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**DBT Star College Scheme**  
*Sponsored Credit based Programme on*

# Fundamentals of solar photovoltaics



**Resource Person:**

**Mr. Kurias K.M.**

Research Scholar

Cochin University of Science and Technology, Cochin

Organized by  
**Department of Physics**

**Inaugural session on 25<sup>th</sup> February 2021**

**Time: 9.30 a.m.**

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2021/3/29 10:22

# **FUNDAMENTALS OF SOLAR PHOTOVOLTAICS**

**Course offered to UG students**

**Course duration: 5 weeks (36 hrs)**

## **Course Outcome:**

**On the completion of the course, students will be able to display**

- ❖ **The prospects and limitations of non-renewable and renewable energy supplies, as well as the significance of solar energy in terms of human and natural aspects of the environment**
- ❖ **Acquire conceptual knowledge about solar energy harvesting, especially solar cells**
- ❖ **Know the fundamental principle that underline the working of solar cells – from materials to technologies**
- ❖ **Able to identify the material properties for choosing materials for solar cell applications**
- ❖ **Capability to access a solar cell based on various aspects that determine solar cell performance**
- ❖ **Acquire knowledge on the state of the art of various solar cell technologies- Si, thin films technology, DSSC and organic solar cells**
- ❖ **Help to recognise relevant and appropriate areas in the field to be tackled in future studies or in the professional career of the students.**

## **Course Outline:**

How we tackle our energy needs in future, why do we talk about solar cells, how solar cell produce power, and how can we measure solar cell efficiency? These are just a few of the questions the course addresses. For those who are looking for a general insight and those who aims a career in the field of solar cells, the course is an excellent.

You will learn the semiconductor physics necessary to understand the operations of a solar cells, solar cell design aspects and loss mechanisms. The course includes detailed discussions on design and fabrications of c-Si solar cell: from materials to device. The course will make you familiar with commercial and emerging photovoltaic (PV) technologies like Al-BSF, PERC cells, DSSC, perovskite, organic and quantum dot solar cells. At the end of the course you will have gained a fundamental understanding of the field. This will allow you to identify the most interesting or relevant aspects to be pursued in your future studies or in your

professional career. You would have acquired a basic understanding of the field at the conclusion of the course. This will help you to recognise relevant and appropriate areas in the field to be tackled in your future studies or in your professional career.

### **Week 1:**

Introduction to course, energy demands and consumption, primary energy sources, renewable energy, solar radiation basics, solar spectrum. Light absorption.

### **Week 2:**

Physics of solar cell operations, review of semiconductor physics, carrier generation and recombination, basic device equations.

### **Week 3:**

Solar cell operations, p-n junction model (dark and illuminated) and depletion capacitance, current voltage characteristics in dark and light, solar cell characteristics and parameters, conversion efficiency

### **Week 4:**

c-Si photovoltaics, solar cell design, Si wafers, details of c-Si solar cell fabrication, depositions tools, characterization tools, losses in solar cells, optical and electrical losses, light management techniques, semiconductor metal contacts, amorphous and polycrystalline si solar cells (qualitative discussions)

### **Week 5:**

Thin film solar cells, qualitative discussions on DSSC, organic and perovskite solar cells, quantum dot solar cells, tandem solar cells, applications of various kinds of solar cells, Advanced concepts and innovations: high efficiency solar cells, nanomaterials for photovoltaics, PV band gap engineering and optical engineering, market and economy.

### **Text Books:**

[1] Solar Photovoltaics: Fundamentals, Technologies and Applications by Chetan Singh Solanki

[2] website: <https://www.pveducation.org>

### **Reference text:**

- [1] Physics of Solar Cells: From Basic Principles to Advanced Concepts, by Peter Würfel and Uli Würfel, Wiley
- [2] The Physics of Solar Cells, by Jenny A Nelson, world scientific publishing company (2003)
- [3] Semiconductor Material and Device Characterization, by D. K SCHRODER

**Attendance:**

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Session 1**

**Date: 25.02.2021**

**Time: 4.30 p.m. to 6.00 p.m.**

Name	Batch	Feedback on Fundamentals of solarphotovoltaics - session 1
Jessin Joy Alex	B.Sc. Physics III DC	The session was informative.
Anitta Jose	B.Sc. Physics III DC	Interesting. Understood the topics..
MalavikaSmitha	B.Sc. Physics III DC	Was very informative and explained in simple and easy way
Abhishek K P	B.Sc. Physics I DC	The class was amazing, it was not at all a boring class.
Seethalakshmi M	B.Sc. Physics III DC	Interesting class
Prathibha P P	B.Sc. Physics III DC	Good session and no suggestions
Miria Johnson	B.Sc. Physics III DC	Good session
Immanuel Markose Paul	B.Sc. Physics III DC	Good, presentation is very simple & interesting
RehanSabu	B.Sc. Physics III DC	Sir today I cant attend the session because of some issue so please do consider it.I really like this topic.Next class onwards I will be there
Nishy Mary Mathew	B.Sc. Physics III DC	Interesting

Naveena R Thomas	B.Sc. Physics I DC	Understood all the topics in this session.
ArdraAjith	B.Sc. Physics III DC	It was a nice session, I could brush up the basics of solar energy and related energy sources.
Jacob Reji	B.Sc. Physics III DC	Good class
ShijinaShanavas	B.Sc. Physics III DC	Today session would be very benefit ,about the basics in solarvoltaics.in this way of teaching is convenient. And Thank you
Jacob Reji	B.Sc. Physics III DC	.
Ganga Vinod	B.Sc. Physics I DC	Good
Abhishikth Joseph Anand	B.Sc. Physics III DC	The Session was good and informative .
Aleena KM	B.Sc. Physics III DC	Good
Preedhi P P	B.Sc. Physics III DC	The class was informative and interesting.
Divyap.s	B.Sc. Physics III DC	Very good
PARVATHY S	B.Sc. Physics III DC	Good lecture
Tona	B.Sc. Physics III DC	Good class
Nandan M	B.Sc. Physics III DC	Interesting class . Slide show presentation was nice and I suggest to continue the class this way with the presentation . No disturbances like range or clarity wasn't experienced . Class started at the exact time and finished on pre announced 6: 45 ( or early ) without any lag . Thank you



