

## **DBT Annual Progress Report (2020-21), Department of Physics**

### **Qualitative improvements due to DBT support**

DBT Support in the session 2020-21, proved to be beneficial in terms of procurement of various equipment's in the Physics Lab which could not be procured earlier due to paucity of funds.

### **The various set-ups and equipment's already purchased/ordered are:**

Digital Storage Oscilloscope (DSO) (2), Maxwell's Bridge (1), Transistor characteristics kit (3), De-Sauty's Bridge (3), Callendar and Griffith Bridge Platinum Resistance Thermometer set up (1), Fresnel Biprism set up (1), Four probe set up (3), Chemicals and Hydrothermal Autoclave (1) to perform experiments in Nanophysics.

### **The equipment's which are in the process of Purchase:**

Michelson interferometer (1), Hall effect (2), CRO (4), Callendar and Griffith Bridge Platinum Resistance Thermometer set up (1), Four bit counters (3), Planck's Constant (1), Frequency Generators (5), Microcontroller Kits (3), LCR meter (1), Millikan's oil drop set up (1), spectrometers (5), DSO (4), Multimeter (5), Michelson interferometer (1), MATLAB Software

Various new experiments (outside the syllabus) and minor projects have also been done. Students involved were made familiar with the concept and simulation part, if available, and some have also been given Hands-On experience in the lab depending upon their availability and requisite permissions due to Covid Times.

### **Some of the experiments and minor projects undertaken are as under:**

1. To compute bending loss in Optical Fibre using different types of bending. (Minor-Project)

Mentors: Dr. Narender Singh Choudhary and Dr. Monika Goyal

2. Calculation of energy levels, oscillator strength, and transition probabilities for He-Like ions. (Minor-Project)

Mentors: Dr. Sunny Aggarwal and Dr. Arun Goyal

3. To determine the wavelength of a monochromatic source of light with the help of Fresnel Biprism. (New experiment)

Mentors: Dr. Narender Singh Choudhary and Dr. Seema Dabas

4. Synthesis and electrochemical properties of nickel-manganese sulphur for super capacitor application. (Minor-Project)

Mentor: Ms Pooja Devi

5. To determine the temperature-coefficient of Resistance for Platinum using Platinum Resistance Thermometer and Callender and Griffith Bridge. (New Experiment)

Mentors: Dr. Monika Goyal and Mr. Pradeep Sharma

- **Details of experiments with proofs are provided in the end.**

#### **Novel Aspect introduced during the scheme implementation**

1. Since Physical attendance of students in the lab was not possible during the session 2020-21, stress was laid upon giving as much exposure to simulation of new experiments and projects as possible to the students. They were encouraged to write their own projects and make their circuits online using vlabs.

2. A National Workshop was organized online to give the glimpses of some concepts in Information technology and climate change science to students and faculty to understand physics in blended mode. The topics like

*New Age Computing with demonstration using CloudSim Simulator*

*Cyber security as a tool for Digital Edge in Covid Times*

*Trends and Challenges in climate change science*

were covered.

#### **Lessons learnt / difficulties faced/suggestions if any, in implementation of the programme and utilization of DBT grant.**

The session 2020-21 was conducted largely on virtual mode so many new teaching and learning online tools were introduced to both faculty and students. Discussions were a lot easier when held online as outstation students could participate more. Since the very idea of the DBT scheme is to give hands-on experience to the students and faculty of various experimental set ups in the lab, that way the whole experience of the scheme was missed. However, we tried to procure set ups keeping interdisciplinary approach in mind for students in all science streams in the college till the time they can actually get hands on experience in the lab.

The only suggestion I would like to give regarding the implementation of scheme is to provide a bigger window for the utilization of funds in these circumstances. Most of the time, need of various instruments or keeping lecture/session on a particular topic (both for teaching and non-teaching and students as well) arises when work is practically performed in the lab.

