

Product Design and Development
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Lecture - 01
Introduction

[FL] friends, we are going to start our discussion on the topic Product Design and Development. As you are well aware that this course is a 4 week course in which we will be discussing the various aspects of product design and development. I am happy to see they are lot of applicants lot of learners who have registered for this course and I can assure you that if you take interest in the course you will not at all be disappointed.

Friends to start with ours, ours is a manufacturing based economies. Usually we call our self as a agriculture based economy, but with the government programs like make in India, stand up India, start up India, there are so many issues in which we can contribute and now our focus is more on manufacturing although our focus is there on agriculture also, but with passage of time we have to evolve our self and our focus should also keep on changing for the betterment of the country as well as the society as a whole.

Now, in this course on product design and development we should start our discussion with the very basic fundamental aspect that why new and new products are required in the society or in engineering applications. As you will see India is very good we want to make it as a manufacturing hub of the world, but our major focus in manufacturing is we are manufacturing the products, we are assembling the products, but where we are lacking we are lacking in designing the products. So, were design approach has to change our engineers have to become self sufficient, self reliant in designing the best possible products, that are designed by the designers worldwide.

If we see in manufacturing sector we have so many multinational companies were manufacturing their products in our country, but we are not the best designers the design of the car or of the auto mobile is done in some other your of sure and India is used as manufacturing hub to produce that product or to manufacture the that product or to assemble that product. Our focus should be to become a designers our focus should be to train our engineers to become the best designers in the world all though many of our technical institute like IITs, MITs and other engineering institute have the focus and

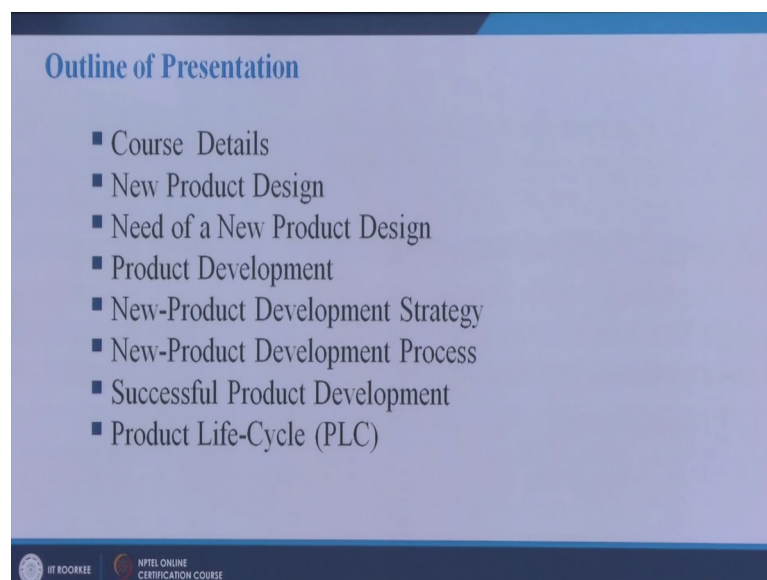
teach this course of product design and development at the UG level, but the tools and techniques slightly are not covered in much detail.

In this course we will try to and gage the learners in the practical aspects of product design and development where have whereas, we have the theoretical as knowledge theoretical aspects are known to most of the engineers, but the practical aspects are missing. So, our focus would be to find tune the practical aspects of the product design as well as how to develop a product, we will try to see if we can incorporate some videos also in the lectures that your able to understand that how a complete development of a prototype can also be done using the product design, design and development approach.

Today I will just like to introduce as a introductory lecture that what we are going to do in this course, what we are going to learn in this course and what, why there is a need for developing a new product and how we can develop a successful product or what are the factors that we should keep in mind for developing a successful product.

Let us start the presentation and try to understand the, what we are going to do in this particular course, now this is the outline of the presentation first we will discuss the course details, what we are going to cover in this course.

