M.E Semester: 2 Mechanical Engineering (Thermal Engineering) Subject Name: COMBUSTION ENGINEERING

A. Course Objective

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

B. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total	Evaluation Scheme				Total	
301			т	D	Total	Credit	TL	IEORY	IE CIA P		PR. /	
CODE	NAME	_			Total		ITILORI		IL	CIA	VIVO	Marks
		Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
METH206-A	Combustion Engineering	4	0	2	6	5	3	70	30	20	30	150

C. Detailed Syllabus

- 1. Combustion thermodynamics; Stoichiometry; first and second laws of thermodynamics applied to combustion;
- Ignition and combustion in SI engine; Flame travel; turbelent flame propagation; flame stabilization; vaporization; Review of detonation and Diesel knock; effect of various factors; Combustion chambers for SI engines; Combustion in CI engine; Ignition delay and diesel knock; Excess air supply and air motion; Combustion chamber for CI engines- Construction and Performance aspects; M-combustion chamber; latest combustion chamber and technology.
- 3. Fundamentals of combustion kinetics' Combustion products in equilibrium; rate of reactions; chain reactions; opposing reactions; consecutive reactions, competitive reactions; Conservation equation for multi component reacting systems.
- 4. Combustion of liquid fuel droplet; fuel atomization; types of injectors; spray formation and charactristics; Oil fired furnace combustion; gas turbine spray combustion; direct injection engine combustion; detonation of liquid gaseous mixture.
- 5. Combustion of solid fuels; Coal combustion; combustion of pulverized coal; combustion of coal on bed in a fluidised bed and in a cyclone burners; stabilization of pulverized coal combustion; design consideration of coal burners; combustion generated pollution.

D. Lesson Planning

Sr.No.	Date/Week	Unit No.	% Weightage	Topic No:
1	1 st ,2 ^{ed} ,3 ^{ed}	Unit 1	20 % .	1,60
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.

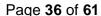
- **5.** Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
- **6.** Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- **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. Suggested list of experiment is as given below.
- 1. With the help of orsat apparatus determine volumetric analysis of product of combustion.
- 2. Bomb calorimeter determination of highest and lowest calorific value of solid fuel.
- 3. Combustion of fuel in diesel engine with help of P.V.Diagram.
- 4. Combustion of fuel in petrol engine with the help of P.V.Diagram.
- 5. Flue gas analysis by gas analyser.
- 6. Various combustion methods used for burning pulverized fuel.
- 7. Fluidised bed combustion
- 8. Conversion of Volumetric analysis in to graviometric analysis.

F. Students Learning Outcomes

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

G. Recommended Study Materials

- Text & Reference Books:
- 1. Combustion Engineering Gary L. Borman, Kenneth W. Ragland, McGraw Hill
- 2. Principles of Combustion Kenneth K. Kuo, John Wiley & Sons
- 3. Fuels & Combustion S. P. Sharma & Chander Mohan, Tata McGraw Hill
- 4. Fuels & Combustion Sarkar
- 5. Introduction to combustion phenomenon, Kanurymurty, Mc-Ggraw hill
- 6. Combustion, fundamentals, strehlow, Mc-Ggraw hill



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