

Term plan for TEP4170 Heat and combustion technology, spring 2019

version: 26 Feb. 2019

There might still be changes.

	Date	Hours	Topic	Literature
2	8.1	2F	Introduction, combustion technology, flame types, laminar and turbulent	E: Ch.1 T: Ch.1
	10.1	2F	Mass, heat and momentum transfer, turbulence	E: Ch.1-2
3	15.1	2F	Turbulence, reactions, modeling	E: Ch.1-2
	17.1	2F	Turbulence modeling	E: Ch.2-3
4	22.1	2F	Turbulence models, $k-\epsilon$ model; Some simple flows, boundary-layer flows	E: Ch.3-4
	24.1		(no lecture due to defence)	
5	29.1	2F	Boundary-layer flows; Energy and mass transfer	E: Ch.4-5
	31.1	2F	Chemical kinetics (Reactors and systems)	T: Ch.4-5 T: Ch.6
6	(5.2)	1h/gr	Laboratory exercise I Non-premixed flames, in groups (Paul Svendsen)	
	7.2	2h	Computational technology in thermal engineering and safety technology. Guest lecture by Rune N. Kleiveland, DNV GL – Digital Solutions	
7	(12.2)	1h/gr	Laboratory exercise I Non-premixed flames, in groups (Paul Svendsen)	
	14.2	2F	Chemical kinetics	T: Ch. 4-5
8	19.2	2F	Chemical kinetics Laminar flames, premixed	T: Ch.4-5 T: Ch8
	21.2	2h	Fire and physics of fire; Guest lecture by Reidar Stølen, RISE Fire Research (the Norwegian Fire Laboratory), http://www.risefr.no	
9	26.2	2F	Laminar flames, premixed; non-premixed	T: Ch.8, 9
	28.2	1-2F	Laminar flames, non-premixed	T: Ch.9
10	5.3	2F	Energy transfer in turbulent flow	E: Ch.8
	7.3	2F	Length scales; simulation, simple estimates; turbulent combustion	E: Ch.9
11	(12.3)	1h/gr	Laboratory exercise II - premixed flames/ flammability limits, in groups Paul Svendsen)	
	14.3	2F	Turbulent combustion	E: Ch.10
12	19.3	2F	Turbulent combustion	E: Ch.10
	21.3	2F	Turbulent combustion (EDC)	E: Ch. 11
13	26.3	2F	Turbulent combustion (EDC)	E: Ch. 11
	?28.3	2h	Safety thinking and safe design in thermal engineering; Guest lecture - to be decided	
14	2.4	2F	Pollutant formation and emissions	T: Ch.15
	4.4	2F	Pollutant formation and emissions	T: Ch.15
15	8.4		(open)	
	11.4		(open)	
16-17			(easter)/(open)	
18	2.5?	1-2F	Summary, round off	All
18-23			Self study	
	6.6		10:15(?) Diverse questions before exam (7 Jun.)	Any

Textbooks (the books are denoted "E" and "T" in the plan above):

Ivar S. Ertesvåg: "Turbulent strøyming og forbrenning" (Tapir, 2000)/"Turbulent flow and combustion" (translation, 2008). Norwegian version in bookstore, English translation from author.

Stephen A. Turns: "An introduction to combustion", 3rd ed. (McGraw-Hill,2012)

Time and place:

Basically, we are scheduled for Tuesdays 16-18, 18-19 and Thursdays 14-16, all in room VA2. Since both students and teachers may find time after 1600 as inconvenient, we will try to find an alternative time for these lectures/exercises. This will be discussed with the students. Alternative hours must not be in conflict with the scheduled hours of any participating student, and we need to find a room available.

For the lab exercises:

We will form groups of 2-3 students and provide contact with the laboratory engineer, Paul Svendsen. Each group makes an appointment with him about a suitable time. Preferrably, this should be in the first week of February (Lab. Exc. I) and first week of March (Lab.Exc. II). Conduct of the experiments take less than 1 h, and the appointments should be made at least a week in advance.

For theory exercises:

Exercises are primarily for your learning. (And you also learn by discussing with fellow students.) In addition, there is a formal aspect, as a certain number have to be approved for access to exam. When you run into difficulties that you cannot resolve on your own (which can be expected) or in discussion with fellow students, you should contact assistant or teacher . If you get problems with a deadline, contact assistant or teacher (before the deadline).

Exercises schedule 2019

Exercise No	Topic	Week	Deadline	week lectured
1	Repetition	2	soon	--
2	Turbulence - Averaging and modeling	3	18.jan	2,3
3	Turbulence energy, boundary layer	4	25.jan	4
4	Thermodynamics repetition	5	1.feb	--
Lab.I	Lab Exercise I – non premixed flames	6	3 days	
5	Simple turbulent flows	7	15.feb	4
6	Chemical kinetics	8	22.feb	5,7
7	Laminar flames	9	8.mar	8,9
Lab.II	Lab Exercise 2 – premixed flames, flammability	10-11	3 days	
8	Energy spectrum, Simple estimates	11	15.mar	10
9	Non-premixed combustion, turbulent combustion	12	22.mar	10-12
10	Turbulent combustion, Eddy-Dissipation Concept	13	29.mar	12-13
11	Pollutants	14	5.apr	14

The exercises are found at the open web site <http://www.ivt.ntnu.no/ept/fag/tep4170/> (link from Blackboard)