

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 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	
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;
2. Ignition and combustion in SI engine; Flame travel; turbulent 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 characteristics; 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
2	4 th , 5 th , 6 th	Unit 2	20 %	2
3	7 th , 8 th , 9 th	Unit 3	20 %	3
4	10 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

