

Fundamentals of Combustion for Propulsion
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Lecture - 01
Introduction

Good morning everyone. Welcome to the NPTEL course, course come workshop on combustion for propulsion. This will be a three and a half days course we will have lectures and discussions spread over the entire day. I must say a little bit about the audience, for the benefit of the people who are here and also for the benefit of the students who will be watching this videos later.

We have a group of audience from diverse backgrounds and from academic institutions, research students from academic institutions and also practicing engineers from space and defense agencies. So, the purpose of having such a group is to have an interactive exchange of ideas, which are central to development of propulsion systems.

And the focus will be on introducing existing ideas and literature. And the few new ideas which will enable practicing engineers to develop propulsion systems which are not just good in terms of performance. Another important aspect that will be discussed is the stability of propulsion systems. So, it is an emerging issue in development of high performance propulsion systems.

So, that will be a central that will be one of the themes of this course and workshop. If I take away for the research students, will be to see and learn of ways in which academic research can contribute to the development of stable propulsion systems. There are a number of fundamental open issues which require an academic intervention if I may use that word would you like to add a few points.

Quite often when you learning the subject in courses in academic institutions, excuse me I you will discover you will learn those fundamentals and they not connect with reality. And

you get recruited into one of these places you learn all the job slowly. What we have uncovered over period of time is that, if you discovered a problem in development; you might not know which part of the fundamental is to be applied for understanding what has happening taking a correct corrective action.

Therefore, this course was designed essentially to start from applications; you have applications you are doing development and then you discover an issue what then you should you do with the question. So, we want to talk to you and tell you what part of the fundamentals are relevant to some of them. And what kind of analysis has to be done.

Quite often you have heard do not tell me too many equations; quite often equations are now changed into your software and you click the button and you get the plots. But quite often you also hear people asking your question what are the basis of the set of equations? You need to use and so on.

Also the tools to analyze, on the back of the envelope for a complex problem to identify which are the true causes or the principal causes is I think very important. So, we hope to achieve some of these objectives during the course. You may find some small equations being dealt with carefully but, most often qualitatively which part of the physics is influencing what you are observing will be the point which also you can test.

So, this is the plan over the next 3 and a half days. And you can ask any question which you think is reasonable not reasonable as well; we will decide what the result of the discussion will be afterwards.

. And briefly tell you what the course plan is, we will be here for 3 and a half days. We will start with an overview of what fundamentals are required for understanding, analyzing, designing and developing propulsion systems. And then we will discuss these fundamental concepts in some detail this will keep us occupied for a day and a half. And then we will start looking at a couple of applications of the fundamentals that have been introduced.

One application will be an analysis or a introduction of a theoretical framework for understanding how composite solid propellants burn. There will be one application that we will look at. And following that we will move on to discussion of liquid propulsion systems, I on the third day we will start discussions on liquid propulsion systems.

And on the last day we will wrap up the discussions with the overview of hybrid propulsion systems. And any other point significant point that may have come up during the 3 days; we will take it up on the last day and have a discussion. There will be the overall course plan, as sir was mentioned by Professor Mukunda; feel free to you know see clarifications raise some points.

Would the only I think that we would like you to keep in mind, sometimes if we feel that a point that is raised by one of you, requires a more detailed discussion which requires ideas from you know ideas from lectures that have not been covered. We will postpone it to a later session and then we will discuss it in some detail ok. That is about all that I think I have to say.