

DEPARTMENT OF MECHANICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech / Thermal Power Engineering		
Course Title	FUELS, COMBUSTION AND EMISSION CONTROL		
Course Code	ME601	No. of Credits	3
Course Code of Pre-requisite subject(s)			
Session	July 2020	Section (if, applicable)	
Name of Faculty	Dr. S Vedharaj	Department	Mechanical Engineering
Email	vedha@nitt.edu	Telephone No.	
Name of Course Coordinator(s) (if, applicable)			
E-mail		Telephone No.	
Course Type	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		
Syllabus (approved in BoS)			
<p>Types of fuels and their properties - Coal characterization - Combustion chemistry - Stoichiometry Heat of reaction - Calorific value - Adiabatic flame temperature - Equilibrium - Mass transfer.</p> <p>Chemical kinetics - Important chemical mechanisms - Simplified conservation equations for reacting flows - Laminar premixed flames - Simplified analysis.</p> <p>Factors influencing flame velocity and thickness flame stabilization - Diffusion flames - Introduction to turbulent flames.</p> <p>Coal combustion systems – Liquid fuel atomizers - FBC - Different types of FBCs - Models for droplet and Carbon particle combustion.</p> <p>Emissions - Emission index - Corrected concentrations - Control of emissions for premixed and non-premixed combustion.</p> <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Sharma, S.P. and Mohan, C., Fuels and Combustion, Tata McGraw-Hill, 1987. 2. Sarkar. S., Fuels and Combustion, Orient Longman, 2005. 3. John B. Heywood, Internal Combustion Engine Fundamentals, McGraw Hill Book, 2018. 4. Obert, E.F., Internal Combustion Engine and Air Pollution, International Text Book Publishers, 1983. 			

COURSE OBJECTIVES	
<ul style="list-style-type: none"> ➤ To study fuels and their properties combustion chemistry and stoichiometry. ➤ To solve simplified conservation equations for reacting flows and to compare different types of FBCs. ➤ To distinguish the factors influencing flame velocity and thickness flame stabilization. ➤ To understand the emission norms and standards 	
COURSE OUTCOMES (CO)	
Course Outcomes	Aligned Programme Outcomes (PO)
At the end of the course student will	
1. Recall fuels and their properties combustion chemistry and stoichiometry.	1, 2, 3
2. Construct simplified conservation equations for reacting flows.	1, 2, 3, 5
3. Choose the factors influencing flame velocity and thickness flame stabilization.	1, 2, 3, 5
4. Discuss emissions, emission index and control of emissions for premixed and no premixed combustion.	1, 2, 3

COURSE PLAN – PART II			
COURSE OVERVIEW			
This course provides an overview about fuels, combustion chemistry, chemical kinetics, premixed and diffusion flames, simplified combustion models, different type of combustors, emission formation and control measures			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	1 st Week	Introduction, Fuels – Production & extraction methodologies for Solid, Liquid and gaseous fuels	Presentation
2.	2 nd Week	Fuels – Properties and their influence on combustion – Methods for property estimation	Presentation
3.	3 rd Week	Introduction to Combustion and thermochemistry –Stoichiometry – Calorific value – Problems	Online mode using Digital pad
4.	4 th Week	Adiabatic flame temperature – Chemical Equilibrium – Gibbs function – Full equilibrium – Mass transfer – Stefan problem	Online mode using Digital pad
5.	5 th Week	Introduction to Chemical Kinetics – Elementary reactions – Multistep mechanism – Chain Branching & Termination reactions	Online mode using Digital pad
6.	6 th Week	Simplified conservation equations for reacting flows - Laminar premixed flames - Simplified analysis.	Online mode using Digital pad
7.	7 th Week	Factors influencing flame velocity and thickness flame stabilization – Quenching Flammability & Ignition – Flame Stabilization	Online mode using Digital pad

8.	8 th Week	Diffusion flames - Introduction to turbulent flames.	Online mode using Digital pad
9.	9 th Week	Simple Model for droplet evaporation and burning	Online mode using Digital pad
10.	10 th Week	Carbon particle combustion – One film and Two film model.	Online mode using Digital pad
11.	11 th Week	Coal combustion systems – Liquid fuel atomizers	Presentation
12.	12 th Week	FBC - Different types of FBCs	Presentation
13.	13 th Week	Emissions - Emission index - Corrected concentrations - emissions from premixed combustion and control methods	Presentation
14.	14 th Week	Emissions formation from non-premixed combustion and control strategies.	Presentation

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Cycle test 1	7th Week	60 minutes	20%
2.	Cycle test 2	13th Week	60 minutes	20%
3.	Assignment I			15%
4.	Assignment II			15%
5.	End Semester		120 minutes	30%

COURSE EXIT SURVEY

- Students feedback in the class after every 4 weeks and also through class committee meetings.
- Feedback from students on the course outcomes shall be obtained at the end of the course.

COURSE POLICY

MODE OF CORRESPONDENCE (email/ phone etc)

- All the communication (schedule of assessment/ course material/ any other information regarding this course) will be intimated through the class representative.
- The Faculty is available for consultation after contact hours with prior appointment through email: vedha@nitt.edu

COMPENSATION ASSESSMENT POLICY

- Attending all the assessments (1, 2, 3, 4, 5) are mandatory for every student. Flexibility is given to the students to fix the date for each mode of evaluation convenient to majority of the students.

- If any student fails to attend cycle test 1 and 2 due to genuine reason like medical emergency, the student may be permitted to appear for the compensation assessment (CPA) on submission of appropriate documents as proof and prior intimation. (Not valid for students having attendance lag). The portion for compensation assessment is full portion
- Students not having 75% minimum attendance at the end of the semester and also didn't attend cycle test 1 and 2 will be awarded 'V' Grade and have to REDO the course.
- In any case, compensation assessment (CPA) is not considered as an improvement test.
- The minimum marks for passing this course and grading pattern will adhere to the regulations of the institute.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- All the students are expected to attend all the contact hours. Students should maintain 75% minimum physical attendance by the end of the course to attend the end semester examination.
- Absence due to medical reason and institutional activities will be considered when the student falls below 75% of physical attendance and it should be supported by a letter (in professional letterhead) from the concerned authorities. Any preparatory works in view of institution activities should not be taken up in class contact hours.
- Students not having 75% minimum attendance at the end of the semester will be awarded 'V' Grade and have to REDO the course.

ACADEMIC DISHONESTY & PLAGIARISM

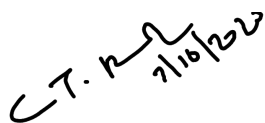
- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programmes.

FOR APPROVAL



Dr. S. Vedharaj (AP/ME)
Course Faculty



CC-Chairperson



HOD (ME)