance and how it affects measurements,	Prof. Susanta Sen, RPE

		network theorem, description of experiment	
2.	Introduction to Quantum Theory	Problems in classical physics, black-body radiation, Planck's law, Photoelectric effects, de Broglie hypothesis, verification, wave mechanics, uncertainty, potential problems	Prof. Arup Roy, SCC
3.	Boolean Logic	Basic Logic gates and their use in digital systems	Prof. J. B. Roy, RPE
4.	Lab & solving problems in Boolean logic		Dr. S. Mukhopadhyay, RPE & Prof. J. B. Roy
5.	Band Theory	Exclusion Principle, Formation of bands, Metal, insulator and semiconductors, electrons and holes, experimental method for band gap	Dr. Anirban Bhattacharya, RPE
6.	Diodes	Electron Devices, ICs, impact of miniaturization, Impurities, p and n type, p-n junction, I-V curves	Prof. P. K. Basu, RPE
7.	Number Systems	Decimal, binary and other types, addition, subtraction, half and full adders	Prof. J. B. Roy, RPE
8.	Diodes & Transistors	Zener diodes, LEDs, Lasers, Bipolar Junction transistor operations, curves	Prof. P. K. Basu, RPE
9.	Lab	Diodes, Zener diodes, Transistor Characteristics, Logic circuit experiments	Dr. S. Mukhopadhyay, RPE
10.	Measurements with CRO	Concept of waveform, display systems, synchronizations	Prof. Susanta Sen, RPE
11.	Transistor circuits	Amplifications, load lines, Q-point choice, amplifier design	Dr. Sumitra Mukhopadhyay, RPE
12.	Frequency domain analysis	Time and Frequency Domain, Fourier Analysis Fourier Transforms,	Prof. Susanta Sen, RPE
13.	Lab	CRO, Clipping and Clamping Circuits and waveforms	Dr. S. Mukhopadhyay & Prof. S. Sen, RPE

STUDENT DEMONSTRATORS

No	Name	Affiliation
1.	(Smt) Sayantani Sen	B.Tech (IT): 3 rd Sem: RPE
2.	Sanghamitro Das	B. Tech (RPE)
3.	Kaushik Bairagi	B. Tech (RPE)
4.	Biswajit Pal	B. Tech (RPE)
5.	Pulakesh Maity	B. Tech (RPE)
6.	(Smt) Sangita Dutta	B. Tech (RPE)
7.	(Smt) Senjuti Khanra	B. Tech (RPE)
8.	Suman Kumar Das	B. Tech (RPE)
9.	(Smt) Raka Ramona Day	B. Tech (RPE)
10.	Srikanta Mondal	B. Tech (RPE)

PARTICIPANTS (All B. Sc. (Physics Honours) Students from SCC)

No	Name	No	Name
1.	Piyush Kanti Sarkar	2.	Prasanta Kr. Nayak
3.	Akakesh Samanta	4.	Ayon Mukherjee
5.	Saptaswa Bhattacharya	6.	Sudipta Roy
7.	Somnath Sarkar	8.	Sayantan Dhar
9.	Ram Gopal Barman	10.	Soumitra Mondal
11.	Sideshna Bera	12.	Somnath Mukhopadhyay
13.	Biswajit Banerjee	14.	Panini Dasgupta
15.	Deep Sarkar	16.	Asitendu Das
17.	Debomoy Boral	18.	Somilak Mukhopadhyay
19.	Ajoy Maji	20.	Soumi Mullik
21.	Ananya Santra	22.	Subhasish Barik
23.	Swagata Ghosh	24.	Subhojyoti Khan
25.	Rome Samanta	26.	Soumi Chatterjee
27.	Suman Ghosh	28.	Arijit Das
29.	Tousif Hassan	30.	Sumanta Kundu
31.	Debalina Chatterjee	32.	Shauri Chakrabarty
33.	Moumita Saha	34.	Devanil Choudhury
35.	Suman Chand	36.	Malabika Tanti
37.	Soumya Datta	38.	Subhendu Ghosh
39.	Biplab Mondal	40.	Arka Mukherjee
41.	Moumi Bera	42.	Sayanti Mandal
43.	Ananya Biswas	44.	Aritra Dutta
45.	Madhurima Misra	46.	Nabanita Das
47.	Aparajeeta Guha	48.	Dipanjan Paul
49.	Tuhin Malik	50.	Nilanjan Basu
51.	Subhajeet Chatterjee		

A number of teachers, both from the Scottish Church College and IRPE, also attended some of the lectures. However, due to their other assignments they could not be present throughout the Workshop.

FEEDBACK

All the theoretical lectures were highly interactive. The resource persons made it clear that the participants could interrupt them at any time to get things clarified and/or to make further enquiries. There had been overwhelming number of questions. Even the students queued up to ask questions during tea and lunch breaks. Some topics, notably, Quantum Mechanics, needed more time, since that formed the basis for understanding band structure, transport and other properties of semiconductor materials.

The hands-on-training in the lab. was extremely useful.

VALEDICTORY FUNCTIONS/ AWARD OF CERTIFICATES

Since the Workshop ended in the evening of November 8, 2009 : a Sunday, the Valedictory function could not be held immediately after the end of the Workshop. A special meeting was convened by the Principal, inviting all the faculties and student demonstrators in his office at the Scottish Church College.

The informal function highlighted on the short speeches by faculties on the experience gained by them. The student demonstrators expressed their happiness for giving them the opportunity to demonstrate the operation of the circuits which they themselves learnt as B. Sc. Students. They pointed out that the experience was immensely rewarding for them as they learnt how to make the subject comprehensible to the beginners. The small age difference between the trainers and learners was helpful.

The Principal profusely thanked the speakers and student demonstrators for making the event successful. All expressed their hope that such kind of joint venture would recur involving more participation from more UG Colleges.

Special Certificate of Appreciation signed by the Principal, SCC and the Director, UGC-NRCPS were awarded to the Student Demonstrators. The Principal took the responsibility of distributing the Participation Certificate to the student participants all belonging to the SCC.