Vysakh k kumar	B.Sc. Physics III DC	Good
Parvathy Das	B.Sc. Physics III DC	It was informative.
Devi Vrinda	B.Sc. Physics III DC	Good session. I could understand very well.
ARYA K N	B.Sc. Physics III DC	Nice class..understood the topics discussed
AparnaVenu	B.Sc. Physics I DC	It was an informative and good session
Vivek Vijay	B.Sc. Physics III DC	It was overall good,great presentation.
Minumoljose	B.Sc. Physics III DC	Worthwhile
Sivakami N Shibu	B.Sc. Physics I DC	Good
Sivapriya S	B.Sc. Physics III DC	Very nice session.
Aparna Anil	B.Sc. Physics III DC	It was a very good session ,no changes are needed as for my opinion
Rishika Ajay	B.Sc. Physics III DC	Useful session
Aryalakshmy A	B.Sc. Physics III DC	Worthwhile.No changes needed
Sandriya Teresa Raju C	B.Sc. Physics I DC	Infact I attended the session for the purpose of credits but the lecture made me enthusiastic more than i even imagined.
Riya S Sam	B.Sc. Physics I DC	It was an informative session. Get to know more about energy, energy sources, world energy consumption, various solar energy technologies

		and so on. Well explained. Looking forward to attend more awesome sessions from Sir.
Devananda S	B.Sc. Physics I DC	It is beneficial
AravindViswam V	B.Sc. Physics I DC	Good Session

**Attendance:**

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Session 2**

**Date: 26.02.2021**

**Time: 8.30 a.m. to 10.00 a.m.**

Name	Batch	Feedback
Aleena KM	B.Sc. Physics III DC	Good
Tona Elisa Scaria	B.Sc. Physics III DC	Good class
Anitta Jose	B.Sc. Physics III DC	Understood the topic
ARYA K N	B.Sc. Physics III DC	Understandable
Sivapriya S	B.Sc. Physics III DC	Informative session
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class
Vysakh k kumar	B.Sc. Physics III DC	Good
Jacob Reji	B.Sc. Physics III DC	Hood class
MalavikaSmitha	B.Sc. Physics III DC	Clearly explained

Miria Johnson	B.Sc. Physics III DC	good session
Aryalakshmy A	B.Sc. Physics III DC	Nice class
Vysakh k Kumar	B.Sc. Physics III DC	Good
Seethalakshmi M	B.Sc. Physics III DC	Usefull
Jessin Joy Alex	B.Sc. Physics III DC	The session was good.
Divyap.s	B.Sc. Physics III DC	Very good
Parvathy Das	B.Sc. Physics III DC	Session was informative.
Aparna Anil	B.Sc. Physics III DC	Very good sesssion
Devi Vrinda	B.Sc. Physics III DC	Good session.
Parvathy S	B.Sc. Physics III DC	Good lecture
Nishy Mary Mathew	B.Sc. Physics III DC	Good
ArdraAjith	B.Sc. Physics III DC	Nice session, topics were clearly mentioned.
Immanuel Markose Paul	B.Sc. Physics III DC	Good
Anjaly Krishna S	B.Sc. Physics III DC	It was an informative class

Aparna Anil	B.Sc. Physics III DC	Very good sesssion
Seethalakshmi M	B.Sc. Physics III DC	Useful
Akhil T R	B.Sc. Physics III DC	Interesting class. Thank you sir
Prathibha P P	B.Sc. Physics III DC	Class was interesting ..
Preedhi P P	B.Sc. Physics III DC	The class was informative.
RehanSabu	B.Sc. Physics III DC	Basic details about solar cell,its function as well as the way absorption and collection occurs.Efficiency of the material.
Ruth Susan Koshy	B.Sc. Physics III DC	Good class
Nandan M	B.Sc. Physics III DC	Today's class was interesting . Very punctual and well planned . Thank you so much sir .
Naveena R Thomas	B.Sc. Physics I DC	Understood all the topics.
Sandriya Teresa Raju C	B.Sc. Physics I DC	Excellent 🧡.Solar cell operations was explained well.
Sivakami N Shibu	B.Sc. Physics I DC	Excellent.Solar cell operations was explained well.
Riya S Sam	B.Sc. Physics I DC	Amazing session. Get to know about Solar cell operations.
Vivek Vijay	B.Sc. Physics III DC	The class was good.
Rishika Ajay	B.Sc. Physics III DC	Useful session
VISHNU V	B.Sc. Physics III DC	Good class



**Attendance:**

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Session 3**

**Date: 27.02.2021**

**Time: 8.30 a.m. to 10.00 a.m.**

Name	Batch	Feedback
JESSIN JOY ALEX	B.Sc. Physics III DC	Good
Jacob Reji	B.Sc. Physics III DC	👍
Aparna Anil	B.Sc. Physics III DC	Very nice session
Seethalakshmi M	B.Sc. Physics III DC	Good class
Aleena KM	B.Sc. Physics III DC	Good
ArdraAjith	B.Sc. Physics III DC	Session was very interesting
Tona Elisa Scaria	B.Sc. Physics III DC	Good class
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class sir
Prathibha P P	B.Sc. Physics III DC	Nice class.
Sivapriya S	B.Sc. Physics III DC	Understood today's class
Preedhi P P	B.Sc. Physics III DC	Good session.
Vysakh k kumar	B.Sc. Physics III DC	Good class
Naveena R Thomas	B.Sc. Physics I DC	Understood the class
MALAVIKA SMITHA	B.Sc. Physics III DC	class clear
Devi Vrinda A	B.Sc. Physics III DC	Good
Aparna Anil	B.Sc. Physics III DC	Very nice session

