M.E Semester: 3 Mechanical Engineering (Thermal Engineering)
Subject Name: THERMAL ENERGY SYSTEMS

A. **Course Objective**

- To present a problem oriented in depth knowledge of Thermal Energy Systems
- To address the underlying concepts and methods behind Thermal Energy Systems

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	
METH302-A	Thermal Energy Systems	3	1	0	4	4	3	70	30	20	30	150

C. **Detailed Syllabus / Lesson Planning**

1. Design of Thermal Systems
   Design Principles, Workable systems, Optimal systems, Matching of system components, Economic analysis, Depreciation, Gradient present worth factor
2. Mathematical Modeling
   Equation fitting, Nomography, Empirical equation, Regression analysis, Different modes of mathematical models, selection, computer programs for models.
3. Modeling Thermal Equipments
   Modeling heat exchangers, evaporators, condensers, absorption and rectification columns, compressor, pumps, simulation studies, information flow diagram, solution procedures.
4. System Optimization
   Objective function formulation, Constraint equations, Mathematical formulation, Calculus method, Dynamic programming, Geometric programming, Linear programming methods, solution procedures.
5. Dynamic Behavior of Thermal System
   Steady state simulation, Laplace transformation, Feedback control loops, Stability analysis, Non-linearties.

D. **Detailed Syllabus / Lesson Planning**

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

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.

F. **Students Learning Outcomes**

- The student can identify different areas of Thermal Energy Systems.

- Can find the applications of all the areas in day to day life.

G. **Recommended Study Materials**

- **Text & REFERENCES**

1. J.N.Kapur, Mathematical Modelling, Wiley Eastern Ltd., New York, 1989.
2. W.F. Stoecker, Design of Thermal Systems, McGraw Hill, 1980.
3. W.F. Stoecker, Refrigeration and Airconditioning, TMH, 1985.
4. Fanger P.O., Thermal Comport, McGraw Hill, USA 1972.
5. McQuiston FC & Parker TD, Heating, Ventilating and Air conditioning, Analysis and Design, John Wiley & Sons, USA 1988.

- **Websites**

1. http;//www.engr.usak.ca/dept/mee/research/thermal_fluid.html
2. http://at.yorku.ca/cgi-bin/amca/cadl-26
3. http://www.gre.ac.uk/research/cms/centre
4. http://naca.larc.nasa.gov