6.7. UK-India Collaborative Workshop on

Photonic Devices and Systems for Mid and Long Wavelength Infrared Applications December 13, 2009

Following a bilateral agreement between the Governments of UK and India, two Institutions, one from each country, form a partnership in the UK-India Leadership Program. Universities of Sheffield and Calcutta are one amongst such partners. As an initiation of the partnership program, the Department of Electronics & Electrical Engineering of the University of Sheffield and the Department of Radio Physics and Electronics, University of Calcutta, agreed to hold a one day workshop on a common theme. The one day workshop Photonic Devices and Systems for Mid and Long Wavelength Infrared Applications was held accordingly.

The chosen date of the Workshop was December 13, 2009, the day before the inauguration of the 4th International Conference CODEC 09, and the venue was the Institute of Radio Physics and Electronics, CU, India. Participants were Research Scholars and Young Faculties belonging to various Institutes and Colleges from India having background and interest in the field of Semiconductor Photonics. Dr. Judy M. Rorison, University of Bristol, an Invited Speaker in CODEC 09, also registered and attended the Workshop. A nominal registration fee was charged for the participation. The Workshop was co-sponsored by the IEEE Photonics Society - Calcutta Chapter. Major financial supports were provided by the University with Potential for Excellence (UPE) program of the University of Calcutta and the UGC NRCPS of the Department of Radio Physics and Electronics, CU.

The Workshop started with a brief but formal inauguration describing it as a stepping stone to build collaborations between the University of Calcutta and the Universities in UK including the University of Sheffield. The speakers in the inaugural program mentioned earlier collaboration between the two departments in the development of Gunn and other types of microwave devices and circuits, as well as setting up of a Liquid Phase Epitaxy reactor in RPE. The exchange of visitors between the two departments under earlier British Council – UGC programmes, e.g., ALIS etc, was also recalled.

Three speakers from the University of Sheffield and two speakers from the University of Calcutta delivered talks covering all important areas of the topic. The list of speakers and the titles of the talk are mentioned below:

Time	Speaker & Affiliation	Title of Talk
09.45	P. K. Basu <i>Radio Physics and Electronics, University of Calcutta, India</i>	Mid and Long Wavelength Infrared Photonic Devices – Overview
10.30	C. H. Tan <i>Electronic and Electrical Engineering, Sheffield University, UK</i>	Mid and Long Wavelength Infrared Photodetectors
11.30	R. Hogg <i>Electronic and Electrical Engineering, Sheffield University, UK</i>	Broadband Quantum Dot Light Sources for Biomedical Imaging
13.30	J. P. R. David <i>Electronic and Electrical Engineering, Sheffield University, UK</i>	Avalanche Breakdown in Semiconductors
14.30	N. R. Das <i>Radio Physics and Electronics,</i>	Some Aspects of Modeling Semiconductor Photonic Devices

University of Calcutta, India

A few Ph.D. and M. Tech. students of our University were also given the opportunity to attend the Workshop. A number of faculties of RPE department, attending the Workshop had fruitful interactions with the speakers at the end of each talk. The Workshop ended with a formal Valedictory Session. The participation certificates were also distributed to the registered participants.

After the technical session, a discussion meeting took place involving delegates from some UK Universities (University of Sheffield, University of Bristol), the University of Calcutta, Aalborg University - Denmark, and McMaster University, Canada. The session started with a discussion on the "Credit Transfer System" followed in UK, Europe and North America. This would facilitate the studies of Indian students abroad and foreign students in India as a part of collaboration without wasting time or losing credit during studies/training abroad. The experience gathered by RPE by sending one of its M. Tech student to Ecole Polytechnique, France, to conduct his laboratory work and thesis work during his 3rd and 4th semesters was mentioned. The discussion is then followed by working out various steps to start collaboration. It was apparent from the discussion that partial financial support from India should be arranged to make the visit of Indian students/faculties through sponsored projects or otherwise.

List of Participants

	Name	Affiliation	Position
1.	Dr. Judi Rorison	Dept EEE, University of Bristol, UK	Reader
2.	Prof. J. P. R. David	Dept EEE, Univ. Sheffield, UK	Professor
3.	Dr. R. Hogg	Do	Reader
4.	Dr. C. H. Tan	Do	do
5.	Dr. Mukul Kumar Das	Dept ECE, Indian School of Mines University	Assistant Prof essor
6.	Mr. Abhiskek K. Shrivastava	Do	Research Scholar
7.	Mr. Ashish Ranjan	Do	Do
8.	Mr. Santosh Kumar Choudhary	Do	Do
9.	Mr. Swapan Bhattacharyya	Dept ECE, Asanol Engg College, WB	Professor
10.	Mr. Santu Sarkar	Dept. ECE, Academy of Technology, Hoogly, WB	Do
11.	Mr. Arindam Ray	Heritage Inst of Technology, Kolkata	Senior Lecturer
12.	Mr. Sujit Kumar Mondal	Academy of Technology, Hoogly, WB	Do
13.	Ms. Sarmishtha Sengupta	WB University of Technology, Kolkata	Lecturer
14.	Mr. Arpan Deyashi	RRC Institute of Information Technology, Kolkata	Lecturer
15.	Ms. Tuktuki Rakshit Ghosh	Techno India College, Salt Lake, Kolkata	Lecturer
16.	Mr. Himadri Sekhar Dutta	A. K. Choudhury School of Information Technology, CU	Lecturer