Immanuel Markose Paul	B.Sc. Physics III DC	Good
Akhil T R	B.Sc. Physics III DC	Thank you sir
Divyap.s	B.Sc. Physics III DC	Very good
Ruth Susan Koshy	B.Sc. Physics III DC	Good class
ARYA K N	B.Sc. Physics III DC	good
Miria Johnson	B.Sc. Physics III DC	Good session
Aryalakshmy A	B.Sc. Physics III DC	Nice session
Parvathy Das	B.Sc. Physics III DC	Session was informative
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Minumoljose	B.Sc. Physics III DC	Explanation is really good. Understandable
Anjaly Krishna S	B.Sc. Physics III DC	Informative class
Parvathy S	B.Sc. Physics III DC	Good class
Vishnu V	B.Sc. Physics III DC	Good class
VISHNU V	B.Sc. Physics III DC	Good class
Rishika Ajay	B.Sc. Physics III DC	Useful session, good presentation
Seethalakshmi M	B.Sc. Physics III DC	Good

**Attendance:**

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Session 4**

**Date: 27.02.2021**

**Time: 4.30 p.m to 6.00 p.m.**

Name	Batch	Feedback
JESSIN JOY ALEX	B.Sc. Physics III DC	Good
Aleena KM	B.Sc. Physics III DC	Good
A Sreejith	B.Sc. Physics III DC	Good
Jacob Reji	B.Sc. Physics III DC	.
ArdraAjith	B.Sc. Physics III DC	Very Informative session
Sivapriya S	B.Sc. Physics III DC	Good session
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class
Vysakh k kumar	B.Sc. Physics III DC	Good
Nishy Mary Mathew	B.Sc. Physics III DC	Good
ARYA K N	B.Sc. Physics III DC	Good

Vysakh k Kumar	B.Sc. Physics III DC	Good
Ruth Susan Koshy	B.Sc. Physics III DC	Good class
Sivakami N Shibu	B.Sc. Physics I DC	Good
Naveena R Thomas	B.Sc. Physics I DC	Nice class
Aparna Ani	B.Sc. Physics III DC	Very much understanding class
Aryalakshmy A	B.Sc. Physics III DC	Nice class
Akhil T R	B.Sc. Physics III DC	Present sir
Anitta Jose	B.Sc. Physics III DC	Class was clear
Miria Johnson	B.Sc. Physics III DC	good
Devi Vrinda A	B.Sc. Physics III DC	Good
Parvathy Das	B.Sc. Physics III DC	Session was informative.
Prathibha P P	B.Sc. Physics III DC	Interesting class
Seethalakshmi M	B.Sc. Physics I DC	Good class
Tona Elisa Scaria	B.Sc. Physics III DC	Good Class
Parvathy S	B.Sc. Physics III DC	Good lecture
Divya P S	B.Sc. Physics III DC	Very good.
Rishika Ajay	B.Sc. Physics III DC	Good session

MALAVIKA SMITHA	B.Sc. Physics III DC	sir could you please share the slide in the classroom
Preedhi P P	B.Sc. Physics III DC	Interesting session
Seethalakshmi M	B.Sc. Physics III DC	Good class..
Nandan M	B.Sc. Physics III DC	Today's class was very descriptive . Thoroughly enjoyed it . Since class ends within an hour , it is much easier to concentrate without any lag or tiredness .Thank you .
ArdraAjith	B.Sc. Physics III DC	Very informative session
Riya S Sam	B.Sc. Physics I DC	Informative session. Well explained and good presentation.
Minumoljose	B.Sc. Physics III DC	Usefull
Vishnu V	B.Sc. Physics III DC	Good class





## Attendance

DBT star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Date: 05.03.2021**

**Time: 5.30 p.m. to 7.00 p.m.**

## Session 10

Name	Batch	Feedback
Sivapriya S	B.Sc. Physics III DC	Good session
Jessin Joy Alex	B.Sc. Physics III DC	Good
Naveena R Thomas	B.Sc. Physics I DC	Nice class.
Aryalakshmy A	B.Sc. Physics III DC	Sir,could you please upload ppt in the classroom
Devi Vrinda	B.Sc. Physics III DC	Good
Malavika Smitha	B.Sc. Physics III DC	Clear
Vysakh k kumar	B.Sc. Physics III DC	Good session
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Aparna Anil	B.Sc. Physics III DC	Understanding session
Immanuel Markose Paul	B.Sc. Physics III DC	Good
Divya P S	B.Sc. Physics III DC	Sir, ppt clss roomil share cheyyamoo?
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class sir
Minumol Jose	B.Sc. Physics III DC	Nice class
Shijina Shanavas	B.Sc. Physics III DC	Good session .thankyou
Seethalakshmi M	B.Sc. Physics III DC	Good
Ardra Ajith	B.Sc. Physics III DC	Very informative and useful session
Akhil T R	B.Sc. Physics III DC	Thankyou sir
Anitta Jose	B.Sc. Physics III DC	The class was clear
Aleena KM	B.Sc. Physics III DC	Good sir

Parvathy S	B.Sc. Physics III DC	Good lecture
Prathibha P P	B.Sc. Physics III DC	Informative session
A Sreejith	B.Sc. Physics III DC	Good
Tona Elisa Scaria	B.Sc. Physics III DC	Good
Nandan M	B.Sc. Physics III DC	Present
Preedhi P P	B.Sc. Physics III DC	Understandable class.
Riya S Sam	B.Sc. Physics I DC	The class was so nice. Very well taught all the topics.
Jacob Reji	B.Sc. Physics III DC	.
Sivakami N Shibu	B.Sc. Physics I DC	Informative
Rishika Ajay	B.Sc. Physics III DC	Good session
Anjaly Krishna S	B.Sc. Physics III DC	It was nice