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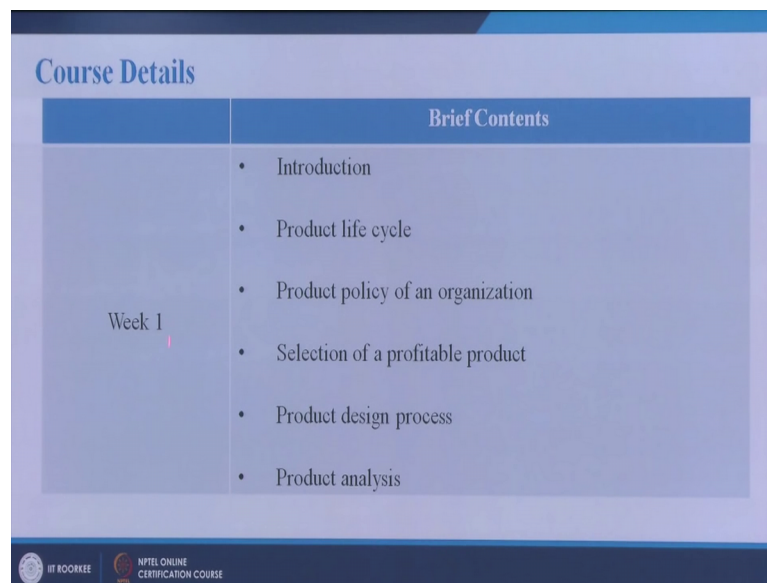


Secondly, the New Product Design, basic concepts, the need of the product design, that the Need of a New Product Design, Product Development, New - Product Development

Strategy, with New- Product Development Process and Successful Product Development and Product Life Cycle. I will just like to introduce the product life cycle and we will cover it in the next lecture the details and the analysis that we can do based on the product life cycle.

Now, to start with let us first see the course details now in course details week one our focus right.

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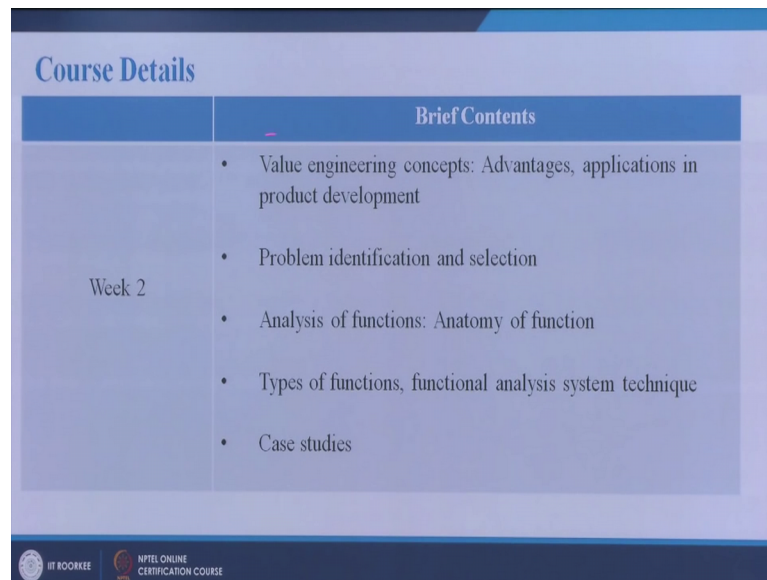
	Brief Contents
Week 1	<ul style="list-style-type: none">• Introduction• Product life cycle• Product policy of an organization• Selection of a profitable product• Product design process• Product analysis

The slide features a blue header with the text 'Course Details'. Below this is a table with two columns. The first column is labeled 'Week 1' and the second column is labeled 'Brief Contents'. The 'Brief Contents' column lists six items: Introduction, Product life cycle, Product policy of an organization, Selection of a profitable product, Product design process, and Product analysis. At the bottom of the slide, there are logos for 'IIT ROORKEE' and 'NPTEL ONLINE CERTIFICATION COURSE'.

Now, we are here we are at the introduction stage of our course, next we will cover the Product life cycle, we will cover the Product policy of an organization, then Selection of a profitable product, what are the factors, what are the methods, which can help us or what is the information or knowledge that we require to select a profitable product that we will see, again we will see the Product design process.

Today, I will just outline that what are the various stages, but we will have a detailed discussion that what should be kept in mind when we are going to design a products. That will be a separate tutorial or a lecture on this product design process and finally, we will see the product analysis. So, many ideas come to us each one of us is field up with ideas, but in order to convert or in order to change those ideas into reality and, so that they can come or become a tangible product what are the analysis procedures that are required, that we will cover in our last section of week 1 that will be product analysis.

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The slide is titled "Course Details" and features a table with two columns: "Week 2" and "Brief Contents". The "Brief Contents" column lists five bullet points: "Value engineering concepts: Advantages, applications in product development", "Problem identification and selection", "Analysis of functions: Anatomy of function", "Types of functions, functional analysis system technique", and "Case studies". At the bottom of the slide, there are logos for "IIT ROORKEE" and "NPTEL ONLINE CERTIFICATION COURSE".

