COURSE OUTLINE			
Course Title	**THERMAL ENGINEERING**		
Course Code	EN621	**No. of Credits**	03
Department	Department of Energy and Environment	**Faculty**	Dr.V.Gopalakrishnan

Pre-requisites Course Code	Basic Course on Thermodynamics		
Course Coordinator(s) (if, applicable)	None		
Other Course Teacher(s) **E-mail**	None Gopalakrishnan.vgk@gmail.com	**phone No**	94433 52151
Course Type	**Elective**		

COURSE OVERVIEW

This course is designed for the post graduate students of Energy Engineering disciplines & intended to familiarize the students with the fundamentals of thermal engineering and their applications.

COURSE OBJECTIVES

The objective of the course will focus on the following points

1. To explain the fundamentals of Heat, Work, Energy & their mutual conversion
2. To provide knowledge of the various Heat Engines, their characteristics, performance & limitations
3. To introduce the concept of Efficiency , Economy & Environmental Impact of Thermal Energy in its various forms & how to extract useful output from heat engines & refrigerators

COURSE OUTCOMES (CO)	
The student, at the end of the course, should be able - • To understand the thermodynamic concepts, followed in the major heat engines • To perform calculations related to their work done & Efficiencies • To understand their various types and relative merits & demerits • To do a reasonable cost-economic analysis • To appreciate the mechanical design behind the engines	**Aligned Programme Outcomes (PO)**

COURSE ASSESSMENT METHODS

ACTIVITIES	MARKS ALLOTED	No.of.Groups
BASED ON ACTIVITIES		
Seminar Presentation	10 Marks	Individually
BASED ON INTERNALS		
Test-1 (Scheduled)- September end	20 Marks	Individually
Test-2 (Scheduled)- October end	20 Marks	Individually
BASED ON END SEMESTER		
End Semester	50 Marks	Individually
TOTAL	100 Marks	

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

TEXT BOOKS

1. *Nag. P.K., " Engineering Thermodynamics ",Tata McGraw-Hill Publishing Co., Ltd.,1994*
2. *Moran, Shapiro, Munson and Dewitt, "Introduction to Thermal Systems Engineering: Thermodynamics, Fluid Mechanics and Heat Transfer", John Wiley, N. Y 2000*
3. *Sonntag, R.E and Van Wylen, G.J.., "Fundamentals of Thermodynamics", Sixth Edition,2003.*
4. *Khurmi. R.S, Gupta. J.K, " A textbook of Thermal Engineering", 2002*

REFERENCES

1. *Bacon, D.H., "Engineering Thermodynamics ", Butterworth & Co., London, 1989.*
2. *Saad, M.A., "Thermodynamics for Engineers ", Prentice-Hall of India Pvt. Ltd., 1989.*
3. *Mayhew, A. and Rogers, B., " Engineering Thermodynamics ", Longman Green & Co.Ltd., London, E.L.B.S. 4th Edition, 1994*
4. *Ganesan, Y.,* Internal Combustion Engines*, Tata McGraw-Hill, 2003.*
5. *Heywood, J.B.,* Fundamentals of Internal Combustion Engines*, McGraw-Hill, 1988*
6. *Ballaney, P.L.,* Thermal Engineering*, Khanna Publishers, 1996.*

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

1.Overall Class performance, reflected in pass percentage & the grades obtained
2. Student Feed-back

COURSE TEACHING AND LEARNING ACTIVITIES

No	Topic	Hours	Mode of D
1	Air Compressor types , working principle	2	Lecture wit
2	Optimum intermediate pressure for perfect inter cooling.	1	-do -
3.	Compressor efficiencies and mean effective pressure	2	-do-
4.	Multi-staging	1	-do-
5.	Problems involving Compressors	---	Assignm
6	Basic Rankine steam cycle, comparison with Carnot cycle	2	Lecture wit
7	Reheat cycle - Regenerative cycle	2	-do-
8	Efficiencies in steam power plant.	2	-do-
9	Problems involving steam cycles	---	Assignm
10	Ideal fluid in vapor cycle Binary vapour power cycle	1	Semin
11	Otto cycle - Diesel Cycle - Dual cycle - Comparison	2	Lecture wit
12	Basic, Brayton cycle, intercooling, reheating & regeneration	2	-do-
13	Aircraft propulsion	1	Semin
14	Problems involving Gas cycles	---	Assignm
15	Refrigerators , Heat pump systems	1	Lecture wit
16	Ideal & actual vapor compression Refrigeration cycle	2	-do-
17	Vapour absorption refrigeration cycle	2	-do-
18	Gas refrigeration cycle , Production of Solid Ice	1	Semin
19	Problems involving Refrigeration	--	Assignm
20	Principles of operation of Steam Turbines	1	Lecture wit
21	Classification of turbines	2	-do-
22	Velocity, Pressure compounded impulse turbine	2	-do-
23	Turbine velocity diagrams for flow thro turbine blades	1	Semin
24	Steam turbine performance.	1	Semin
25	Forces on the blades, work done – Blade or diagram efficiency	1	Semin
26	Problems on Turbine Velocity Diagrams	---	Assignm
27	Classification of IC Engine components	1	Lecture wit
28	Four stroke cycles, valve timing, Spark ignition	1	-do-
29	Air Fuel Mixture requirements of IC Engines	1	Semin
30	Comparison of two stroke & four stroke Engines	1	Semin
31	Engine power - Indicated power - Break horse power –	1	Semin
32	Engine efficiency - Performance analysis of IC Engine.	1	Semin
33	Problems on IC Engine Performance	--	Assignm
34	**Cycle Tests**	2	Test

T O T A L - 40 Hrs (Lectures 28 Hrs, Seminars – 10 Hrs, Cycle Tests - 2 Hrs)

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)
1. Individual topics for Seminars and assignments to prevent copying from each other 2. Insistence on proper attendance, as per existing institution policies 3. Proper Invigilation during Cycle Tests 4. Strict evaluation of Cycle & End Semester Tests
FOR SENATE'S CONSIDERATION
V Gopalakrishnan M. Ruella **Course Faculty** _____ **CC-Chairperson** N.A.A. **HOD** _____