

**Scheme of Examination:**

One question from Part A: 40 marks

One question from Part B: 40 Marks

Viva voce: 20 Marks

Total: 100 Marks

<b>B. E. MECHANICAL ENGINEERING</b> <b>Choice Based Credit System (CBCS) and Outcome Based Education (OBE)</b> <b>SEMESTER - VIII</b>			
<b>ENERGY ENGINEERING</b>			
Course Code	<b>18ME81</b>	CIE Marks	40
Teaching Hours /Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03
<b>Course Learning Objectives:</b> <ul style="list-style-type: none"> <li>Understand energy scenario, energy sources and their utilization</li> <li>Learn about energy conversion methods</li> <li>Study the principles of renewable energy conversion systems.</li> </ul>			
<b>Module-1</b>			
<b>STEAM GENERATORS</b> Coal and ash handling, Generation of steam using forced circulation, high and supercritical pressures, LaMount, Benson, Velox, Loeffler, Schmidt steam generators, Cooling towers and Ponds, Accessories such as Superheaters, De-superheater, Economizers, Air preheaters.			
<b>Module-2</b>			
<b>Solar Energy:</b> Introduction, Solar radiation at the earth's surface, Solar radiation measurements, Flat plate collectors, Focussing collectors, Solar pond, Solar electric power generation-Solar photovoltaics. <b>Biomass Energy:</b> Photosynthesis, photosynthetic oxygen production, energy plantation. Bio Chemical Route: Biogas production from organic wastes by anaerobic fermentation, Bio gas plants-KVIC, Janta, Deenbandhu models, factors affecting bio gas generation. Thermal gasification of biomass, updraft and downdraft			
<b>Module-3</b>			
<b>Geothermal Energy:</b> Forms of geothermal energy, Dry steam, wet steam, hot dry rock and magmatic chamber systems. <b>Tidal Energy:</b> Tidal power, Site selection, Single basin and double basin systems, Advantages and disadvantages of tidal energy. <b>Wind Energy:</b> Wind energy-Advantages and limitations, wind velocity and wind power, Basic components of wind energy conversion systems, horizontal and vertical axis wind mills, coefficient of performance of a wind mill rotor, Applications of wind energy.			
<b>Module-4</b>			
<b>Hydroelectric plants:</b> Advantages & disadvantages of water power, Hydrographs and flow duration curves-numericals, Storage and pondage, General layout of hydel power plants- components such as Penstock, surge tanks, spill way and draft tube and their applications, pumped storage plants, Detailed classification of hydroelectric plants, water hammer. <b>Ocean Thermal Energy:</b> Ocean thermal energy conversion, Principle and working of Rankine cycle, Problems associated with OTEC.			
<b>Module-5</b>			
<b>NUCLEAR ENERGY</b> Principles of release of nuclear energy-Fusion and fission reactions. Nuclear fuels used in the reactors, Chain reaction, Moderation, breeding, Multiplication and thermal utilization factors. General components of a nuclear reactor and materials, Brief description-Pressurized water reactor, Boiling water reactor, Sodium graphite reactor, Fast Breeder reactor, Homogeneous graphite reactor and gas cooled reactor, Radiation hazards, Shielding, Nuclear waste, Radioactive waste disposal.			
<b>Course Outcomes:</b> At the end of the course the student will be able to: CO1: Understand the construction and working of steam generators and their accessories.			

CO2: Identify renewable energy sources and their utilization.

CO3: Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, nuclear, hydel and tidal.

**Question paper pattern:**

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

SI No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Textbook/s</b>				
1	Power Plant Engineering	P. K. Nag	Tata McGraw Hill Education Private Limited, New Delhi	Third Edition, 2012.
2	Power Plant Engineering	Arora and Domkundwar	Dhanpat Rai & Co. (P) Ltd.	Sixth Edition, 2012.
3	Non-conventional Sources of Energy	G.D.Rai	Khanna Publishers, New Delhi	Fifth Edition, 2015.
4	Non-conventional energy resources	B H Khan	McGraw Hill Education	3rd Edition
<b>Reference Books</b>				
1	Power Plant Engineering	R. K. Rajput	Laxmi publication New Delhi	
2	Principles of Energy conversion	A. W. Culp Jr	McGraw Hill	1996
3	Power Plant Technology	M.M. EL-Wakil	McGraw Hill International	1994
4	Solar Energy: principles of Thermal Collection and Storage	S.P. Sukhatme	Tata McGraw-Hill	1984