	Brief Contents
Week 2	<ul style="list-style-type: none">• Value engineering concepts: Advantages, applications in product development• Problem identification and selection• Analysis of functions: Anatomy of function• Types of functions, functional analysis system technique• Case studies

Then coming on to week 2 we will start our discussion with Value engineering concepts, now value engineering is an important aspect which should be kept in mind while designing a product, why because the cost is the most important parameter that governs the product design, that we will see in the subsequent lecture. Value engineering in is in itself a complete subject, which is generally not taught to the under graduate students in our country that IIT Roorkee we have this course as one of the electives for our bachelor students.

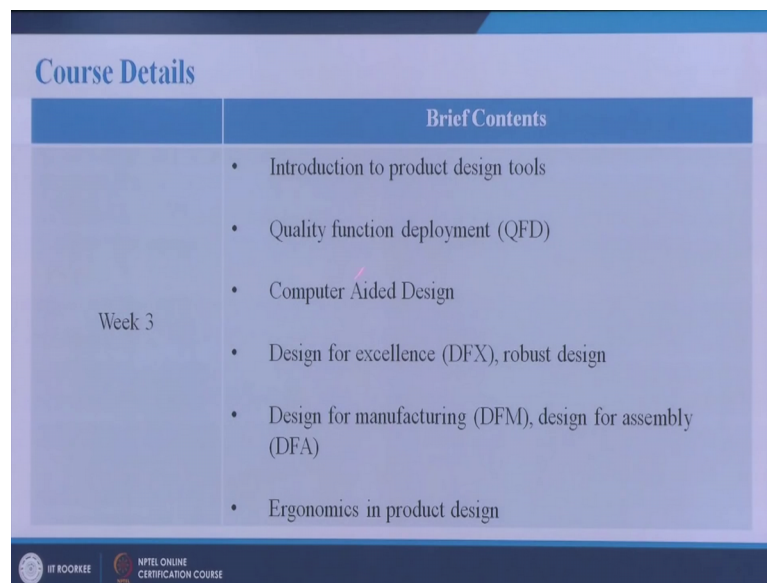
I want to introduce this concept of value engineering to all engineers who are attending this course or to all graduate who are attending this course, I am not focusing by applications or the examples of the case studies only for the engineers, even the other learners who are graduates and who have some kind of innovative mind set they can also attend this courses or attend this lecture and can get benefited by the discussions that will have during the course or the knowledge discussion or knowledge sharing that we will have during the course, even you can write to me with your suggestions we can do little bit of modification all also, if the delivery content of the course. So, that it is beneficial to all the learners who have registered for the course.

Value engineering is a very you can say important aspect in any design process and we will see that what do we know about value engineering, how much knowledge has been develop about value engineering, what are the various case studies related to value

engineering and how the concepts and practice of value engineering can help us to optimize our product design and make our product more competitive in the market.

In value engineering aspects we will be covering the advantages applications and applications specially in product development, then we will see value engineering problem identification and selection analysis of the functions or anatomy of the function we will study.

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Course Details	
	Brief Contents
Week 3	<ul style="list-style-type: none">• Introduction to product design tools• Quality function deployment (QFD)• Computer Aided Design• Design for excellence (DFX), robust design• Design for manufacturing (DFM), design for assembly (DFA)• Ergonomics in product design

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There are different types of functions like primary function, secondary function, tertiary function, necessary function, unnecessary functions. So, we will do that and we will learn that through Functional Analysis System Technique which is a standard technique of value engineering which is known as fast, FAST if you Google this word FAST you will see, so many examples of FAST you will get . So, that we will cover and then we will see few successful case studies where the principles of value engineering have been applied and successfully implemented across the organizations not only in India, but across the world.

This value engineering week will be very very important and I feed that learners will be able to develop a completely new approach towards product design after going through these lectures, or these sessions on value engineering. After the week 2, in week 3 our focus will be to develop the skills related to product design process, in this our focus will be introduction of the various product design tools, then we will focus on Quality

Function Deployment usually known as QFD, Computer Aided Design, Design for Excellence, Robust Design, Design for Manufacturing, Design for Assembly and Ergonomics in product design.