## Attendance

DBT star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Date: 06.03.2021**

**Time: 5.30 p.m. to 7.00 p.m.**

### Session 11

Name	Batch	Feedback on Fundamentals of solar photovoltaics - session 11
Sivapriya S	B.Sc. Physics III DC	Good session
Jessin Joy Alex	B.Sc. Physics III DC	Good
Shijina shanavas	B.Sc. Physics III DC	Good session
Ardra Ajith	B.Sc. Physics III DC	Topics were very clearly explained. The session was very good.
Arya K N	B.Sc. Physics III DC	Good
Parvathy S	B.Sc. Physics III DC	Good lecture
Malavika Smitha	B.Sc. Physics III DC	Clear
Aryalakshmy A	B.Sc. Physics III DC	Nice class
Miria Johnson	B.Sc. Physics III DC	Good
Immanuel Markose Paul	B.Sc. Physics III DC	Good
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class
Anitta Jose	B.Sc. Physics III DC	It was clear

Divya P S	B.Sc. Physics III DC	Good
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Prathibha P P	B.Sc. Physics III DC	Informative and understanding
Naveena R Thomas	B.Sc. Physics I DC	Understood the topics taught in the class.
Preedhi P P	B.Sc. Physics III DC	Good class
Anjaly Krishna S	B.Sc. Physics III DC	It was informative
Aparna Anil	B.Sc. Physics III DC	Nice session
Parvathy Das	B.Sc. Physics III DC	Session was informative.



### Attendance

DBT Star college scheme sponsored credit based programme on “ **Fundamentals of solar photovoltaics**”

**Date: 08.03.2021**

**Time: 8.30 a.m to 10.00 a.m.**

### Session 12

Name	Batch	Feedback
Aleena KM	B.Sc. Physics III DC	Good
Aryalakshmy A	B.Sc. Physics III DC	Nice session
Arya k n	B.Sc. Physics III DC	Nice
Sivapriya S	B.Sc. Physics III DC	Can you just give a summary of DSSC topic?
Miria Johnson	B.Sc. Physics III DC	Good. It is better if the DSSC class is taken once again
Aparna Anil	B.Sc. Physics III DC	Good sesssion
Nandan M	B.Sc. Physics III DC	Present
Parvathy Das	B.Sc. Physics III DC	Session was informative.
Immanuel Markose Paul	B.Sc. Physics III DC	Good

Vivek Vijay	B.Sc. Physics III DC	The session was good
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class 👍
Ardra Ajith	B.Sc. Physics III DC	The topics were clear. The webinar on DSSC was very effective and topics were well explained, so only a quick recall of those topics would be required, if possible.
Naveena R Thomas	B.Sc. Physics I DC	Understood the class.
JESSIN JOY ALEX	B.Sc. Physics III DC	Good
Divya P.S	B.Sc. Physics III DC	Very good
Shijina Shanavas	B.Sc. Physics III DC	Good session
Anitta jose	B.Sc. Physics III DC	The class was clear
Anjaly Krishna S	B.Sc. Physics III DC	Informational class

## Attendance

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Date:09.03.2021**

**Time:8.30 a.m. to 10.00 a.m.**

### Session 13

Name	Batch	Feedback on Fundamentals of solar photovoltaics - session 13
Aparna Anil	B.Sc. Physics III DC	Nice session
Prathibha P P	B.Sc. Physics III DC	Informative class
Aleena KM	B.Sc. Physics III DC	Good sir
Preedhi P P	B.Sc. Physics III DC	Good lecture
Sivapriya S	B.Sc. Physics III DC	Good session
Miria Johnson	B.Sc. Physics III DC	Good
Shijina Shanavas	B.Sc. Physics III DC	Good session
Seethalakshmi M	B.Sc. Physics III DC	Good
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class
Jacob Reji	B.Sc. Physics III DC	Good
Vysakh k kumar	B.Sc. Physics III DC	Good session
Naveena R Thomas	B.Sc. Physics I DC	Sir... Can you please share the Slides of today's class...

Divya P S	B.Sc. Physics III DC	Good
JESSIN JOY ALEX	B.Sc. Physics III DC	Good
Immanuel Markose Paul	B.Sc. Physics III DC	Good
Devi Vrinda	B.Sc. Physics III DC	Good
Anitta Jose	B.Sc. Physics III DC	Clear
Ardra Ajith	B.Sc. Physics III DC	The session was very informative.
Malavika Smitha	B.Sc. Physics III DC	Clear
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Anitta Jose	B.Sc. Physics III DC	Clear
Anitta Jose	B.Sc. Physics III DC	Clear
Nandan M	B.Sc. Physics III DC	Was a good class . Really helped a lot .

## Attendance

DBT Star college scheme sponsored credit based programme on “ **Fundamentals of solar photovoltaics** ”

**Date: 10.03.2021**

**Time: 8.30 a.m. to 10.00 a.m.**

### Session 14

Name	Batch	Feedback
Aleena KM	B.Sc. Physics III DC	Good
Tona Elisa Scaria	B.Sc. Physics III DC	Good class
Anitta Jose	B.Sc. Physics III DC	Understood the topic
ARYA K N	B.Sc. Physics III DC	Understandable
Sivapriya S	B.Sc. Physics III DC	Informative session
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class
Vysakh k kumar	B.Sc. Physics III DC	Good
Jacob Reji	B.Sc. Physics III DC	Hood class
Malavika Smitha	B.Sc. Physics III DC	Clearly explained
Miria Johnson	B.Sc. Physics III DC	good session
Aryalakshmy A	B.Sc. Physics III DC	Nice class
Vysakh k Kumar	B.Sc. Physics III DC	Good
Seethalakshmi M	B.Sc. Physics III DC	Useful
Jessin Joy Alex	B.Sc. Physics III DC	The session was good.
Divya p.s	B.Sc. Physics III DC	Very good
Parvathy Das	B.Sc. Physics III DC	Session was informative.
Aparna Anil	B.Sc. Physics III DC	Very good session
Devi Vrinda	B.Sc. Physics III DC	Good session.
Parvathy S	B.Sc. Physics III DC	Good lecture
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Ardra Ajith	B.Sc. Physics III DC	Nice session, topics were clearly mentioned.