17.	Mr. Kaustabh Dasgupta	Meghnad Saha Institute of Technology, Kolkata	Lecturer
18.	Ms. Swati Bhargava	LNM Institute of Information Technology, Jaipur, Rajasthan	Research Scholar
19.	Prof. P. K. Basu	INRAPHEL	Professor
20.	Prof. Susanta Sen	Do	Do
21.	Prof. G. Ghosh	Do	Do
22.	Prof. P K. Goswamy	Do	Do
23.	Prof. N. R. Das	Do	Do
24.	Prof. J. B. Roy	Do	Do
25.	Dr. Gopa Sen	Do	Reader
26.	Dr. Anirban Bhattacharyya	Do	Lecturer
27.	Dr. Bratati Mukhopadhyay	Do	Do
28.	Dr. Sumitra Ghosh	Do	Hony Lecturer
29.	Mr. Rikmantra Basu	Do	Research Fellow
30.	Ms. Kasturi Mukherjee	Do	RF
31.	Ms. Paulami Rakshit	Do	RF
32.	Mr. Kanishka Mazumdar	Do	M. Tech student
33.	Mr. Joybrata Goswamy	Do	M. Tech student

Plans for Collaboration between CU and SU

An informal meeting was held between the faculties of University of Sheffield and IRPE on the last day of CODEC 09 at Hyatt Regency. Earlier, the UK participants were shown the infrastructures and facilities to be developed by the Centre for Research in Nanoscience & Nanotechnology in CU's Salt Lake campus. It was decided that University of Sheffield would accept a student from IRPE: preferably at the M. Tech level, who is willing to pursue a research career and give him a training on running and maintaining clean room facilities : a course offered regularly by Sheffield. It was pointed out that the travel money for sending such a student is available from CU's endowment fund. The issue of providing living allowances in Sheffield for a period of 3 months was discussed. The Sheffield faculties were requested to explore possible avenues for such funding. Some thrust areas of collaborative research between the two partners were also identified.

6.8 Workshop on “Future Generation ICT and its Standards’

Introduction

A workshop on “Future Generation ICT and its Standards’ was organized by the Institute of Radio Physics and Electronics in collaboration with Global ICT Standardization Forum of India (GISFI) in the Institute of Radio Physics and Electronics, Calcutta University on 13th December 2009. This Workshop was held in parallel with the Indo-UK Workshop held also in Sisir Mitra Bhaban of the Institute.

Lectures and Speakers

The following paragraphs give a brief outline of the lecture titles, speakers and their affiliation

	Speaker & Affiliation	Title	Coverage
1.	Prof. Knud Skouby, CTIF, Copenhagen, Denmark	Applications and Services for Future Technologies	various issues related to applications and user preferences over next-generation networks.
2.	Prof. Ole Brun Madsen, CTIF, Aalborg University, Denmark	A New Global ICT Reference Infrastructure Architecture	The essence of his talk was on importance of network heterogeneity in the network infrastructure of tomorrow. He pointed out how the applications need to adapt in heterogeneous network environment
3.	Prof. Debashis Saha, IIM, Kolkata	Network Mobility: Issues and Challenges	issues in network mobility management and various optimization issues in this regard.
4.	Dr. Ashok Chatterjee, Ericsson, USA	Standardisation Process in the USA	various steps in standardization process in 3GPP and 3GPP2 meetings and various issues related to standardization
5.	Mr. Prateep Misra, Tata Consultancy Services Ltd,	Future Generation ICT Infrastructure	various infrastructure requirements for ICT and their standardization issues
6.	Mr. P. K. Garg, Member, Radio Regulation Board of ITU	Spectrum Issues for Future Generation ICTs	spectrum allocation issues and their impact on ICT standardization process
7.	Mr. Arun Golas, Deputy Director General, TEC, Govt. of India	Role of TEC in Standardization in India	activities of Telecom Engineering Center as the central entity for telecom equipment standardization in India. He also discussed the complexities involved in standardization process especially in telecom equipment and technology domain.
8.	Dr. D. Singh, Dean R&D, Sinhgad Institute of Technology, India	I3CT Dreams and Academic Initiatives of GISFI	proposed activities of the International Institute of Information and Communication Technologies” established

in Lonavala, Maharashtra, India and the various research programs to be undertaken in that institute in collaboration with the CTIF, Aalborg University, Denmark.

9. Mr. Debasis Bandyopadhyay, Vice President, Tata Consultancy Services Ltd. concluding remarks and distributed the certificates to the participants in the workshop.

Participants

1. Arijit Ukil
2. Samar Kumar Sadhukhan
3. Naga Kiran Guddanti
4. Soma Bandyopadhyay
5. K S Avinash
6. Dhruba Jyoti Bhoumick
7. Venkat Roy
8. Jaydip Sen
9. Arnab Sinha
10. Dipankar Layek
11. Ansuman Bhattacharya
12. V. S. Hendre
13. S. S. Mulik
14. D.K. Singh
15. Kanika Orea
16. Srishthi Shaw

**6.9 4th International Conference Computers and Devices for Communication
(CODEC 09)
December 14-16, 2009 at Hyatt Regency Kolkata**

Introduction

International Conference on Computers and Devices for Communication (CODEC) was first held in 1998 by INRAPHEL at Science City, Kolkata, to mark the golden jubilee of the Institute. Since then CODEC has been organized every three years, the second and the third being held respectively in 2004 and 2006. The present CODEC 09: the fourth in the series was held during December 14-16, 2009 at Hyatt Regency Hotel Kolkata. The pre conference Workshops were held on December 13, 2009.

As in previous occasions, CODEC 09 was attended by a large number of international scientists as well as faculties, scientists and young researchers from India. The following paragraphs give a brief outline of the various activities held during the three days.

Technical Sponsors

CODEC 09 is technically sponsored by two societies of IEEE (USA), namely Electron Devices Society (EDS) and Photonics Society (PS). In addition, Institution of Engineering & Technology (IET: formerly IEE) of UK and Society for Photo Instrumentation Engineers (SPIE) of USA, became the technical sponsors, as in earlier occasions.

The conference was financially supported by INSA, CSIR, DRDO, DOS, BRNS, CAS in RPE (UGC), UGC-NRCPS, CU's UPE fund, WEBEL, Department's own budget and some token support from IEEE-PS. A large part of the total expenditure was met from the registration fee. Some earning was made possible through advertisement and fees provided by industries for opening their stalls.

Committees

The International and National Advisory Committees comprised internationally reputed scientists in the allied fields.

