

SOLAR ENERGY ENGINEERING AND TECHNOLOGY

PROF. PANKAJ KALITA

Department of energy science and engineering
IIT Guwahati

TYPE OF COURSE : New | Elective | UG/PG

COURSE DURATION : 12 weeks (20 Jul' 20 - 9 Oct' 20)

EXAM DATE : 17 Oct 2020

PRE-REQUISITES : Basic knowledge of heat transfer, thermodynamics and fundamentals of physics

INTENDED AUDIENCE : UG, PG and Doctorate students

INDUSTRIES APPLICABLE TO : This course will be very much effective for the engineers working in the solar industries.

COURSE OUTLINE :

The course content is designed to provide comprehensive knowledge on solar radiation, analysis of solar radiation data, fundamentals of the solar thermal and photovoltaic system along with storage of energy required for effective design of efficient solar energy conversion devices. The concepts will be illustrated with practical examples, schematics and block diagrams wherever required. A sufficient number of numerical problems with solutions will be discussed in the course. This course is specifically designed for undergraduate and postgraduate students of Energy Engineering and Technology. Further, the course will be very much useful for students and researchers from varied academic backgrounds for the synthesis of novel energy conversion devices and processes.

ABOUT INSTRUCTOR :

Prof. Pankaj Kalita is Assistant Professor in the Centre for Energy, Indian Institute of Technology Guwahati. He has more than 4 years of teaching and 10 years of research experience in the field of renewable energy (solar energy, thermochemical and biochemical conversion of biomass and energy storage). He has published 19 research papers in various reputed journals.

COURSE PLAN :

- Week 1:** Energy Scenario, overview of solar energy conversion devices and applications, physics of propagation of solar radiation from the sun to earth
- Week 2:** Sun-Earth Geometry, Extra-Terrestrial and Terrestrial Radiation, Solar energy measuring instruments
- Week 3:** Estimation of solar radiation under different climatic conditions, Estimation of total radiation
- Week 4:** Fundamentals of solar PV cells, principles and performance analysis, modules, arrays, theoretical maximum power generation from PV cells
- Week 5:** PV standalone system components, Standalone PV-system design.
- Week 6:** Components of grid-connected PV system, solar power plant design and performance analysis.
- Week 7:** Fundamentals of solar collectors, Snails law, Bougers law, Physical significance of Transmissivity - absorptivity product.
- Week 8:** Performance analysis of Liquid flat plate collectors and testing
- Week 9:** Performance analysis of Solar Air heaters and testing
- Week 10:** Solar thermal power generation (Solar concentrators).
- Week 11:** Thermal Energy Storage (sensible, latent and thermochemical) and solar pond
- Week 12:** Applications: Solar Refrigeration, Passive architecture, solar distillation, and emerging technologies.