Immanuel Markose Paul	B.Sc. Physics III DC	Good
Anjaly Krishna S	B.Sc. Physics III DC	It was an informative class
Aparna Anil	B.Sc. Physics III DC	Very good session
Seethalakshmi M	B.Sc. Physics III DC	Useful
Akhil T R	B.Sc. Physics III DC	Interesting class. Thank you sir
Prathibha P P	B.Sc. Physics III DC	Class was interesting ..
Preedhi P P	B.Sc. Physics III DC	The class was informative.
Rehan Sabu	B.Sc. Physics III DC	understood the classl.
Ruth Susan Koshy	B.Sc. Physics III DC	Good class
Nandan M	B.Sc. Physics III DC	Today's class was interesting . Thank you so much sir .
Naveena R Thomas	B.Sc. Physics I DC	Understood all the topics.
Sandriya Teresa Raju C	B.Sc. Physics I DC	Excellent .
Sivakami N Shibu	B.Sc. Physics I DC	Extremely usefu
Riya S Sam	B.Sc. Physics I DC	Amazing session.
Vivek Vijay	B.Sc. Physics III DC	The class was good.
Rishika Ajay	B.Sc. Physics III DC	Useful session
VISHNU V	B.Sc. Physics III DC	Good class

## Attendance

DBT Star college scheme sponsored credit based programme on “ **Fundamentals of solar photovoltaics** ”

**Date:11.03.2021**

**Time: 8.30 a.m. to 10.00 a.m.**

## Session 15

Name	Batch	Feedback
JESSIN JOY ALEX	B.Sc. Physics III DC	Good
Jacob Reji	B.Sc. Physics III DC	👍
Aparna Anil	B.Sc. Physics III DC	Very nice session
Seethalakshmi M	B.Sc. Physics III DC	Good class
Aleena KM	B.Sc. Physics III DC	Good
Ardra Ajith	B.Sc. Physics III DC	Session was very interesting
Tona Elisa Scaria	B.Sc. Physics III DC	Good class
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class sir
Prathibha P P	B.Sc. Physics III DC	Nice class.
Sivapriya S	B.Sc. Physics III DC	Understood today's class
Preedhi P P	B.Sc. Physics III DC	Good session.
Vysakh k kumar	B.Sc. Physics III DC	Good class
Naveena R Thomas	B.Sc. Physics I DC	Understood the class
MALAVIKA SMITHA	B.Sc. Physics III DC	class clear
Devi Vrinda A	B.Sc. Physics III DC	Good
Aparna Anil	B.Sc. Physics III DC	Very nice session
Immanuel Markose Paul	B.Sc. Physics III DC	Good
Akhil T R	B.Sc. Physics III DC	session was very clear
Divya p.s	B.Sc. Physics III DC	Very good
Ruth Susan Koshy	B.Sc. Physics III DC	Good class

ARYA K N	B.Sc. Physics III DC	good explanation
Miria Johnson	B.Sc. Physics III DC	Good session
Aryalakshmy A	B.Sc. Physics III DC	Nice session
Parvathy Das	B.Sc. Physics III DC	Session was informative
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Minumol jose	B.Sc. Physics III DC	Explanation is really good. Understandable
Anjaly Krishna S	B.Sc. Physics III DC	Informative class
Parvathy S	B.Sc. Physics III DC	Good class
Vishnu V	B.Sc. Physics III DC	Good class
VISHNU V	B.Sc. Physics III DC	Good class
Rishika Ajay	B.Sc. Physics III DC	Useful session, good presentation
Seethalakshmi M	B.Sc. Physics III DC	Good,thank you sir



## Attendance

DBT star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Date:12.03.2021**

**Time: 4.30 p.m to 6.00 p.m.**

### Session 16

Name	Batch	Feedback
JESSIN JOY ALEX	B.Sc. Physics III DC	Good
Aleena KM	B.Sc. Physics III DC	Good
A Sreejith	B.Sc. Physics III DC	Good
Jacob Reji	B.Sc. Physics III DC	very useful
Ardra Ajith	B.Sc. Physics III DC	Very Informative session
Sivapriya S	B.Sc. Physics III DC	Good session
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class
Vysakh k kumar	B.Sc. Physics III DC	Good
Nishy Mary Mathew	B.Sc. Physics III DC	Good
ARYA K N	B.Sc. Physics III DC	Good
Vysakh k Kumar	B.Sc. Physics III DC	Good
Ruth Susan Koshy	B.Sc. Physics III DC	Good class
Sivakami N Shibu	B.Sc. Physics I DC	Good
Naveena R Thomas	B.Sc. Physics I DC	Nice class
Aparna Ani	B.Sc. Physics III DC	Very much understanding class
Aryalakshmy A	B.Sc. Physics III DC	Nice class
Akhil T R	B.Sc. Physics III DC	Present sir
Anitta Jose	B.Sc. Physics III DC	Class was clear
Miria Johnson	B.Sc. Physics III DC	good

Devi Vrinda A	B.Sc. Physics III DC	Good
Parvathy Das	B.Sc. Physics III DC	Session was informative.
Prathibha P P	B.Sc. Physics III DC	Interesting class
Seethalakshmi M	B.Sc. Physics I DC	Good class
Tona Elisa Scaria	B.Sc. Physics III DC	Good Class
Parvathy S	B.Sc. Physics III DC	Good lecture
Divya P S	B.Sc. Physics III DC	Very good.
Rishika Ajay	B.Sc. Physics III DC	Good session
MALAVIKA SMITHA	B.Sc. Physics III DC	sir could you please share the slide in the classroom
Preedhi P P	B.Sc. Physics III DC	Interesting session
Seethalakshmi M	B.Sc. Physics III DC	Good class..
Nandan M	B.Sc. Physics III DC	Thoroughly enjoyed it . .Thank you .
Ardra Ajith	B.Sc. Physics III DC	Very informative session
Riya S Sam	B.Sc. Physics I DC	Informative session. Well explained and good presentation.
Minumol jose	B.Sc. Physics III DC	Nice session
Vishnu V	B.Sc. Physics III DC	Good class