Inauguration

The Inaugural Program was held at 9 AM on December 14, 2009 with Prof. (Dr) Debesh Das, the Honourable MIC of IT, Government of West Bengal as the Chief Guest. Prof. D. J. Chattopadhyay, Pro Vice Chancellor (Academic) of CU presided over the meeting. Prof. Susanta Sen, of INRAPHEL, the General Chair gave the welcome address and Dr. (Mrs.) Gopa Sen, the Secretary, moved a vote of thanks.

Technical Program

Papers were solicited by proper display in the website www.irpel.org more than a year earlier than the conference dates. The technical co-sponsors, i.e., IEEE-EDS and IEEE-PS also announced the event in their Newsletters. Printed posters were also sent to many institutions by post and distributed in several conferences held in India prior to CODEC 09. The topics covered in the conference were:

1. Advanced Computers and Networking (ACN)
2. Circuits and Systems (CIS)
3. Nano Electronics and Nano Photonics (NEP)
4. Wireless and Mobile Technology (WMT)
5. Electron Devices and Materials (EDM)
6. Radio and Space Science (RSS)
7. Optoelectronics and Lightwave Technology (OLT)

8. Industry Session

The submitted abstracts were subject to peer review and on the basis of the referees' comments; selected papers were put in oral or poster category. A large number of abstracts were also rejected.

The following list gives the titles and speakers of the keynote, plenary and invited talks.

No	Name of Speaker	Affiliation	Title	Area
1.	G. Prati	CNIT, Pisa, Italy	100 Gigabit Ethernet: State of the Art, perspectives and Physical Impairments	Keynote
Plenary Talks				
2.	H. Iwai	Tokyo Inst. technology, Japan	Si MOSFET: Roadmap for 22 nm and beyond	NEP
3.	Sanjit Mitra	UCSB, USA	Structural Subband Decomposition: A New Concept in Digital Signal Processing	CAN
4.	M. Jamal Deen	McMaster University, Canada	Low cost High Sensitivity Silicon Imagers for Biomedical Applications	EDM
5.	John Marsh	University of Glasgow, UK	Monolithic Integration in Photonics- Where is the Commercial Imperative?	OLT
6.	V Ramgopal Rao	IIT-Bombay, India	Polymer Based Sensor Devices and Systems for Healthcare and Security Applications	CIS
7.	A. S. Vengurlekar	TIFR, Mumbai	Interaction of Light with Subwavelength Slits in a Metallic Slab	OLT/NEP
Invited Talks				
8.	Basabi Chakrabarti	Iwate Prefecture Univ. Japan	Multidimensional Time Series Analysis for Online Handwriting Applications	ACN
9.	Goutam Chakrabarti	Do	Genome Fragment Assembling- A Genetic Algorithm Approach	CAN
10.	W. M. Boerner	UICECE/CSN Lab, Chicago, USA	Recent Advances in Fully Polarimetric Space SAR Sensor Design and Its Applications	CIS
11.	Lan Fu	Australian National University, Australia	III-V Quantum Dots for Optoelectronic Device Applications	NEP
12.	B. M. A. Rahman	City University, London, UK	Rigorous Characterization of Silicon Nanowires for Compact Nanophotonic Devices	NEP
13.	Milan K Sanyal	SINP, Kolkata		NEP
14.	Samit K Ray	IIT-Kharagpur	Core-Shell Ge Nanowires and Heterojunctions for Memory and Photodetector Devices	NEP
15.	Bhabani Prasad Sinha	ISI, Kolkata	Energy Efficient Low Power Wireless Networks	WMT
16.	J. P. R. David	Univ. Sheffield	Extended Wavelength Avalanche	OLT

No	Name	Affiliation	Topic	Category
			Photodiodes	
17.	Shiva Kumar	McMaster Univ/Corning Glass	Space-time Dualities and Their Applications to Fibre-Optic Communication Systems	OLT
18.	Judy M. Rorison	Univ. Bristol, UK	Dilute Nitrides: Materials and Applications	EDM
19.	A. Sengupta	NPL, New Delhi	Atomic Frequency Standards	RSS
20.	Chee Hing Tan	Univ. Sheffield	Potential Material for Avalanche Photodiodes Operating above 10 Gb/s	OLT
21.	S. K. Sarkar	NPL, New Delhi	Recent Advances in Radio Environment for Radio Communication in India	RSS
22.	R.Gangopadhyay	LNM Inst. Info. Tech, Jaipur	Micro-resonator Based Photonic Components in Advanced Optical Communication Systems	OLT
23.	Richard Hogg	Univ. Sheffield, UK	GaAs Based Quantum Dot Superluminescent Diodes for Optical Coherence Tomography of Skin Tissue	OLT
24.	M. R. Howlader	McMaster University, Canada	Nanobonding Technologies for Optoelectronic Applications	EDM
25.	Samar Saha	Siltera USA Inc, CA, USA	Source-drain Engineering of JFET	Industry
26.	Kallol Hazra	HP India	Cloud Computing – The Next Chasm	Industry
27.	S. K. Lahiri	IIT-KGP/SNBNCBS-Kolkata	RF MEMS Switch : An Overview at a Glance	EDM
28.	Sunil R Das	Univ. Ottawa, Canada	Hybrid Test Compression in Systems-on-Chip Test – An Overview and Methodology	CAN
29.	Sugata Sanyal	TIFR, India	Secure Communication in Cognitive Radio Networks	CAN
30	L. Pavesi	Univ. Trento, Italy	Nano Silicon Photonics	OLT

List of candidates enjoying fellowship (registration fee waiver)

No	Name	Affiliation
1.	Md. Shahidul Islam	Instt. Of Information and Communication Technology, Bangladesh University of Engg. & Technology, Dhaka, Bangladesh
2.	Dr. D. K. Chakrabarti	Retd. Professor, PRL, Ahmedabad
3.	Ms. Haimabati Dey	SRF, IIT-Kharagpur
4.	Sri Saikat Chattopadhyay	SRF, School of Physics, Devi Ahilya University, Indore, MP
5.	Arnab Sinha	ACMU, ISI, Kolkata
6.	Siddhartha Panda	INRAPHEL, CU

