M.E Semester: 2 Mechanical Engineering (Thermal Engineering)
Subject Name: THERMAL POWER PLANT ENGINEERING

A. **Course Objective**

- To present a problem oriented in depth knowledge of Thermal Power Plant Engineering
- To address the underlying concepts and methods behind Thermal Power Plant Engineering

B. **Teaching / Examination Scheme**

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
METH201	Thermal Power Plant Engineering	4	0	2	6	5	3	70	30	20	30	150

C. **Detailed Syllabus**

1. Recent trends in Steam Power Plants, design of combustion chambers, Fluidized bed combustion chambers, burners and selection criteria, combustion calculations, design and selection for economizers, air-preheater, superheater, desuperheaters, and reheaters. Performance testing and maintenance.
2. Design of Advanced boiler and steam system, heat balance sheet, co-generation and combined cycle, boiler efficiency, thermodynamics and power plant cycle analysis. Power plant layout and selection, Arrangement of units. Advancement in high pressure boilers and miniature boilers.
3. Classification and comparison of different types of gas turbine power plants, Thermodynamic cycles, Analysis of closed cycle and open cycle gas turbine plants, Methods of improving the thermal efficiency and power output of gas turbine plants.
4. Different components of gas turbine plants and different arrangements of gas turbine components. Types of combustion chambers used, fuels and fuel handling equipments, Governing of gas turbines. Combined steam and gas turbine plants. Recent developments of gas turbine power plants.
5. Modern nuclear power plants and their arrangement, types of nuclear furnaces and moderator, heat exchangers, turbines for nuclear power plants. Nuclear waste disposal, Gas disposal system.
6. Advances in diesel electric power plant, types of engines used, analysis of thermodynamic cycles, supercharging of diesel engine, performance and analysis of diesel power plant, present development in diesel power plant.
7. Economics Analysis of Power Plant. Cost electric energy, selection of type of generation and generating equipment, performance and operating characteristic, load division and tariff method.
8. Fluctuating Loads on Power Plants: Introduction, load curves, Different terms and definitions, Effect of variable load on power plant design and operation, Method to meet variable loads.
9. Peak Load Plants: Requirements, Pump storage power plants, Economical justification of pump storage plant, Their advantages and disadvantages compressed air storage plants, Their advantages and limitation.
10. Energy conservation and management, distribution of energy consumption, load sharing, need of energy conservation, methods of energy conservation, energy management techniques.

D. **Lesson Planning**

Sr.No.	Date/Week	Unit No.	% Weightage	Topic No:
1	1^{st} ,2^{ed} ,3^{ed}	Unit 1	20 % .	1,2
2	4^{th} ,5^{th} ,6^{th}	Unit 2	20 %	3,4
3	7^{th} ,8^{th} ,9^{th}	Unit 3	20 %	5,6
4	19^{th} ,11^{th} ,12^{th}	Unit 4	20 %	7,8
5	13^{th} ,14^{th} ,15^{th}	Unit 5	20 %	9,10

E. **Instructional Method & Pedagogy**

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
8. Experiments shall be performed in the laboratory related to course contents.
9. List of Experiments:

1. Case study on selection of size of different elements of steam power plant.
2. Performance and operation methods of Power Plant.
3. Experimental performance test on steam power plant: To study boiler operation and calculate boiler capacity, efficiency and all other necessary parameters.
4. Experimental performance test on steam power plant: To study steam turbine operation and calculate steam turbine efficiency, fuel consumption, steam quality, flow rate, condenser effectiveness and all other necessary parameters.
5. Experimental performance test on steam power plant: To calculate dryness fraction of steam, heat balance and energy utilization.
6. Industrial visit of Steam Power Plant, and prepare detail study report.
7. Study of Fluidized bed combustion system and its design.
8. Study of Nuclear Power Plants, properties and reaction of nuclear fuel
9. Study of co-generation and combine cycle.
10. Industrial visit of Nuclear Power Plant, and prepare detail study report.

F. **Students Learning Outcomes**

- The student can identify different areas of Thermal Power Plant Engineering
- Can find the applications of all the areas in day to day life.

G. **Recommended Study Materials**

- **Text & Reference Books:**

1. Black and Vetach, “Power Plant Engineering”, Chapman and Hall, International Thomson Publishing Co., 2001.
2. El, Wakil, ”Power Plant Technology”, McGraw-Hill, 2003.
3. Gebhartt, G. F., ”Steam Power Plant Engineering”, John Wiley & Sons, 2002.
4. Kearton, ”Steam Turbine Theory and Practice”, ELBS, 2001.
5. Burger R., “Cooling Tower Technology”, Chemical Publishing Company
6. Shields, C. D., “Boilers”, McGraw Hill, New York, 2001
7. Babcock-Wilcox manual “Steam”
8. Vandagriff, R.L “Practical guide to boiler systems”, Marcel Dekker, 2000
9. Oliver, K.G “Industrial boiler management, an operations guide, Industrial Press, NewYork. 2002