## Attendance

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Date: 13.03.2021**

**Time: 8.30 a.m. to 10.00 a.m**

### Session 17

Name	Batch	Feedback on Fundamentals of solar photovoltaics - session 5
Sivapriya S	B.Sc. Physics III DC	Good session
Jacob Reji	B.Sc. Physics III DC	very useful
Preedhi P P	B.Sc. Physics III DC	Interesting class.
Aleena KM	B.Sc. Physics III DC	Good sir
Miria Johnson	B.Sc. Physics III DC	Good
Akhil T R	B.Sc. Physics III DC	Present sir
Anitta Jose	B.Sc. Physics III DC	Nice session
Sivapriya S	B.Sc. Physics III DC	Good session
Parvathy Das	B.Sc. Physics III DC	Session was informative.
Seethalakshmi M	B.Sc. Physics III DC	Good
Malavika Smitha	B.Sc. Physics III DC	very helpful
Aryalakshmy A	B.Sc. Physics III DC	Nice class
Aparna Anil	B.Sc. Physics III DC	Knowledgeable session
Vysakh k kumar	B.Sc. Physics III DC	Good class
Divya P.S	B.Sc. Physics III DC	Superb
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class
Prathibha P P	B.Sc. Physics III DC	Interesting session.
Naveena R Thomas	B.Sc. Physics I DC	Understood all the topics.
Nandan M	B.Sc. Physics III DC	Present .

Immanuel Markose Paul	B.Sc. Physics III DC	Understood
Ardra Ajith	B.Sc. Physics III DC	Very nice presentation.
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Arya K N	B.Sc. Physics III DC	Good
Shijina Shanavas	B.Sc. Physics III DC	Good session .
Riya S Sam	B.Sc. Physics I DC	All the topics were clearly explained.
Ruth Susan Koshy	B.Sc. Physics III DC	Good class
Minumol jose	B.Sc. Physics III DC	Good
JESSIN JOY ALEX	B.Sc. Physics III DC	Good
Anitta Jose	B.Sc. Physics III DC	Class was Clear
Parvathy S	B.Sc. Physics III DC	Good lecture
Tona Elisa Scaria	B.Sc. Physics III DC	Good

## Attendance

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Date: 15.03.2021**

**Time: 4.30 p.m. to 6.00 p.m.**

### Session 18

Name	Batch	Feedback
Sivapriya S	B.Sc. Physics III DC	Good session
Jessin Joy Alex	B.Sc. Physics III DC	Good
Seethalakshmi M	B.Sc. Physics III DC	Good
Aparna Anil	B.Sc. Physics III DC	Very good session
Tona Elisa Scaria	B.Sc. Physics III DC	Good session
Naveena R Thomas	B.Sc. Physics I DC	Understood the topics taught in this session.
Miria Johnson	B.Sc. Physics III DC	Good
MALAVIKA SMITHA	B.Sc. Physics III DC	clear
Vysakh k kumar	B.Sc. Physics III DC	Very Good session
Vysakh k kumar	B.Sc. Physics III DC	Very good session
Abhishikth Joseph Anand	B.Sc. Physics III DC	Sir,Recapping of earlier class topics was good .
Rishika Ajay	B.Sc. Physics III DC	Good session
Parvathy S	B.Sc. Physics III DC	Good class
Ruth Susan Koshy	B.Sc. Physics III DC	Good class
Anitta Jose	B.Sc. Physics III DC	Clear
Anjaly Krishna S	B.Sc. Physics III DC	It was good
Prathibha P P	B.Sc. Physics III DC	Class was understandable
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Akhil T R	B.Sc. Physics III DC	Present sir
Jacob Reji	B.Sc. Physics III DC	No feedback

A Sreejith	B.Sc. Physics III DC	Good
Preedhi P P	B.Sc. Physics III DC	Nice class.
Devi Vrinda A	B.Sc. Physics III DC	Good
Aryalakshmy A	B.Sc. Physics III DC	Easy to understand
Minumol Jose	B.Sc. Physics III DC	Good
Immanuel Markose Paul	B.Sc. Physics III DC	Good
Aleena KM	B.Sc. Physics III DC	Good
Sivakami N Shibu	B.Sc. Physics I DC	Informative session
Divya P S	B.Sc. Physics III DC	Good sir
Ardra Ajith	B.Sc. Physics III DC	Very nice session and thank you sir for recalling the previous topics.
Vishnu V	B.Sc. Physics III DC	Good one..
Arya K N	B.Sc. Physics III DC	Good
Riya S Sam	B.Sc. Physics I DC	Carrier Transport and Drift current are well explained. The slides helps to understand more about the topic
Anitta Jose	B.Sc. Physics III DC	Clear
Vivek Vijay	B.Sc. Physics III DC	Good class
Nandan M	B.Sc. Physics III DC	The class was excellent as always .
Aryalakshmy A	B.Sc. Physics III DC	Interesting class

**Attendance:**

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Session 5**

**Date: 01.03.2021**

**Time: 5.30 p.m to 7.00 p.m**

Name	Batch	Feedback on Fundamentals of solar photovoltaics - session 5
Sivapriya S	B.Sc. Physics III DC	Good session
Jacob Reji	B.Sc. Physics III DC	.
Preedhi P P	B.Sc. Physics III DC	Interesting class.
Aleena KM	B.Sc. Physics III DC	Good sir
Miria Johnson	B.Sc. Physics III DC	Good
Akhil T R	B.Sc. Physics III DC	Present sir
Anitta Jose	B.Sc. Physics III DC	Class was clear
Sivapriya S	B.Sc. Physics III DC	Good session
Parvathy Das	B.Sc. Physics III DC	Session was informative.
Seethalakshmi M	B.Sc. Physics III DC	Good
Malavika Smitha	B.Sc. Physics III DC	Sir slides also, please post it
Aryalakshmy A	B.Sc. Physics III DC	Nice class