- | | | |
|-----|-------------------|--|
| 7. | Dr. S P. Pati | Retd. Professor, Sambalpur University |
| 8. | P. R. Tripathi | SRF, Sambalpur University |
| 9. | M. Swati Bhargava | SRF, L N Mittal Inst Info. Technology, Jaipur, Rajasthan |
| 10. | Tanmay Das | INRAPHEL, CU |
| 1. | Anirban Banerjee | INRAPHEL, CU |
| 12. | Sonia R. Fredrick | Sona College of Technology, Salem, Tamilnadu |

**6.10 2009 IEEE Applied Electromagnetic Conference (AEMC 09)
December 14-16, Hyatt Regency Kolkata**

2009 IEEE Applied Electromagnetics Conference AEMC and URSI Commission B meeting were held in Hyatt Regency Kolkata during December 14-16, 2009. This has been organized by the IEEE Antennas and Propagation & Microwave Theory and Techniques joint Chapter, IEEE Calcutta Section, in association with the Institute of Radio Physics and Electronics, University of Calcutta. This biennial International Conference is the second event of the series and has been attended by about 190 delegates from different parts of the Globe, which include USA, Canada, UK, Spain, Germany, Turkey, Japan, China, Malaysia, Hong Kong, Thailand, Singapore and obviously India. A significant participation from Indian Defence and Space Research Organization is quite indicative.

Prof. Raj Mittra of Pennsylvania State University chaired the inaugural session on the first day of the conference. IEEE AP-S President Prof. Makoto Ando of Tokyo Institute of Technology delivered the Keynote address. Participation from Office of Naval Research Global (ONRG) is quite significant. Dr. Shawn Thorne and Dr. Robert Bolia, two Associate Directors of their Tokyo centre gave nice presentations seeking active collaboration with Indian Universities and Institutes.

Fifteen tutorial lectures were planned and remarkably all the Speakers from different parts of the world showed up with their excellent deliberations. A talk on *Mobile Communication from Electrical Engineering Viewpoint* by Prof. T. K. Sarkar of Syracuse University and another presentation on *Square Kilometer Array Antenna* by Prof. S. Ananthkrishnan were highly appreciated by the audience

Apart from IEEE, the conference was supported by Government of West Bengal, University of Calcutta, Schlumberger-USA, CST-Germany and Agilent-India.

AEMC Invited talks

No	Speaker	Affiliation	Title of Talk
1.	S. Ananthkrishnan	<i>Pune University, India</i>	Antennas for Radio Astronomy
2.	Raj Mittra	<i>Pennsylvania State University, USA</i>	Square kilometer array – a unique instrument for exploring the mysteries of the universe using the square kilometer array
3.	Kiyotoshi Yasumoto	<i>Kyushu University, Japan</i>	Guidance and Scattering of Electromagnetic Waves by Layered Cylindrical Arrays of Circular Rods
4.	Magdalena Salazar Palma	<i>Universidad Carlos III de Madrid, Spain</i>	A Brief Chronology of The Origin and Developments of Wireless Communication
5.	Tapan K. Sarkar	<i>Syracuse University, USA</i>	A Look At Some Of The Practices In Mobile Communication From An Electrical Engineering Viewpoint
6.	S. N. Joshi	<i>Central Electronics Engineering Research Institute, Pilani, India</i>	Overview of Microwave Tubes Requirements in the Country
7.	Shiban K. Koul	<i>Indian Institute of Technology-Delhi, India</i>	Micromachined Microwave and Millimeter Wave Circuit Design
8.	K. T. Selvan	<i>University of Nottingham Malaysia Campus, Malaysia</i>	Inspiring innovative thinking via teaching in context: Maxwell's equations
9.	J. Venkataraman	<i>Rochester Institute of</i>	Project Based Electromagnetic Education

		<i>Technology, USA</i>	
10.	Binboga Siddik Yarman	<i>Istanbul University, Turkey</i>	Automated Design of Antenna Matching Networks with Optimum Circuit Topology on MatLab
11.	Somnath Mukherjee,	<i>RB Technology, USA</i>	Remote Characterization of Microwave Networks - Principles and Applications
12.	S. Rengarajan	<i>California State University Northridge, USA</i>	A Tutorial on Design and Analysis of Waveguide- Fed Slot Array Antennas
13.	M. Krairiksh	<i>King Mongkut's Institute of Technology, Bangkok, Thailand</i>	Phased Array of Switched-beam Elements and its Applications”
14.	Edward Kai-Ning Yung	<i>City University of Hong Kong, Hongkong</i>	An Active RFID System for Hospitals
15.	Wolfgang-M. Boerner	<i>University of Illinois at Chicago, USA</i>	Recent Advances in SAR Remote Sensing: "Multimodal POLinSAR Imaging with Applications to Remote Sensing of the Terrestrial Covers and the Monitoring of Environmental Stress Changes

List of Candidates who enjoyed fellowship under UGC-NRCPS

No	Name	Affiliation
1.	Amit Kumar Varshney	University of Burdwan, WB
2.	Ashesh Ray Chaudhuri	IIT-Kharagpur
3.	K. Prashanti	IIT-Bombay, Mumbai
4.	Kaustav Chakravarty	INRAPHEL, CU
5.	M S Nishamol	CUSAT, Cochin
6.	Paramita Mukherjee	University of Burdwan, WB
7.	Prasun Banerjee	University of Calcutta
8.	V P Sarin	CUSAT, Cochin
9.	S S Karthikeyan	IIT-Guwahati
10.	Yogesh Kumar Choukiker	NIT-Rourkela

6.11 Winter School on DSP Algorithms, Architecture & Applications (DSPA++)

A winter school on DSP Algorithms, Architecture & Applications (DSPA++ 2010) is organized at the Institute of Radio Physics and Electronics, University of Calcutta from January 4-22, 2010 as an activity of UGC Networking Resource Centre in Physical Sciences. This event is also a part of the *Institute's Diamond Jubilee* celebration beginning from April 2009.

