School of Studies in Electronics & Photonics

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Photonics research laboratory @ PRSU state that a Solar-Based Photonics Research Lab focuses on studying and developing materials, devices, and systems that leverage solar energy and photonic technologies. This kind of research lab typically explores how light (photons) can be harnessed, manipulated, and utilized in various ways, with solar energy as the primary source. The aim is to improve solar energy efficiency, reduce costs, and create new technologies for sustainable energy solutions.

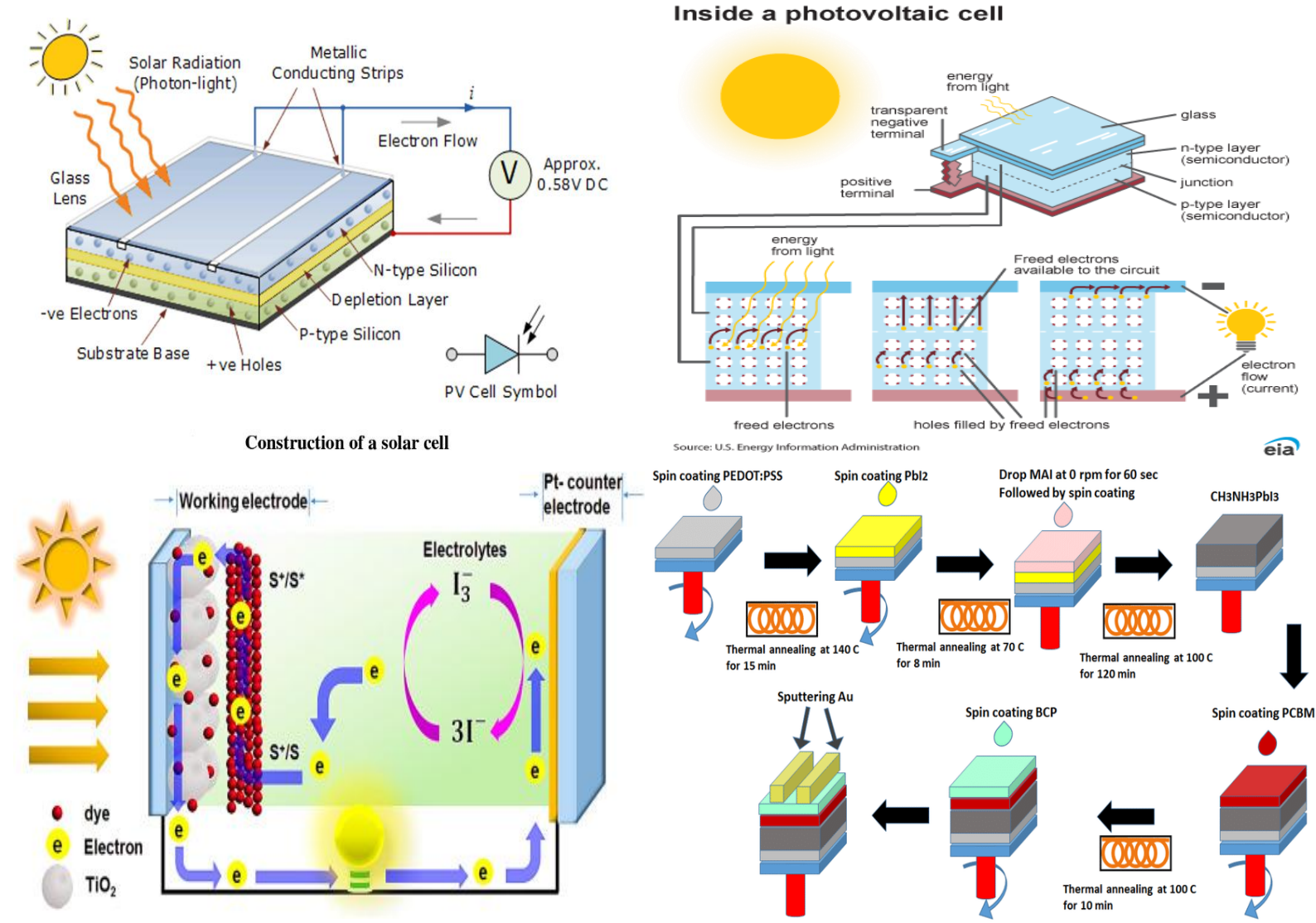


Figure: Construction & Making Process of Perovskite Solar Cell & Dye-Sensitized Solar Cell.

Research Area

- **Speech & Image Signal Processing, Digital Filter Design, Micro-controller Based System Design**

- **Computational Condensed Matter Physics, Design & Simulation of Solar Cells, Organic & Polymer LEDs**

Photonics Research Laboratory

Department of S.o.S. in Electronics & Photonics

1.Ellipsometer

An **ellipsometer** is a scientific instrument used to measure the **thickness** and **optical properties** (like refractive index and extinction coefficient) of thin films on surfaces. It works by analysing how **polarized light** changes when it reflects off a material.