So, you can see each one of these is a subject in itself and we will try to bring together only the most important parts of these concepts like the Design for Manufacturing, the Design for Assembly. There are standard guidelines for keeping in mind or standard guidelines for the engineers which help the engineers to develop the products and in order to make it manufacturable, manufacturable we should say easily manufacturable, easy to assemble all right. We will cover all these concepts like design for manufacturing, design for assembly not the concept point of view, but the application point of view.

We will try to explain, we will try to understand these with the help of examples that this was the situation, this was the product, this was manufactured using this process, but after the applying design for manufacturing guidelines how the product design was changed to suite to the need of the manufacturing engineer and how it became easy to manufacture that product after redesigning it you following the DFM or the DFA guidelines.

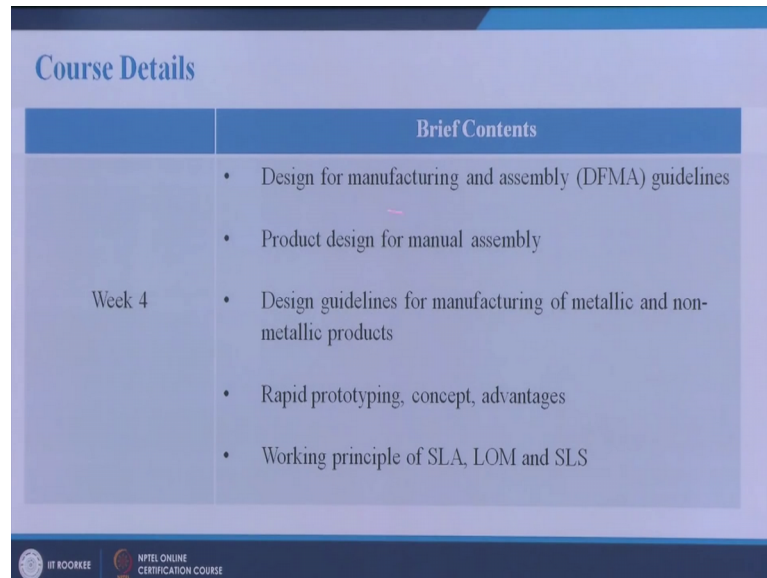
We will take those examples in due course of time and you will develop that thought process that if you use these guidelines how you can modify the existing products and make their manufacturing simple or in design of a new product you will keep these guidelines in your mind beforehand and your manufacturing will become easier, all those conditions we will see with the help of various case studies.

Finally, we will see the Ergonomics in product design and which is an important aspect for example, all of you may be sitting on a chair or may be lying on your bed and watching the TV or watching this lecture on the screen. There has to be a concept of ergonomics in these your next should be positioned in a way that it does not hurt you if you are leaning in that position for half an hour.

Similarly, if you are sitting on a table the eye ball contact with the screen should be such that your eyes do not get tired. So, all these are basic principles of ergonomics which we will be taken care of when we are designing the product. We will see the principles of ergonomics and our focus will not only be the understanding what do we mean by ergonomics, but we will be trying to understand that, how ergonomics can be used for

designing the various products and we will try to see the case studies where ergonomics has helped in the product design so, that the products have become successful.

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Course Details	
	Brief Contents
Week 4	<ul style="list-style-type: none">• Design for manufacturing and assembly (DFMA) guidelines• Product design for manual assembly• Design guidelines for manufacturing of metallic and non-metallic products• Rapid prototyping, concept, advantages• Working principle of SLA, LOM and SLS

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In our last week we will focus on the design for manufacturing and assembly guidelines, we will see product design for manual assembly suppose there is a product for example, this camera which is recording, this complete lecture it has so many different parts I can see may be there may be 200 parts that have gone into this assembly very small assembly of the camera.

Now, what design guideline should be done, so that this assembly becomes easier it becomes full proof and there is no problem while assembling this cam camera small set of, but with so, many different-different parts which have been joined together to make this complete structure. All those guidelines we will see that in product design what are the guidelines for the products which have to be assembled by manual operations.

Then we will see; what are the guidelines for the products which have to be assembled by automatic operation. So, the point is if you, if you see the development of the course initially we are talking of the product designed the concepts of value engineering in product design, and surely we are moving towards development of the product or the manufacturing of the product. If you see the title of the course product design and development, the last 2 weeks more or less will focus on developing of a prototype or

developing of a model of the design that we have to conceptualize during the first 2 weeks.

