BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE-PILANI - HYDERABAD CAMPUS
ACADEMIC - UNDERGRADUATE STUDIES DIVISION, SECOND SEMESTER 2019-2020
(COURSE HANDOUT PART II)

07/01/2020

In addition to part-I (general handout for all courses in the time-table), this handout provides the specific details regarding the course.

Course No.: ME F482

Course Title: COMBUSTION

Instructor-in-charge: Dr. N. JALAIAH

1. **Course Description:** Fuels, Combustion, Adiabatic Flame Temperature, Chemical Kinetics, Chain Reactions, Conservation Equations for Reacting Flows, Laminar and Turbulent Premixed Flames, Diffusion Flames, Droplet and Particle Combustion, Emissions, Applications

2. **Scope and Objective:** The study of combustion is relevant to heating, electric power generation, transportation, propulsion, reducing atmospheric pollution, fire safety, etc. Starting with the review of thermodynamic fundamentals, followed by physical and chemical aspects of basic combustion phenomena, this course is designed to discuss thoroughly on the principles of premixed flame combustion and diffusion flame combustion. The objective of this course is to provide basic principles of combustion processes, to highlight the salient features in practical and scientific applications of combustion, and to establish links between combustion processes and combustion equipment and applications.

3. **Text Book**:

   D.P. Mishra, "*Fundamentals of Combustion*", Prentice Hall of India Pvt. Ltd., New Delhi, 2008.

   Reference Books:

   1. **Anil W. Date**, "*Analytic Combustion – With Thermodynamics, Chemical Kinetics, and Mass Transfer*", Cambridge University Press, New Delhi, 2011.
   2. **Stephen R. Turns**, "*An Introduction to Combustion – Concepts and Applications*", Tata McGraw Hill Education Pvt. Ltd., 3rd Edition, 2012.
   3. **J. Warnatz, U. Mass and R.W. Dibble**, "*Combustion*", Macmillan India Ltd., 4th Edition, 2006.
   4. **Sara McAllister**, **Jyh-YuanChen**, and **A. Carlos Fernandez-Pello**, "*Fundamentals of Combustion Processes*", Springer,2011.
   5. **F. El-Mahallawy,S.El-Din Habik**, "*Fundamentals and Technology of Combustion"*, Elsevier Science; 1st Edition, 2002.

4. **Course Plan**:

Lecture Nos.	Learning Objectives	Topics to be covered	Chapter/ Section
1-4	Introduction	Brief history of combustion, Types of fuels, Combustion modes, Applications	TB: Chapter 1
5-9	Thermodynamics of Combustion	Review of thermodynamics laws and properties, Stoichiometric reaction, Fuel-Air ratio, Equivalence ratio, Heat of combustion, Enthalpy of formation, Adiabatic flame temperature	TB: Chapter 2
10-13	Physics of Combustion	Fundamental laws of transport phenomena, Conservation equations, Transport in turbulent flow	TB: Chapter 3
14-20	Chemistry of Combustion	Basic reaction kinetics, Fundamentals of elementary reactions, Chain reactions, Multi-step reactions, Global kinetics	TB: Chapter 4
21-28	Premixed Flame	Introduction, 1-D Combustion wave, Hugoniot curve, Laminar premixed flame, Burning velocity: Measurement methods and Effects of chemical and physical variables,	TB: Chapter 5

Lecture Nos.	Learning Objectives	Topics to be covered	Chapter/ Section
		Flame extinction, Ignition, Flame stabilizations, Turbulent premixed flame	
29-34	Diffusion Flame	Gaseous jet diffusion flame, Liquid fuel combustion, Atomization, Spray Combustion, Solid fuel combustion	TB: Chapter 6
35-38	Combustion and Emission	Atmosphere, Chemical emission from combustion, Quantification of emission, Emission control methods	TB: Chapter 7
39-42	Combustion Applications	Combustion in SI and CI engines, Gas Turbines, Boilers and Furnaces, Pulverized and Fluidized bed Boilers	Class Notes

5. Evaluation Scheme:

Evaluation Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid Semester Test	90 min	20	7/3 11.00 -12.30 PM	CB
Surprise Tests	15 min each	20	Lecture Class	OB
Literature Survey/ Seminar		20	To be announced in the classroom	OB
Comprehensive Exam	3 hours	40	14.05.2020 AN	CB

6. Chamber Consultation Hour: To be announced in the class room.

7. Notices: All notices concerning this course will be displayed on the **Mechanical Engineering NoticeBoard**. Besides this, students are advised to visit regularly **CMS** (Institute's web based course management system) for latest updates.

8. Make-up Policy: Make-up shall be given only to the genuine cases with prior intimation.

9. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
ME F482