Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NFMC523	Alternate Energy Systems	3	1	0	4

Course Objective

The main aim of the course is to

- Introduce students about alternate energy systems, power productions from non-fossil fuel sources.

Learning Outcomes

At the end of the course student will

- Be able to understand various alternate energy options available in earth.
- Design power extraction systems from different non-fossil fuel sources.

Unit No.	Topics to be Covered	Lecture Hours	Tutorial Hours	Learning Outcome
1	Introduction to Indian power distribution system, role of different types energy sources in electricity grid, peak and minimum power demand cycle.	4	1	Students shall learn about Indian power distribution system.
2	Solar energy and Spectral Distribution, Sun Tracking, Heat Transfer for Solar Energy, Solar Energy Collection, Parabolic Trough, Central Receiver, Parabolic Dish, Solar thermal Power Plant, Flat Plate Solar collectors, Solar air heaters and their applications, Photovoltaic conversion, Solar cell, Storage of Solar energy, Solar ponds. Solar Thermal Power Plants.	8	3	Students shall learn about solar thermal energy conversion and utilization.
3	The photovoltaic cell, Module and Array, Equivalent Electrical Circuit, Open Circuit Voltage and Short Circuit Current, Array Design, Sun Intensity, Sun Angle, Shadow Effect, Temperature Effect, Effect of Climate, Electrical Load Matching, Sun Tracking, Peak Power Point Operation, PV System Components	5	1	Students shall learn about solar photovoltaic energy conversion and utilization.
4	Wind Speed and Power Relations, Power Extracted from the Wind, Rotor Swept Area, Air Density, Global Wind Patterns, Wind Speed Distribution. System Components, Tower, Turbine Blades, Yaw Control, Speed Control.	5	2	Students shall learn about the energy available in wind.
5	Tidal Energy, Hydro-power plants, geothermal energy	8	3	Students shall learn about different types of other energy sources
6	Biomass, biochar, biodiesel, bioethanol, biogas composition and yield etc. Biomass for industrial applications.	6	2	Students shall learn about energy from biomass and other biofuels.
7	Nuclear energy, Fuel cell.	6	2	Students shall learn about nuclear and fuel cell energy conversion and utilization.
Total		**42**	**14**	

Text Book:

1. D. P. Kothari, K. C. Singal and Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies 2nd Edition, PHI India.

Reference Books:

1. Wind and Solar Power Systems: Mukund R. Patel, CRC Press, London.
2. B. H. Khan, Non-conventional energy resources, McGraw Hill, New Delhi.
3. B.K.Hodge, Alternative Energy Systems and Applications, 2nd Edition, John Wiley & Sons, 2017.