2.UV-VIS-NIR Spectrometer

A **UV-VIS-NIR spectrometer** is an analytical instrument used to measure
the **absorbance** or **transmittance** of light in **ultraviolet (UV)** and **Visible (VIS)** regions and Near Infra red (**NIR**) of the electromagnetic spectrum (typically 200–800 nm).
It helps identify and quantify substances based on how they absorb light at specific wavelengths. UV VIS spectroscopy is commonly used in **chemistry**, **biology**, **environmental science**, and **material analysis** for studying the concentration and properties of compounds.

3.Quantum Efficiency and VI Measurement System

Quantum Efficiency (QE): Quantum Efficiency refers to the effectiveness of a photodetector (like a solar cell or photodiode) in converting incident photons into electrical charge. It is express A **Dip Coating Unit** is a device used to apply thin and uniform coatings onto a substrate by **immersing it into a solution** and then **withdrawing it at a controlled speed**. As the substrate is pulled out, a thin layer of the coating material adheres to its surface and dries.

This method is simple, cost-effective, and widely used in **nanotechnology**, **optics**, and **material science** for producing **thin films**, **protective coatings**, or **functional layers** on glass, metal, or other materials.

d as a percentage and indicates how many electrons are generated per incoming photon. Higher QE means better light-to-electricity conversion.

V-I Characteristics:
V-I (Voltage-Current) Characteristics describe how the current through a device varies with applied voltage. It provides essential information about the electrical behaviour of components like diodes, transistors, and solar cells, helping to understand performance, resistance, threshold voltage, and power output.

4.Dip Coating Unit

A **Dip Coating Unit** is a device used to apply thin and uniform coatings onto a substrate by **immersing it into a solution** and then withdrawing **it at a controlled speed**. As the substrate is pulled out, a thin layer of the coating material adheres to its surface and dries.

5.Spin Coating Unit

A **Spin Coating Unit** is a device used to create **uniform thin films** on flat substrates by depositing a liquid solution and spinning the substrate at high speed. The centrifugal force spreads the liquid evenly, and the solvent evaporates, leaving behind a thin, consistent coating.

6.SILAR Controller

A **SILAR Controller** (Successive Ionic Layer Adsorption and Reaction) is a device used to deposit **thin films** on substrates through a step-by-step chemical process. In SILAR, the substrate is alternately dipped into cationic and anionic solutions, with rinsing steps in between, allowing controlled layer-by-layer film growth.

7.Vacuum Coating

Vacuum Coating is a technique used to deposit thin films onto surfaces within a **vacuum chamber**. Materials are evaporated or sputtered in a low-pressure environment and then condensed onto the substrate, forming a uniform coating.

This method provides **high-purity**, **adhesion**, and **control over thickness**, making it widely used in **optics**, **electronics**, **solar cells**, and **decorative coatings**. Common types include **thermal evaporation**, **sputtering**, and **chemical vapour deposition (CVD)**.

8.Spray Pyrolysis

Spray Pyrolysis is a **simple and cost-effective** technique used to deposit thin films by spraying a solution containing precursor chemicals onto a **heated substrate**. The heat causes the sprayed droplets to undergo **thermal decomposition**, forming a thin, uniform film.

This method is commonly used in **solar cells**, **gas sensors**, and **optical coatings** due to its ease of use, scalability, and ability to produce **nanostructured materials** with good adhesion and coverage.

SIGNAL PROCESSING LABORATORY

BIOPAC Student Lab (BSL)

The **BIOPAC Student Lab (BSL)** is a teaching system widely used in academic institutions for **life science education**. It integrates hardware and software to help students **record, analyze, and interpret physiological data** in real-time. The electrical activity associated with our various body parts such as muscles, Brain, Heart, eyes etc. can be recorded and analyze.

Fig. BIOPAC Student Lab (BSL)

Applications of BIOPAC in ECG (Electrocardiography): **ECG** measures the electrical activity of the heart for **Heart Rate & Rhythm Monitoring, Effect of Breathing on Heart Rate (RSA), Cardiovascular Fitness Assessments,**

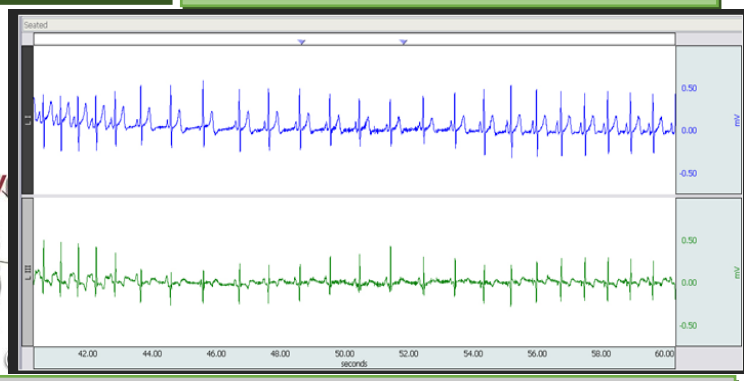
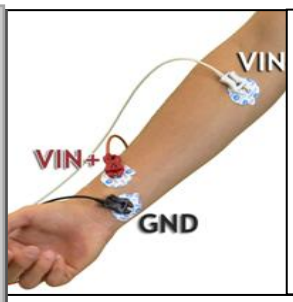