We advertised for the school in our website www.irpel.org/ugc-network/school. Posters were also sent to the major institutions by post. Registration was sought from young faculties, PG and Ph.D. students of Engineering Institutions preferably age below 40 years of age. The number of selected candidates was limited to 20. Terms and conditions were given in detail therein.

Initially there was an over whelming response for attending the course but finally all of them did not arrive at. Several eminent faculties from different institutions in India gave their talks/lecturers in this winter school, which are mentioned below. Participants for this school are from all over the India. Several M.Tech. Students in their final semester from North East had participated in the school. Several faculties from other different institutions had also participated in the school. It is felt that many more could have been joined had the School been organized in the month of December during their semester end. Due to our involvement with the work in the CODEC 09, an international conference organized by this Department, winter school could not be organized in the month of December 2009. However the winter school has received a wide applause from all the participants, which is evident from their feedback we have received. They also expressed their willingness to participate in such schools in future.

Outside participants stayed in BSNL hostel and we provide them taxi to come to the Department and for their return. We also provide DA to all the participants. The school regularly started sharp at 10 AM and ends at 5 PM. In between there was a lunch break between 1 to 2 pm. Coffee/tea were served during the lecture period once in the morning and once in the evening. Generally first half was kept for theory lecture and second half for the laboratory. We broadly partitioned course into three sections. Firstly, familiarize participants with basics of DSP and then applications of DSP were presented. Thirdly, Practical in the laboratory supplements the theory. The school ended in a very successful note. Course materials were distributed to the Participants. A feedback from one participant about the course and course materials is enclosed below.

On 1/26/10, Mahua Pal <mahuapal@yahoo.com> wrote:

Sir,

Today morning I was just going through the CD from the Winter School.

So I thought I would thank you once again for all the things I had gained from the school and above all for allowing me to attend it.

Thank you so much.

Hope we meet again some day in such workshops/schools.

Thanks.

Mahua Pal, lecturer

Following winter school schedule gives the name of faculties and their lectured topics.

		Winter School DSPA++ Program Schedule	
4.1.2010	10:00-10:30	Inauguration / Welcome address	
(MONDAY)	10:30-10:45	Tea/Coffee Break	
	10:45-13:00	Introduction to Signals & Systems for DSP, Part I (Prof. M. Chakraborty, IIT KGP)	
	13:00-14:00	Lunch	
	14:00-17:00	Introduction to Signals & Systems for DSP, Part II (Prof. M. Chakraborty, IIT	

KGP)

5.1.2010	10:00-12:30 12:30-13:30 13:30-16:00 16:00-17:00	Review of DFT & FFT (Prof. S. Sanyal, JU) Lunch (Advanced by 30 mins) FIR Filter Design (Prof. S. Sanyal, JU) Lab1 (DSP Basics Using Matlab, Part-1) (Dr. A. Das Barman)
6.1.2010	10-11:30 11:30-13:00 13:00-14:00 14:00-17:00	Lab 2A (DSP Basics Using Matlab, Part-2A) (Dr. A. Das Barman) Useful Transforms & Introduction to Filters (Dr. S. Palit, ISI, Kolkata) Lunch Lab 2B (DSP Basics Using Matlab Part-2B) (Dr. A. Das Barman)
7.1.2010	10:00-13:00 13:00-14:00 14:00-17:00	IIR Filter Design (Prof. T.K. Basu, Ex prof. IIT KGP) Lunch Lab 3 (DSP Basics Using Matlab Part-3, Dr. A. Das Barman)
8.1.2010	10:00-13:00 13:00-14:00 14:00-17:00	Multirate Signal Processing (Dr. S. Palit, ISI, Kolkata) Lunch Introduction to Speech Signal Processing (Prof. T.K. Basu, Ex prof., IIT KGP)
9.1.2010	10:00-13:00 13:00-14:00 14:00-17:00	Adaptive Signal Processing (Prof. M. Chakraborty, IIT KGP) Lunch Wavelets in Application of Data Hiding (Dr. S. Maity, B.E. College)
(SATURDAY)	13:00-14:00 14:00-17:00	
10.01.2010	SUNDAY	
11.01.2010	10:00-13:00 13:00-14:00 14:00-17:00	Advanced Topics of Transform (Prof. V.M. Gadre, IIT Mumbai) Lunch Lab 4 (DSP Basics Using Matlab Part-4, Dr. A. Das Barman)
12.01.2010	10:00-13:00 13:00-14:00 14:00-17:00	Adaptive Filtering and Prediction (Prof. B.N. Chatterjee, Ex IIT KGP) Lunch Lab 5 (VLSI Theory Part-1, Prof. S. Sen)
13.01.2010	10:00-13:00 13:00-14:00 14:00-17:00	 (Cancelled due to Bandh)
14.01.2010	10:00-11:30 11:30-13:00	Canonic DSP Structures (part I) (Prof. S.C Dutta Roy ,IIT Delhi) Library visit