### **Key performance indicators**

S.No	Indicators	Pre-Support	During/After Support	Remarks
1.	No of hands-on experiment being conducted	-	-	-
2.	No of new experiments introduced	-	2	Process of procurement of new experimental set ups is on.
3.	Publications/Patents, if any	-	-	-
4.	Training Received by faculty	-	-	-
5.	Exhibitions/seminars/training courses conducted	-	Online Workshop for students and teachers.	Details provided in the end.
6.	Books/Journals subscribed from grants	-	-	-
7.	Outreach Activities (Popular Lectures)	-	Innovation activities-based lecture for all students	Details Provided.
8.	Colleges mentored to apply for DBT star college grants	-	-	-
9.	Invited Lectures	-	-	-

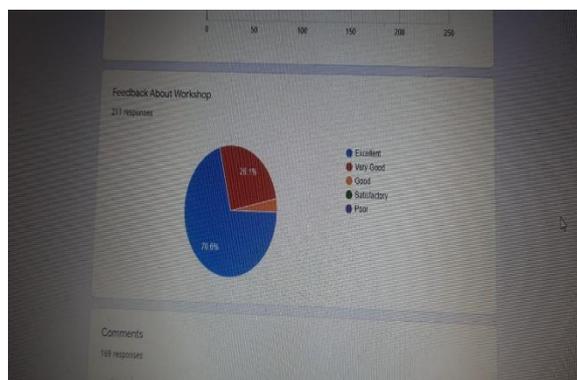
### **Self-evaluation**

50% Objective achieved as no hands-on experience could be given to the students in the current session. No Physical Workshops could be organized by the Physics Department for the students and Non-Teaching Staff due to Pandemic.

### Proofs of Workshops and Popular Lecture

1. A week-long National Workshop on the topic “*Emerging Trends in Science and Technology: Issues in these Unprecedented Times*” was organized by SLC, under the aegis of DBT star college scheme and in collaboration with IQAC, SLC. This workshop was very successfully organized virtually on zoom platform under the able leadership of our Principal, Prof. Rabi Narayan Kar from 4<sup>th</sup> Aug till 8<sup>th</sup> Aug, 2020. The inaugural ceremony on 4<sup>th</sup> Aug, 2020 saw the benign presence of **Prof. Gurmeet Singh, honorable Vice Chancellor, Pondicherry University** who through his motivating address inspired the audience to do their bit in achieving the goal of self-reliant India and showed immense confidence in us to pull off the workshop successfully. The audience of over 200 comprised of both faculty and students from all over India. The next five days saw a bouquet of eminent resource persons from diverse fields of expertise pertaining to science and technology. These include bio technology, climate change science, cloud computing, cyber security, application of Artificial Intelligence in health sector and more. A few prominent names included **Dr. Nisha Mendiratta (Advisor/Scientist G & Associate Head, SPLICE DST, GoI), Prof. Debasis Dash (Chief Scientist, CSIR-IGIB), Dr. Charru Malhotra (Coordinator, centre of e-Governance, IIPA) and others.** The valedictory function on 8<sup>th</sup> Aug, 2020, saw the kind presence of **Prof. Manoj Kumar Dhar, honorable Vice Chancellor, University of Jammu**, who blessed us with his encouraging words. He was full of appreciation for our efforts and impressed upon the need of more meaningful research and innovations in our country. He urged the youth to come up with innovative ideas which could lead us to our aim of ATMA-NIRBHAR BHARAT as any country’s progress is defined in terms of the progress made in Science and Technology sector. The workshop ended with encouraging remarks from our Principal Sir and Vote of thanks from the coordinators.

Feedback



2. Institution's Innovation Council (IIC), Shyam Lal College, University of Delhi, in collaboration with IQAC, organized a session on National Innovation and Start-up Policy for the student with the agenda of *“Emphasizing on Innovation & Entrepreneurship in Higher Education Insititutions”* The orientation session was conducted on Saturday, 30<sup>th</sup> January, 2021 on the virtual platform Zoom. The eminent speaker for the session was **Prof. Bibhu Biswal, co-coordinator DUCIC and Professor in Physics**. The objective of this Orientation Session was to validate the product / business idea's potential and skills required by the start-ups and students to channelize those ideas into fruitful endeavours. The ideas discussed by the honourable speaker were on the basis of Relevance and Validation of Problems, Societal and Technological Problem solving, Feasibility and Creativity in the idea.



### **Details and Proofs of new experiments/Minor projects**

**AIM:** To determine the temperature coefficient of resistance for platinum wire using PRT and Callender and Griffith bridge

**Work done So far:** To perform the above-mentioned experiment the entire set up is purchased and the demonstration of experiment has been conducted. The students of B.Sc. Hons (Chemistry and Mathematics) IV Semester have been asked to perform the experiment. However, as the physical presence of students in the college is restricted due to Covid 19 and Lockdown in Delhi-NCR region we could not call the students to college to perform the experiment.