Aparna Anil	B.Sc. Physics III DC	Knowledgeable session
Vysakh k kumar	B.Sc. Physics III DC	Good class
Divya P.S	B.Sc. Physics III DC	Superb
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class
Prathibha P P	B.Sc. Physics III DC	Interesting session.
Naveena R Thomas	B.Sc. Physics I DC	Understood all the topics.
Nandan M	B.Sc. Physics III DC	Present .
Immanuel Markose Paul	B.Sc. Physics III DC	Understood
ArdraAjith	B.Sc. Physics III DC	Very nice session, but it would be better if the slides are shown along with the lecture like it was done earlier.....
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Arya K N	B.Sc. Physics III DC	Good
ShijinaShanavas	B.Sc. Physics III DC	Good session .
Riya S Sam	B.Sc. Physics I DC	The class about recombination of carriers in solar cells was superb. All the topics were clearly explained.
Ruth Susan Koshy	B.Sc. Physics III DC	Good class
Minumoljose	B.Sc. Physics III DC	Good
JESSIN JOY ALEX	B.Sc. Physics III DC	Good
Anitta Jose	B.Sc. Physics III DC	Class was Clear



Parvathy S	B.Sc. Physics III DC	Good lecture
Tona Elisa Scaria	B.Sc. Physics III DC	Good

**Attendance:**

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Date:02.03.2021**

**Time: 8.30 a.m to 10.00 a.m.**

**Session 6**

Name	Batch	Feedback
Sivapriya S	B.Sc. Physics III DC	Good session
Jessin Joy Alex	B.Sc. Physics III DC	Good
Seethalakdhmi M	B.Sc. Physics III DC	Good
Aparna Anil	B.Sc. Physics III DC	Very good sesssion
Tona Elisa Scaria	B.Sc. Physics III DC	Good session
Naveena R Thomas	B.Sc. Physics I DC	Understood the topics taught in this session.
Miria Johnson	B.Sc. Physics III DC	Good
MALAVIKA SMITHA	B.Sc. Physics III DC	clear
Vysakh k kumar	B.Sc. Physics III DC	Very Good session
Vysakh k kumar	B.Sc. Physics III DC	Very good session
Abhishikth Joseph Anand	B.Sc. Physics III DC	Sir,Recapping of earlier class topics was good .
Rishika Ajay	B.Sc. Physics III DC	Good session
Parvathy S	B.Sc. Physics III DC	Good class

Ruth Susan Koshy	B.Sc. Physics III DC	Good class
Anitta Jose	B.Sc. Physics III DC	Clear
Anjaly Krishna S	B.Sc. Physics III DC	It was good
Prathibha P P	B.Sc. Physics III DC	Class was understandable
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Akhil T R	B.Sc. Physics III DC	Present sir
Jacob Reji	B.Sc. Physics III DC	No feedback
A Sreejith	B.Sc. Physics III DC	Good
Preedhi P P	B.Sc. Physics III DC	Nice class.
Devi Vrinda A	B.Sc. Physics III DC	Good
Aryalakshmy A	B.Sc. Physics III DC	Easy to understand
Minumol Jose	B.Sc. Physics III DC	Good
Immanuel Markose Paul	B.Sc. Physics III DC	Good
Aleena KM	B.Sc. Physics III DC	Good
Sivakami N Shibu	B.Sc. Physics I DC	Informative session
Divya P S	B.Sc. Physics III DC	Good sir
ArdraAjith	B.Sc. Physics III DC	Very nice session and thank you sir for recalling the previous topics.

Vishnu V	B.Sc. Physics III DC	Good one..
Arya K N	B.Sc. Physics III DC	Good
Riya S Sam	B.Sc. Physics I DC	Carrier Transport and Drift current are well explained. The slides helps to understand more about the topic
Anitta Jose	B.Sc. Physics III DC	Clear
Vivek Vijay	B.Sc. Physics III DC	Good class
Nandan M	B.Sc. Physics III DC	The class was excellent as always .
Aryalakshmy A	B.Sc. Physics III DC	Interesting class

**Attendance:**

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Date: 03.03.2021**

**Time: 5.30 p.m to 7.00 p.m.**

**Session 7**

Name	Batch	Feedback
Sivapriya S	B.Sc. Physics III DC	Good session
Vysakh k kumar	B.Sc. Physics III DC	Good class
Shijinashanavas	B.Sc. Physics III DC	Very good session.understanding new terms.thankyou sir.
Rishika Ajay	B.Sc. Physics III DC	Good session
A Sreejith	B.Sc. Physics III DC	Good
MalavikaSmitha	B.Sc. Physics III DC	Clear
Aryalakshmy A	B.Sc. Physics III DC	Nice session
Anitta Jose	B.Sc. Physics III DC	Class was clear
Parvathy Das	B.Sc. Physics III DC	Session was informative.
Aleena KM	B.Sc. Physics III DC	Good sir
Vysakh k kumar	B.Sc. Physics III DC	Good class
Arya K N	B.Sc. Physics III DC	Good
Miria Johnson	B.Sc. Physics III DC	Good

Parvathy S	B.Sc. Physics III DC	Good lecture
ArdraAjith	B.Sc. Physics III DC	It was an interesting session.
Preedhi P P	B.Sc. Physics III DC	Interesting class
Nandan M	B.Sc. Physics III DC	Present
Divya P.S	B.Sc. Physics III DC	Very good
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class
Seethalakshmi M	B.Sc. Physics III DC	Good
Naveena R Thomas	B.Sc. Physics I DC	Understood the topics taught today.
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Immanuel Markose Paul	B.Sc. Physics III DC	Good
Devi Vrinda	B.Sc. Physics III DC	Good
Prathibha P P	B.Sc. Physics III DC	Good class
Ruth Susan Koshy	B.Sc. Physics III DC	Good class
Akhil T R	B.Sc. Physics III DC	Present sir
Tona Elisa Scaria	B.Sc. Physics III DC	Good class
Riya S Sam	B.Sc. Physics I DC	The class was superb. Well explained the topics with good presentation.
Vivekvijay	B.Sc. Physics III DC	Nice class

