

## **Fundamentals of Renewable Energy Sources 3(2+1)**

### **Theory :-**

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. 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 drying system, Solar Photo voltaics: p-n junctions. Solar cells, PV systems, Stand alone, Grid connected solar power station, Calculation of energy through photovoltaic power generation and cost economics. Wind Energy: Energy available from wind, General formula, Lift and drag. Basis 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. Bio-energy: 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: types of biogas plants, biogas generation, factors affecting biogas generation and usages, design consideration, advantages and disadvantages of biogas spent slurry.

### **Practical :-**

Study of different types of solar cookers, solar water heating system, natural convection solar dryer, forced convection solar dryer, solar desalination unit, solar greenhouse for agriculture production, biogas plants, biomass gasifiers, biomass improved cook-stoves, solar photovoltaic system.

### **Suggested Readings :-**

Rai, G.D. 2013. Non-Conventional Energy Sources, Khanna Publishers, Delhi.

Rai, G.D., Solar Energy Utilization, Khanna Publishers, Delhi.

Khandelwal, K.C. & S. S. Mahdi. 1990. Biogas Technology- A Practical Handbook.

Rathore N. S., Kurchania A. K., Panwar N. L. 2007. Non Conventional Energy Sources, Himanshu Publications.

Tiwari, G.N. and Ghoshal, M.K. 2005. Renewable Energy Resources: Basic Principles and Applications. Narosa Pub. House. Delhi.