



# RENEWABLE ENERGY ENGINEERING: SOLAR, WIND AND BIOMASS ENERGY SYSTEMS

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**INTENDED AUDIENCE :** The target audience for this course is

1. B.Tech/M.Tech/PhD students or faculties interested in acquiring knowledge of solar, wind and biomass renewable energy systems
2. Chemical engineer/Mechanical engineer or Biosciences and Bioengineer designing renewable energy systems such as solar, wind and biomass systems
3. Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories working in the area of energy engineering.

**INDUSTRIES APPLICABLE TO :** All Energy Industries and Energy Equipment Manufacturing Industries

## **COURSE OUTLINE :**

In this course an attempt has been made to standardize the course material and to emphasize on the fundamental of non-conventional energy sources (solar, wind, and biomass). Harnessing the energy through these sources using efficient technologies is expected to play an important role in serving as clean energy source for mankind. Thus, processes to harness energy are steadily gaining technical and economic importance worldwide. Therefore, it is necessary for energy planners/ users to know the facts as well as limitations of these technologies. This course aims at bringing the technological developments and research trends in the field of non-conventional energy sources with emphasis on engineering and design aspects. After attending this course students will have insight of biomass types, classifications, selective utilization of biomass resource for extraction of energy, bio-digester, wind machine and thermo-digester design.

## **ABOUT INSTRUCTOR :**

Prof. R. Anandalakshmi is an Associate Professor in the Department of Chemical Engineering, Indian Institute of Technology, Guwahati. Her research interests are in the area of Computational Heat Transfer and Fluid Flow, Process Modeling and Simulation, Solar Thermal Energy Conversion, Energy Efficient Design of Thermal Systems, Microwave Assisted Food and Material Processing, Food Packaging and Preservation, Refrigeration and Air-conditioning Systems

Prof. Vaibhav V. Goud is Professor in the Department of Chemical Engineering, Indian Institute of Technology Guwahati, India since 2018. Principal research interests of Dr. Goud are in the fields of reaction engineering, renewable energy, supercritical fluids, bio lubricants. He has published more than 120 papers in international peer reviewed journals and made presentations of his research in several national/ international conferences. He has also written 14 book chapters in the area of renewable energy. He has taught energy resources as an elective course to UG, PG and Ph.D. students at IIT Guwahati for six consecutive years (2014, 2015, 2016, 2017, 2018 and 2019).

## **COURSE PLAN :**

**Week 1:** Solar Energy: Basics and Concepts

**Week 2:** Non-Concentrating Solar Collectors

**Week 3:** Non-Concentrating Solar Collectors : Practice Problems

**Week 4:** Concentrating Solar Collectors

**Week 5:** Storage Systems

**Week 6:** Biomass types and characterization

**Week 7:** Biochemical conversion processes

**Week 8:** Biochemical conversion processes (Contd.)

**Week 9:** Bioconversion of substrates into alcohol and thermo-chemical conversion of biomass

**Week 10:** Bioconversion of substrates into alcohol and thermo-chemical conversion of biomass (Contd.)

**Week 11:** Wind Energy: Basics: Turbine terms, types and theories

**Week 12:** Characteristics and Power Generation from Wind Energy