	13:00-14:00	Lunch
	14:00-15:30	Canonic DSP Structures (part II) Prof. S.C Dutta Roy ,IIT Delhi
	15:30-17:00	Lab 6 (VLSI Theory Part-2, Prof. S. Sen)
15.01.2010	10:00-11:30	Canonic DSP Structures (part III) Prof. S.C Dutta Roy, IIT Delhi
	11:30-12:00	Tea Break
	12:00-13:30	Canonic DSP Structures (part IV) Prof. S.C Dutta Roy ,IIT Delhi
	13:30-14:30	Lunch (Delayed by 30 mins)
	14:30-17:00	Lab 7 (VLSI Hardware Implementation (FPGA) Part-1, Ms. Arpita Das)
16.01.2010	10:00-13:00	Embedded Systems & DSP Architecture (Prof. Routray, IIT KGP)
(SATURDAY)	13:00-14:00	Lunch
	14:00-17:00	Lab 8 (Mr. Gushiest, MOTOROLA)
17.01.2010	SUNDAY	
18.01.2010	10:00-13.00	(Holiday declared due to demise of Sri. J. Basu)
19.01.2010	10:00-12:30	Image Processing Fundamentals (Prof. M. Kundu, ISI, Kolkata)
	13:00-14:00	Lunch
	14:00-17:00	Lab 9(DSP Hardware Implementation (TI Toolkit) Part-1, Dr. S. Barman(Mandal)
20.01.2010	Holiday	
		Re-configurable Architecture and its application in Software Defined Radio (Prof. Amitava Sinha, Director, School of IT, WBUT)
21.01.2010	10:00-13:00	
(THURSDAY)	13:00-14:00	Lunch
	14:00-17:30	Lab 10 (DSP Hardware Implementation (TI Toolkit) Part-2, Dr. S. Barman (Mandal)
	18:30-21:00	Dinner
22.01.2010	10:00-12:00	Lab 11A (VLSI Hardware Implementation (FPGA) Part-2, Ms. Arpita Das)
	10:00-12:00	And Lab11B. (DSP Hardware Implementation (TI Toolkit) Part-1, Dr. S. Barman(Mandal)
	12:00-13:00	Feedback and Valedictory session
(FRIDAY)	13:00-14:00	Lunch


List of Participants

1	Kumaresh Sarmah	Department of Electronics & Communication Engg. Tezpur University (certificate awarded)
2	Mousam Chatterjee	B.P.Poddar Institute of Engineering & Management, Kolkata (certificate awarded)
3	Subash Chandra Yogi	Tezpur Central University, Napaam, Assam (certificate awarded)

4	Naveen Kumar S.K	Department of Electronics, University of Mysore (certificate awarded)
5	Nipanka Bora	Dept of Electronics and Communications, Tezpur University (certificate awarded)
6	Nishant Goyal	Dayal Bagh Educational Institute, Dayal Bagh, Agra (certificate awarded)
7	Divya Prakash Yadav	College of Agriculture Engg. & Technology, Allahabad (certificate awarded)
8	Somnath Pradhan	Siemens Information Systems Limited, Kolkata (certificate awarded)
9	Mahua Pal (F)	Techno India, Salt Lake, Kolkata (certificate awarded)
10	Rikmantra Basu	Institute of Radiophysics & Electronics, CU (certificate awarded)
11	Venkat Roy	Institute of Radiophysics & Electronics, CU (certificate awarded)
12	Somnath De	Dept. of Computer Science, CU (certificate awarded)
13	Anupam Patra	Future Institute of Technology (Irregular and hence certificate not awarded)
14	Abhishek Bagchi	Haldia Institute of Technology, Haldia Midnapore(Discontinued and hence certificate not awarded)


6.13 SAMPLE ANNOUNCEMENT

150 years of Excellence



University of Calcutta

Institute of Radiophysics & Electronics
University of Calcutta
 92, Acharya Prafulla Chandra Road, Kolkata - 700 009, West Bengal
 India



Summer School
 on
Photonics - Systems, Modeling Approach & Research Trends
PhotoSMART
 (June 1-18, 2010)
 Organized by
Institute of Radio Physics and Electronics,
University of Calcutta
A UGC Networking Resource Centre

About Networking Resource Centre: The University Grants Commission, accepting the recommendation of MHRD task force for basic scientific research in Universities, decided to create a few Networking Resource Centres in the country in areas of Physical, Chemical, Life, Materials and Mathematical Sciences. In the first phase, Institute of Radio Physics and Electronics (INRAPHEL), a Centre of Advanced Study since 1963, has been selected as one such Networking Resource Centre in Physical Science.

The main activity of the Centre is to organize Summer/Winter schools (about 10 in 5 years), train faculties, researchers and Ph.D. students in the areas of expertise of the faculties of the Centre, by allowing the visitors to share equipment, library, internet and other infrastructures. Training of M.Sc. /B. Tech/M. Tech students during summer and other vacation periods will also be given.

Areas to be covered in PhotoSMART: Basics of Photonics, Optical Processes in Semiconductors, Optoelectronic Materials and Devices, Devices and Components for Fibre-Optic Communication Systems, Growth and Fabrication Aspects, MOEMs, Biophotonics, Nanophotonics, Medical Photonics, Laboratory work on Optical Fibre Communication System, Use of Softwares.

Speakers: Faculties of INRAPHEL and other departments/institutions; Seminars by eminent Indian and Foreign visitors will be arranged.

Who can Apply: Faculties, Ph.D. students and postdoctoral fellows in Universities, PG/UG Colleges in Science and Engineering Institutions. Age limit: 40 years or less.

Prospective participants are encouraged to apply in the prescribed format along with a CV mentioning background in the area, and a brief statement of motivation to participate in the school. **The number of candidates to be selected is 20. The candidates are requested to submit no objection certificate from their own Institution/Organization.** Applicants will be selected based on merit, field of research and in order to nurture a well-balanced and diverse group of participants, giving preference to candidates from developing institutions.

Application Deadline: April 23, 2010. List of selected candidates will be put in the website by **May 7, 2010.** Selected participants will be provided TA/DA and fellowship covering the cost of the school, food, and basic shared accommodation in non-ac rooms.

