אוניברסיטת בן-גוריון בנגב

# Topics in solar energy (001-2-4058)

# 3 credits

**Teacher**: Avi Niv, aviniv@bgu.ac.il, Room 014, Building 26 (solar energy)

**Outline**: Sunlight is characterized by its spectrum, angle, spatial dispersion, seasonal and geographical changes, and more. All these factors must be considered for a successful utilization of sunlight for illumination, heat, electricity, or any other form of power. In this introductory course we will study the different aspects that defines sunlight as a power source and the models that are used for its quantification.

**Objectives** - The course aims to familiarize a student with the following topics:

- Sun-Earth geometry
- Solar spectrum and atmospheric transmittance
- Basics of solar power conversion

**Prerequisites**: Undergraduate Math and Physics

**Grading**: 25% homework, 75% final assignment

**Schedule**:

| Topic | Meeting | Covered matters |
|---|---|---|
| Sun-earth geometry | 1-2 | Sun-earth geometry, incident angles, tracking |
| The solar spectrum | 3-4 | Black body radiation and its relevance to solar applications, air-mass and atmospheric transmission |
| Optics of concentrators | 5-6 | Overview of solar concentrators, conservation of etendue, and the fundamental concentration bound |
| Solar thermal power conversion | 7-8 | The operational principle of solar thermal systems |
| Introduction to the PV effect | 9-10 | The diode model of a solar cell, the effect of spectrum, temperature, and light capture |
| Models and statistics of solar radiation | 11-13 | Statistical models of solar radiation |

**Recommended Books:**

1. A. Rabl, Active Solar Collectors and Their Applications, Oxford Univ. press, 1985. (Textbook, TJ 812.R33; 4 copies in the library available for three days)
2. J. A. Duffie, and W. A. Beckmann, Solar Engineering of Thermal Processes, John Wiley, 2006 3rd ed. (TJ 810.D82 - first ed.)
3. J. F. Kreider and F. Kreith, Solar Energy Handbook, McGraw-Hill, 1981.(TJ 810.S6244)
4. D.Y. Goswami, F. Kreith, and J. F. Kreider, Principles of Solar Engineering, Taylor and Francis, 1999.
5. J.M. Gordon, Editor, Solar Energy – The State of The Art, James & James, 2001.
6. J. C. Chen, The Physics of Solar Energy, Wiley, 2011.


אוניברסיטת
בן-גוריון בנגב