

AGPC3003 FUNDAMENTALS OF RENEWABLE ENERGY (3-0-0)

Course objectives :

To provide students with a comprehensive understanding of renewable energy sources (RES), including solar, wind, and bio-energy systems. The course covers principles, technologies, and applications of RES, compares them with non-renewable sources, and equips learners with skills to analyze, design, and evaluate renewable energy solutions for sustainable development.

Module-I

Concept and limitation of Renewable Energy Sources (RES), Criteria for assessing the potential of RES, Classification of RES: Solar, Wind, Geothermal, Biomass, Ocean energy sources, Comparison of renewable energy sources with non-renewable sources.

Module-II

Solar Energy: Energy available from Sun, Solar radiation data, solar energy conversion into heat through Flat plate and Concentrating collectors, different solar thermal devices, Principle of natural and forced convection solar drying system, Solar Photo voltaics: basics and applications, p-n junctions. Solar cells, PV systems, stand alone, grid connected solar power station, Calculation of energy through photovoltaic power generation and cost economics.

Module-III

Wind Energy: Energy available from wind, general formula, Lift and drag. Basics of Wind energy conversion, Effect of density, Frequency variances, Angle of attack, Wind speed, Types of Windmill rotors, Determination of torque coefficient, Induction type generators, Working principle of wind power plant.

Module-IV

Bio-energy: properties of biomass and conversion technologies, Pyrolysis of Biomass to produce solid, liquid and gaseous fuels. Biomass gasification, Types of gasifier, various types of biomass cook stoves for rural energy needs. Biogas: basics of anaerobic digestion, types and constructional details of biogas plants, biogas generation and its properties, factors affecting biogas generation and usages, design consideration, advantages and disadvantages of biogas spent slurry.

Course Outcomes:

- CO1: Remember the classification, potential, and limitations of renewable energy sources (RES) like solar, wind, and biomass. (Knowledge)
- CO2: Explain the working principles of solar thermal devices, photovoltaic systems, and wind energy conversion technologies. (Comprehension)
- CO3: Apply formulas to calculate energy output from solar PV systems and wind turbines, considering cost economics. (Application)
- CO4: Analyze biomass conversion processes (e.g., gasification, pyrolysis) and factors affecting biogas generation. (Analysis)
- CO5: Design a basic renewable energy system (e.g., solar dryer, biogas plant) based on technical and environmental considerations. (Synthesis/Creation)