Fig. BIOPAC Student Lab (BSL) for ECG

Application of BIOPAC in EEG (Electroencephalography) : EEG records electrical activity of the brain for **Brain Wave Analysis, Sleep Studies, Cognitive**

Fig. BIOPAC Student Lab (BSL) for EEG

Application of BIOPAC in EMG (Electromyography): **EMG** measures the electrical activity of muscles for **Muscle Fatigue Studies, Motor Unit Recruitment,**



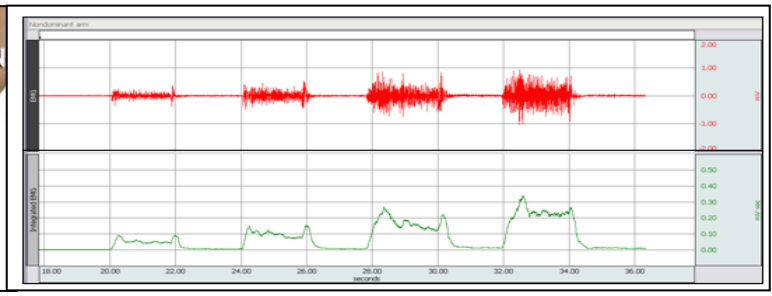
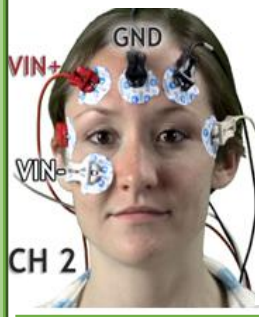


Fig. BIOPAC Student Lab (BSL) for EMG

Applications of BIOPAC in EOG (Electrooculography): **EOG** measures eye movement based on corneo-retinal potentials for **Eye Movement Tracking, Saccadic & Smooth Pursuit Movements, Blink Detection, Attention Studies etc.**



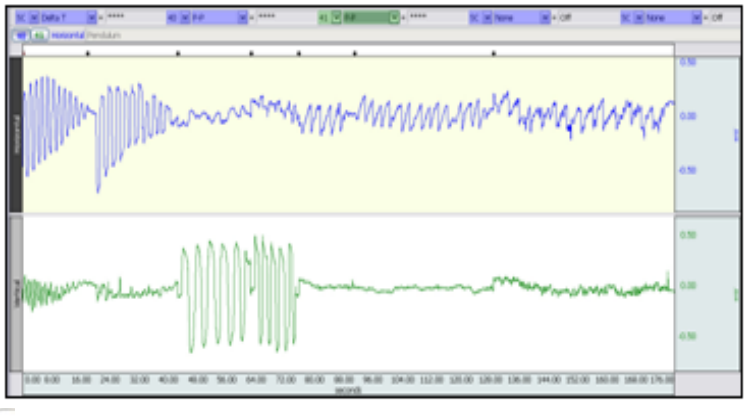


Fig. BIOPAC Student Lab (BSL) for EOG

SIGNAL PROCESSING LABORATORY

Fig. MSP430 Starter Kit

MSP430 Starter Kit

The **Cranes MSP430 Starter Kit** is a development board designed to help students, researchers and embedded system developers to get started with **Texas Instruments' MSP430 microcontrollers.** It is 16-bit RISC microcontrollers having inbuilt Sensors and peripherals providing user friendly environment. Various applications such as Battery-operated systems (watches, sensors, remote controls), Sensor-Based Projects for Temperature, light, motion monitoring, Home Automation, IoT Projects, Robotics and Data Acquisition Systems can be designed.

TMS320C6713 DSK (Digital Signal Processing Starter Kit)

The **TMS320C6713 DSK (Digital Signal Processing Starter Kit)** is a development board based on **Texas Instruments' TMS320C6713 DSP (32-bit floating point DSP)**, 16 MB SDRAM, Audio Codec along with USB & JTAG Interfaces & can be used using MATLAB/ Simulink software tools. Applications such as **Audio Processing, Speech Processing, Image Processing (Basic), Biomedical Signal Processing, Control Systems designing, Communication Systems designing can be implemented.**

Fig. TMS320C6713 DSK

Fig. Spectrum Analyzer

Spectrum Analyzer

The Rigol DSA1030 is a spectrum analyzer that is extensively utilized in radio frequency (RF) testing, electromagnetic interference (EMI) diagnostics, and wireless communication applications and can be used for repair and maintenance of electronic circuits.