

Renewable Energy Resources (RES)



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Names of laboratory works /solar, wind, energy saving/

1. Measurements of the intensity of direct, diffuse, total solar radiation on a horizontal on horizontal and tilted surfaces using pyrometer.
2. Measurement of solar PV panel and PV elements characteristics (U_{oc} , I_{sc} , R , U_w , I_w illuminated by solar radiation (Yerevan, near Cascade steps).
3. Measurement of solar panel performance under artificial (laboratory) conditions using incandescent, halogen, LED and other types of lamps (solar simulator).
4. .Dependence of current and voltage on solar panel temperature. The dependence curve of solar panel power on radiation intensity.
5. The spectrum of the incandescent lamp and other types of lamps and their effect on measurements.
6. Measurements of current, voltage, shading effect, cooling effect, role of diodes including Shotky diodes for Solar PV panels connected in series and parallel.
7. Stabilizing and increasing the voltage from the solar PV panel with the help of a DC-DC booster convertesr.
8. Solar panel cooling with fans to increase panel capacity.
9. Using the solar PV panel to power the Arduino controller and charge the 3.7V lithium ion battery.

11. Work with microcontrollers /Arduino, LM 317, NE 555, TL 431 etc, breadboard, simple charging schemes with Li-ion batteries.
12. Sun tracker with solar PV panel.
13. Study of the performance of a solar thermal water heater (on the picture- part of a solar water heater). Estimating the reflectance and absorption coefficient of solar water heater glass. Estimation of pipe surface absorption coefficient.
14. Determine the characteristics of the air flows from the fan: the speed and power in the direction of the X, Y, Z axes, the drop in the power of the flow from the distance between the fan and the research point, the frequency of rotation of the fan blades.
15. Powering the fan from the solar panel, study of parameters/indicators.
16. Measurement of the voltage and current generated by the DC motor connected with vents affected by the air flow from the ventilator.
17. Study of the effect of air flows on fans with DC motors.
18. A small model of a vertical axis wind farm.
19. Energy saving: Checking the ventilation system /flow rate measurement/. Measurement of device capacities and consumed electricity.
20. Performance study of a 1 KW stand-alone and grid-connected PV plant

Literature

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2. Ռ. Ս. ԽԱՐԱԶՅԱՆ, տեխ.գ.թ. / Վերականգնվող էներգիայի աղբյուրներ և տեխնոլոգիաներ - Եր.: Ասողիկ, 2012թ., 279 էջ:
3. Дж.А. Даффи, У.А. Бекман, “Тепловые процессы с использованием солнечной энергии”, Издательство “Мир”, Москва, 1977, 420 с.
4. Твайделл Дж, Уэйр А. Возобновляемые источники энергии: - М.:Энергоатомиздат. 1990.-392 с.:ил.
5. Sargsyan A. Assessment of Renewable Energy Potential in Armenia (2017 Update).Yerevan, Lusabats Publishing House, 2017-29p.
6. Ինտերնետ ռեսուրսներ
7. <https://www.ecoteam-Armenia.org>

Instruments

Solar part:

Handy pyranometer, 2 multimeters, pyrometer (infrared thermometer), bank of resistances, 1 wattmeter, Solar simulator (or incandescent lamps with distance regulation), Spectrophotometer, thermometer, air pressure meter

Wind part: handy anemometer (wind velocities meter), digital tachometer, DC motors with vints, 2 multimeters, water air blower with capacity up to 15 meters/sec

For solar collector:

Lasers, IMO2 power measurement device, step motors etc

For Electronics part: microcontrollers; Arduino UNO, MEGA, LM 317, NE 555, TL 431 etc, breadboard, simple charging schemes with Li-ion batteries.

For Lab. Works NN 9, 10, 12, 18, 20 equipment should be bought totally, for other works – partly.





