## III B.Tech – I Semester

## (20EE5317) NUCLEAR, GEO-THERMAL & TIDAL ENERGIES

Int. Marks	Ext. Marks	<b>Total Marks</b>	L	Т	Р	С
30	70	100	3	-	-	3

### **Pre-Requisites:** Power Systems-I, Engineering Chemistry

#### **Course Objectives**

- Introduce the fundamental concepts of nuclear, geo-thermal and tidal energies
- Develop a thorough understanding of the key elements and principals of nuclear, geo-thermal and tidal energies for renewable power generation.
- Understand the structure, functions, policies and performance of nuclear, geothermal and tidal energies used for power generation

### **UNIT-I: Introduction to Nuclear Energy**

Over View on Nuclear power around the world, Nuclear Energy, electricity generation in nuclear power plants, Radioactive decay, Nuclear reaction, Thermal reactors, Fast reactors, Nuclear fuel cycle, Front end, Service period, Back end. Nuclear Reactors, Technologies being used around the world, New nuclear technology, Small modular reactors, Generation IV reactors

### **UNIT-II: Economics of Nuclear Power**

Costs of nuclear power, Economic competitiveness, Government Regulations and Incentives Safety Accidents history, Achieving safety, Sating, Industry organizations, International cooperation

#### **UNIT-III: Introduction to Geothermal Energy**

Working of a conventional geothermal reservoir, different ways in which geothermal energy can be used, and working of a geothermal power plant, current energy supply of geo-thermal in the entire world, Policies, and laws that govern and support Geo-Thermal development.

#### **UNIT-IV: Environmental Aspects and Economics of Geo-Thermal Energy**

Consideration of Geo-Thermal Energy as Renewable Energy Comparison of geothermal plants with fossil fuel-fired power plants, reduction of global warming with the help of geothermal energy, other environmental impacts with geothermal energy offset, land requirement for geothermal energy production require, consumption of water in geothermal plants, geothermal energy help in reducing health impacts and healthcare costs.

Some specific examples of ways in which geothermal energy has contributed to local economies, types of commUNITies that benefit most from geothermal development, hidden costs associated with energy development.

### **UNIT-V: Introduction to Tidal Energy**

Basic Science of Tides (Lunar Tidal Dynamics and Tidal Energy Logistics), Historical Aspects, New Technology from an Old Idea, Milling to Electricity, Evolution of Turbine Types (Water wheel Turbines) and Environmental Impacts

## **Course Outcomes:**

After successful completion of the course, the students will be able to:

S.No	Course Outcome					
1.	Demonstrate the impact of nuclear, geo-thermal and tidal energies on power generation.					
2.	Outline the structures of various renewable and non conventional methods (nuclear, geo- thermal and tidal energies on power generation) used in power generation.	L1				
3.	Develop the theoretical models of various renewable and non conventional methods (nuclear, geo-thermal and tidal energies on power generation) used in power generation.					
4.	Assess the performance of various renewable and non conventional methods (nuclear, geo-thermal and tidal energies on power generation) used in power generation.	L6				
5.	Explain the laws and policies mechanisms of various renewable and non conventional methods (nuclear, geo-thermal and tidal energies on power generation) used in power generation.	L2				

## **Correlation of COs with POs& PSOs:**

CO	<b>PO1</b>	PO2	PO3	<b>PO4</b>	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	<b>PO10</b>	PO11	PO12	PSO1	PSO2
CO1			3			2	3					1	3	2
CO2			3			2	3					1	3	2
<b>CO3</b>			3			2	3					1	3	2
<b>CO4</b>			3			2	3					1	3	2
CO5			3		2	3						1	3	2

## **Text Books:**

- Fundamentals of Nuclear Power by Juan S. Giraldo Douglas J. Gotham David G. Nderitu Paul V. Preckel Darla J. Mize published by State Utility Forecasting Group December 2012.
- 2. Geothermal Power Plants: Principles, Applications, Case Studies and Environmental Impact Third Edition by Ronald DiPippo, Ph.D
- 3. Tidal Energy Systems design, optimisation and control by Vikas Khare Cheshta, Khare Savita Nema Prashant Baredar published in Elsevier on 12th October 2018.

# **Reference Books:**

- 1. Non- Conventional energy sources by G.D.Rai published by Khanna Publisherse )
- 2. Non-Conventional sources of energy by Ankur Mathur published by Lakshmi Publications