Image of Callender and Griffith bridge purchased

**Plan of Work:** We have planned to perform the experiment in two parts

- 1) To calibrate the platinum resistance thermometer by measuring the resistance at ice and steam temperature using Callender and Griffith bridge (Purchased)
- 2) To measure the resistance of platinum wire as a function of temperature using LCR meter (Procurement of this instrument is in process).

## 2. To compute the bending loss in optical fiber using different types of bending

- This project involved 6 students from B.Sc.(Prog.) Ist year
- Project has been explained theoretically to students, involved in project
- Experimental set has been demonstrated to the students
- Experimental work has been started by the students on the experimental setup.



### 3. To determine the wavelength of a monochromatic source of light with the help of Fresnel's Biprism

- This project involved 6 students from B.Sc.(Prog.) Ist year
- Required apparatus for the project has been purchased.
- Experimental set up has been demonstrated with the required result and it is ready to start.



### 4. Calculations of energy levels, oscillator strength and transition probability for He-like ions

In this project, one electron and two electron systems were studied using quantum mechanics.

We have run the program for the calculation of energy levels, lifetimes, transition probability, oscillator strength, line strength and transition wavelength of He-like ions and also done analysis of calculated results.

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770 Summary of contributions to energy levels in Ryd.
771 level CSP 2019-order Bvict QED total
772 -----
773 1 0 0 1.8181818181818181 0.0000000000 0.0000000000 1.8181818181818181
774 2 0 0 2.0000000000000000 0.0000000000 0.0000000000 2.0000000000000000
775 3 0 0 2.2500000000000000 0.0000000000 0.0000000000 2.2500000000000000
776 4 0 0 2.5000000000000000 0.0000000000 0.0000000000 2.5000000000000000
777 5 1 0 2.7500000000000000 0.0000000000 0.0000000000 2.7500000000000000
778 6 1 0 3.0000000000000000 0.0000000000 0.0000000000 3.0000000000000000
779 7 1 0 3.2500000000000000 0.0000000000 0.0000000000 3.2500000000000000
780 8 0 0 3.5000000000000000 0.0000000000 0.0000000000 3.5000000000000000
781 9 1 0 3.7500000000000000 0.0000000000 0.0000000000 3.7500000000000000
782 10 2 0 4.0000000000000000 0.0000000000 0.0000000000 4.0000000000000000
783 11 2 0 4.2500000000000000 0.0000000000 0.0000000000 4.2500000000000000
784 12 0 0 4.5000000000000000 0.0000000000 0.0000000000 4.5000000000000000
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791 3 0 0 2.2500000000000000 0.0000000000 0.0000000000 2.2500000000000000
792 4 0 0 2.5000000000000000 0.0000000000 0.0000000000 2.5000000000000000
793 5 1 0 2.7500000000000000 0.0000000000 0.0000000000 2.7500000000000000
794 6 1 0 3.0000000000000000 0.0000000000 0.0000000000 3.0000000000000000
795 7 1 0 3.2500000000000000 0.0000000000 0.0000000000 3.2500000000000000
796 8 0 0 3.5000000000000000 0.0000000000 0.0000000000 3.5000000000000000
797 9 1 0 3.7500000000000000 0.0000000000 0.0000000000 3.7500000000000000
798 10 2 0 4.0000000000000000 0.0000000000 0.0000000000 4.0000000000000000
799 11 2 0 4.2500000000000000 0.0000000000 0.0000000000 4.2500000000000000
800 12 0 0 4.5000000000000000 0.0000000000 0.0000000000 4.5000000000000000
801 -----

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Figure 1. Energies of first 12 states of He-like Li ion.

### 5. Synthesis and electrochemical properties of nickel–manganese sulphur for supercapacitor application.



Fig. 1

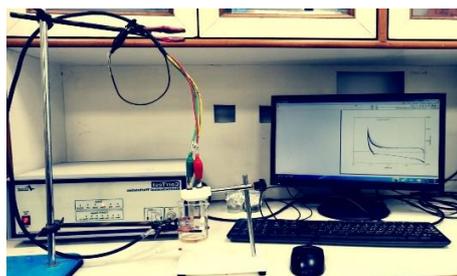


Fig. 2

- This project involved 7 students from B.Sc. (Prog.) Ist year
- Project has been explained theoretically to students, involved in project
- Synthesis process has been explained to the students.
- Required chemicals for this project has been purchased.
- The required work of synthesis will take place in Nano Lab in Department of Physics and Astrophysics, Delhi University.

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