

Manufacturing of turbines (gas, steam, hydro and wind)

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Week - 00

Lecture 00

Welcome to this course on manufacturing of turbines. So, this is the introductory lecture to this course in which we will look at what contents we will be covering in this course. So, in this course we will be having 8 weeks. So, in this 8 weeks we will be having around 40 lectures of 30 minutes each. So we will start the course with introduction to turbines and materials. So in the first week we will look at the introduction to turbines.

Then we will see the need of turbines, what are the general specifications of these turbines and then what is the design philosophy that goes into designing these turbines. And subsequently, we will look at the manufacturing concepts and classification of engineering materials which are connected to the design philosophy of these turbines. In week 2, we will look at selection of materials, manufacturing processes, manufacturability of materials. Then, we will look at mapping of materials and manufacturing processes which are used in turbine manufacturing.

And then we will look at material selection for various turbines with focus on latest materials. Subsequently, we will also look at requirement of precision and metrology in manufacturing of turbines. Moving on in week 3, we will look at the details about gas turbines and superalloys. We will look at the different materials which are used in making the gas turbines, the properties of materials that are the superalloys which are used to make the gas turbines. Subsequently, we will look at the process requirements for gas turbine, overview of the casting processes specifically used for gas turbines with details of investment casting process.

In week 4, we will look at advanced machining and coating techniques which are used in manufacturing of gas turbines. In this module, we will look at laser beam machining, single crystal casting, hot isostatic pressing. Subsequently, we look at creep feed grinding, thermal barrier coating and process integration with gas turbines. Moving on from here, week 5, we will look at the topics of manufacturing of steam turbines. In which we will look at material selection of steam turbines, the investment casting process used for steam turbines, deformation processes, laser metal direct fabrication of the steam turbines, advanced machining techniques used in steam turbines.

Week 6 will focus on manufacturing on hydro turbines. in which again we will look at material selection and challenges in hydro turbines, the dry sand casting process for hydro turbine manufacturing, deformation processes used in hydro turbines, machining and surface modification via thermal spray methods for hydro turbines. Moving on from here in week 7 and 8 we will look at the manufacturing of wind turbines where we look at the details of composite materials which are used in making of the wind turbines. and the details of polymer matrix composites, classification of the composite materials, manufacturing of glass fibers and carbon fibers. And in the last week of this course, we will look at processes used to make the wind turbine blades with respect to hand layup process, spray layup process, vacuum bagging, vacuum infusion processing, resin transfer molding, then use of prepregs out of autoclave processing, technical quality assurance and testing.

So, these will be the major contents of the course which we are going to cover in manufacturing of turbines. Thank you.