Contact Details: For further information on the School please email: photosmart.rpe@gmail.com

UGC-NRC Director: Prof. P.K. Basu
Course Co-Ordinator: Prof. N.R. Das
Joint Co-Ordinator: Dr. B. Mukhopadhyay

Important Dates	
Last date for application online:	April 23, 2010
Intimation of selection:	May 7, 2008
Duration of School	June 1, 2010 – June 18, 2010

*Institute of Radio Physics and Electronics, University of Calcutta,
 92 Acharya Prafulla Chandra Road, Kolkata 700009,
 Tel: +91 33 2350 9115; Fax: +91 33 2351 5828; URL: www.irpel.org/ugc-network/school*

6.14 Sample Feedback Form Winter School DSPA++ 2010

Feedback Form for Participants

Put a tick mark in one box only; you may write comments in a separate sheet or at the end of the questionnaire mentioning question number (e.g., Q.6: Most of the speakers talked too fast/ talked below standard/talked too elementary things, etc)

Academic	
1.	You have been informed of the course content by website/poster. How much of the content was actually covered? (1) > 75% <input type="checkbox"/> (2) 50-75% <input type="checkbox"/> (3) 25-50% <input type="checkbox"/> (4) < 25% <input type="checkbox"/> .
2.	Have the basic principles been adequately explained? (1) Yes <input type="checkbox"/> (2) mostly <input type="checkbox"/> (3) To some extent <input type="checkbox"/> (4) very little <input type="checkbox"/>
3.	Have the device applications and technology aspects been covered? (1) > 75% <input type="checkbox"/> (2) 50-75% <input type="checkbox"/> (3) 25-50% <input type="checkbox"/> (4) < 25% <input type="checkbox"/> .
4.	Give your opinion about coverage of recent developments in the subject (1) More than adequate <input type="checkbox"/> (2) Adequate <input type="checkbox"/> (3) Satisfactory <input type="checkbox"/> (4) Not satisfactory <input type="checkbox"/> .
5.	Your opinion of coverage of lab/demonstration/visit of facilities (1) More than adequate <input type="checkbox"/> (2) Adequate <input type="checkbox"/> (3) Satisfactory <input type="checkbox"/> (4) Not satisfactory <input type="checkbox"/> .
6.	Your opinion of the choice of speakers (1) Excellent <input type="checkbox"/> (2) Good <input type="checkbox"/> (3) Moderately satisfactory <input type="checkbox"/> (4) Unsatisfactory <input type="checkbox"/> .
7.	Your opinion about the overall presentation of the lectures (put number in the scale of 10, i.e., 0,4,9,10) :
8.	Your opinion on the pressure/workload in the present School, considering that such schools attempt to give as much information as possible in a short period. (1) Too much workload, <input type="checkbox"/> (2) Much load <input type="checkbox"/> (3) Fine balance between training and free time <input type="checkbox"/> (4) Not much training <input type="checkbox"/> .
9.	Your opinion about the method of distribution of lecture notes; (1) Highly satisfactory <input type="checkbox"/> (2) Satisfactory <input type="checkbox"/> (3) Moderately satisfactory <input type="checkbox"/> (4) Unsatisfactory <input type="checkbox"/> .
10.	Overlap between your interest and the topics in the school (1) Perfect overlaps; useful for me. <input type="checkbox"/> (2) I work in the area of semiconductors, but all the contents will not be useful to me <input type="checkbox"/> (3) I do not work, but I find the topics will help develop my/our institution's teaching/research activities <input type="checkbox"/> (4) The course is not of interest to me/my institution <input type="checkbox"/> If your answer is (4), give reasons for your attending the School, your expectations and how it was not fulfilled.
11.	Your opinion about the following follow-up actions in your institutions after the training: (1) The course will help develop M. Tech courses <input type="checkbox"/> ; (2) Part of the course can be used in B. Tech/M.Sc/B.Sc level <input type="checkbox"/> (3) Useful, but cannot be used in my institution due to other constraints <input type="checkbox"/> (4) Unable to comment, as I am not a teacher <input type="checkbox"/> .
12.	Do you feel encouraged to do research in the area, given facilities and proper guidance? (1) I am already working <input type="checkbox"/> (2) Yes <input type="checkbox"/> (3) Not yet decided <input type="checkbox"/> (4) No <input type="checkbox"/> .
13.	Would you recommend your colleagues and acquaintances to do research or undertake training in this Institution in this area and/or other thrust areas? (1) Certainly in this area <input type="checkbox"/> (2) In other areas <input type="checkbox"/> (3) Undecided <input type="checkbox"/> (4) No <input type="checkbox"/> .
14.	In a separate sheet give your comments about how to improve the Training Program/School.

15.	You may suggest a few topics for future schools. It is suggested that you prepare a list after discussing amongst all the participants.
Hall management and other matters	
16.	Your comments about ambience, sound systems, projection, etc (1) Quite satisfactory <input type="checkbox"/> (2) Satisfactory <input type="checkbox"/> (3) OK, but some improvements could be done <input type="checkbox"/> (4) Unsatisfactory. <input type="checkbox"/> Give details if you tick (3) or (4). We solicit your frank and even unpleasant comments.
17.	Space in the classroom (1) Spacious <input type="checkbox"/> (2) Some more space was necessary <input type="checkbox"/> (3) Barely adequate <input type="checkbox"/> (4) Too much crowded. <input type="checkbox"/>
18.	Working conditions in labs (1) Spacious <input type="checkbox"/> (2) Some more space was necessary <input type="checkbox"/> (3) Barely adequate <input type="checkbox"/> (4) Too much crowded <input type="checkbox"/> .
Accommodation and other matters	
19.	Your comments about accommodation. 1) Quite satisfactory <input type="checkbox"/> (2) Satisfactory <input type="checkbox"/> (3) OK, but some improvements could be done <input type="checkbox"/> (4) Unsatisfactory. <input type="checkbox"/> Give details if your answer is (3) or (4). We welcome your frank and even unpleasant comments.
20	Your comments about food. 1) Quite satisfactory <input type="checkbox"/> (2) Satisfactory <input type="checkbox"/> (3) OK, but some improvements could be done <input type="checkbox"/> (4) Unsatisfactory. <input type="checkbox"/>
20.	Other arrangements, like transportation, fellowships, method of payments, etc 1) Quite satisfactory <input type="checkbox"/> (2) Satisfactory <input type="checkbox"/> (3) OK, but some improvements could be done <input type="checkbox"/> (4) Unsatisfactory. <input type="checkbox"/> Give details if your answer is (3) or (4). We welcome your frank and even unpleasant comments.

Give details if your answer is (3) or (4). We welcome your frank and even unpleasant comments

Name of the Participant: (optional)

Institute:

SPACE FOR ADDITIONAL COMMENTS
Use may use separate sheets, but staple that to this form