Minumoljose	B.Sc. Physics III DC	Good
Jessin Joy Alex	B.Sc. Physics III DC	Good
Sandriya Raju	B.Sc. Physics I DC	Session helps in knowledge enhancement.
Aparna Anil	B.Sc. Physics III DC	Understanding session
Anjaly Krishna S	B.Sc. Physics III DC	It was good and informative

**Attendance:**

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Date: 04.03.2021**

**Time: 5.30 p.m to 7.00 p.m**

**Session 8**

Name	Batch	Feedback
ARYA K N	B.Sc. Physics III DC	Very well explained
Vysakh k Kumar	B.Sc. Physics III DC	Good
A Sreejith	B.Sc. Physics III DC	Good
Jacob Reji	B.Sc. Physics III DC	.
Naveena R Thomas	B.Sc. Physics I DC	Nice class.
Miria Johnson	B.Sc. Physics III DC	Good
Aleena KM	B.Sc. Physics III DC	Good sir
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class
Aryalakshmy A	B.Sc. Physics III DC	Nice class
Anitta Jose	B.Sc. Physics III DC	Class was clear
Sivapriya S	B.Sc. Physics III DC	Good session
Seethalakshmi M	B.Sc. Physics III DC	Good



Akhil T R	B.Sc. Physics III DC	Thankyou sir
Divya P S	B.Sc. Physics III DC	Good
Preedhi P P	B.Sc. Physics III DC	Nice class
ArdraAjith	B.Sc. Physics III DC	The session was very informative. Animations make the topics more clear.
Tona Elisa Scaria	B.Sc. Physics III DC	Good session
Prathibha P P	B.Sc. Physics III DC	Interesting class
Aparna Anil	B.Sc. Physics III DC	Very good sesssion
Vishnu V	B.Sc. Physics III DC	Good one
Rishika Ajay	B.Sc. Physics III DC	Good session
ShijinaShanavas	B.Sc. Physics III DC	Very good session. Thankyou sir
Anjaly Krishna S	B.Sc. Physics III DC	Informative
Ruth Susan Koshy	B.Sc. Physics III DC	Good class
Parvathy S	B.Sc. Physics III DC	Good class
Sivakami N Shibu	B.Sc. Physics I DC	Informative
Riya S Sam	B.Sc. Physics I DC	Awesome session. Good sound quality
Nandan M	B.Sc. Physics III DC	good

**Attendance:**

DBT Star college scheme sponsored credit based programme on “**Fundamentals of solar photovoltaics**”

**Date: 05.03.2021**

**Time: 8.30 a.m to 10.00 a.m.**

**Session 9**

Name	Batch	Feedback
Akhil T R	B.Sc. Physics III DC	Presenr sir
Sivapriya S	B.Sc. Physics III DC	Good session
Miria Johnson	B.Sc. Physics III DC	Good
Vysakh k kumar	B.Sc. Physics III DC	Good session
Prathibha P P	B.Sc. Physics III DC	Class was understandable
Parvathy S	B.Sc. Physics III DC	Good lecture
Aparna Anil	B.Sc. Physics III DC	Very good sesssion
Riya S Sam	B.Sc. Physics I DC	The session of pn junction under illumination was interesting. Good presentation. Got a lot of new information regarding solar cells. Understood the current voltage characteristics also.
Aryalakshmy A	B.Sc. Physics III DC	Nice class
Naveena R Thomas	B.Sc. Physics I DC	Understood the topics taught in the class.
Anitta Jose	B.Sc. Physics III DC	Class was clear
Preedhi P P	B.Sc. Physics III DC	Nice class

Immanuel Markose Paul	B.Sc. Physics III DC	Good
Jacob Reji	B.Sc. Physics III DC	Good class
Nishy Mary Mathew	B.Sc. Physics III DC	Good
Sivakami N Shibu	B.Sc. Physics I DC	Informative
MalavikaSmitha	B.Sc. Physics III DC	Clear. Could you please post last class slides .
Divya P S	B.Sc. Physics III DC	Sir, Could u plse share the ppt to cls room
ArdraAjith	B.Sc. Physics III DC	The session was very informative and interesting.
Abhishikth Joseph Anand	B.Sc. Physics III DC	Good class
Jessin Joy Alex	B.Sc. Physics III DC	Good
Aleena KM	B.Sc. Physics III DC	Good
Seethalakshmi M	B.Sc. Physics III DC	Good
Nandan M	B.Sc. Physics III DC	good





**Department of Physics  
CMS College Kottayam**

**Report Of Value Added Course**

**Fundamentals of Solar Photo Voltaics**

**Introduction**

The Department of Physics, CMS College kottayam conducted an Add On Course on “Fundamentals of Solar Photo Voltaics” from 25<sup>th</sup> February 2021 to 21st March 2021.

**Objective**

- The prospects and limitations of non-renewable and renewable energy supplies, as well as the significance of solar energy in terms of human and natural aspects of the environment.
- Acquire conceptual knowledge about solar energy harvesting, especially solar cells
- Know the fundamental principle that underline the working of solar cells – from materials to technologies
- Able to identify the material properties for choosing materials for solar cell applications
- Capability to access a solar cell based on various aspects that determine solar cell performance

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**Method**

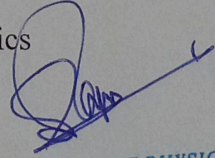
The course was imparted through lectures and practical lab sessions (36 hours). Several sessions are arranged based on designing, processing, development of solar cells. Hands on session was also arranged.

**Result**

The course provided an opportunity for students to understand the fundamentals of solar photovoltaics in our day-to-day life.

**Course Coordinator:** Dr. Jeya P, Assistant Professor, Department of Physics



  
HEAD OF THE DEPARTMENT OF PHYSICS  
C.M.S. COLLEGE, KOTTAYAM  
KERALA, INDIA