Here you can see; sorry here you can see the design guidelines for manufacturing of metallic and nonmetallic products, we will see suppose there is a product which has to be made by casting operation, we have to see that when we design that product we should keep in mind that what are the problem area associated with casting the product. So, we will keep those things in mind while designing the product. So, during the manufacturing stage we do not encounter any problem. All those things will be taken care what are the standard guidelines or rules of thumb or (Refer Time: 13:31) we should be taken into account while we are designing the product which has to be later on manufactured by any standard manufacturing process; it can be casting, it can be forging, it can be a sheet metal operation, it can be a machining operation. So, we will see; what are the standard guidelines to be taken care.

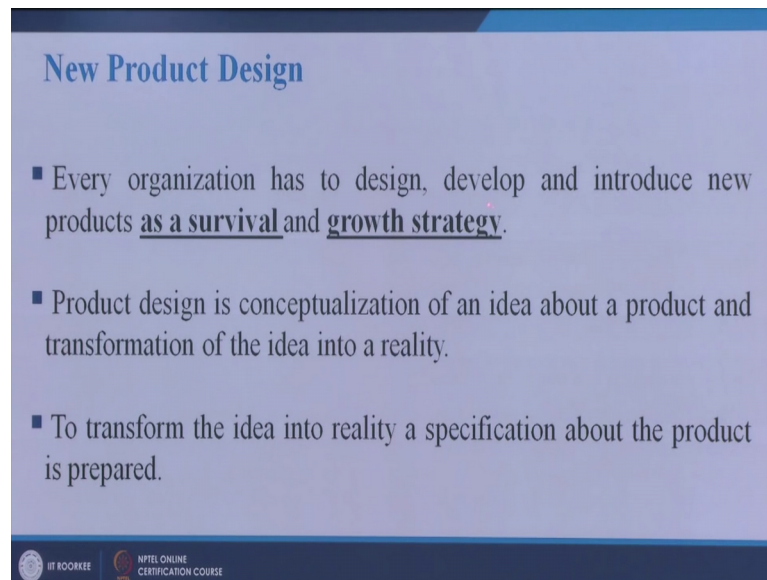
The all that will be considered in this these particular sessions on design guidelines for manufacturing of metallic and nonmetallic products, and then we will see a very important concept of rapid prototyping and we will see that why rapid prototyping is important in today's scenario, then we will see what is the concept and the advantageous of rapid prototyping. And as I have already told you our focus which will primarily be on developing the skills related to the product design process.

We will see what are the standard manufacturing process is a standard techniques which are used under rapid prototyping. In which we will see the working principles of stereolithographic operators, laminated object manufacturing and selective laser sintering. And we will see that how these principles how these processors or techniques work and what type of products or prototypes we can make out of using these processors out of a concept of rapid prototyping. You can see the 4 weeks are filled with lot of you can say titles lot of sub topics, but if we go systematically we should be able to address all these points and we should be able may be after attending the course they deliver the deliverable should be that you become of designer who has basic concept all basic knowledge about the product development process the techniques use for prototyping the products and the techniques use for manufacturing the product.

It covers the whole you can say gambit of the product design, prototyping, and manufacturing. So, the knowledge base required is all these 3, but even if somebody does not have an engineering background can do this course as we are not going to delve too much into the details of manufacturing. There will be a standard approach of product design and prototyping. We will not be discussing too much of manufacturing, but the guidelines that have to be taken care of there definitely we will see that what are the standard guidelines to be taken care of, when the product design is getting converted into a tangible product. For example, the design of this pointer getting converted into this pointer what are the processes that will be used we will try to understand these with the help of certain examples and what factors should be considered or what standard guideline should be considered then we are converting this prototype or in this particular design into a final product.

So, I think the next sessions will be much more useful because today is an introductory session. The next sessions will be much more useful in context of the application of the principles of product design and development. Let us now first see the introductory part of the course that why product design is an important concept and why all engineers and all managers and all graduates should know this concept. Because ideas can come to anybody it is not an idea nobody has as a proprietary right on the idea; ideas are universal anybody can develop a new idea I may have an idea, anybody who thinks fresh, who has an innovative bent of mind can and who thinks about the problems or thinks about the problems all around in life can generate different types of ideas.

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New Product Design

- Every organization has to design, develop and introduce new products as a survival and growth strategy.
- Product design is conceptualization of an idea about a product and transformation of the idea into a reality.
- To transform the idea into reality a specification about the product is prepared.

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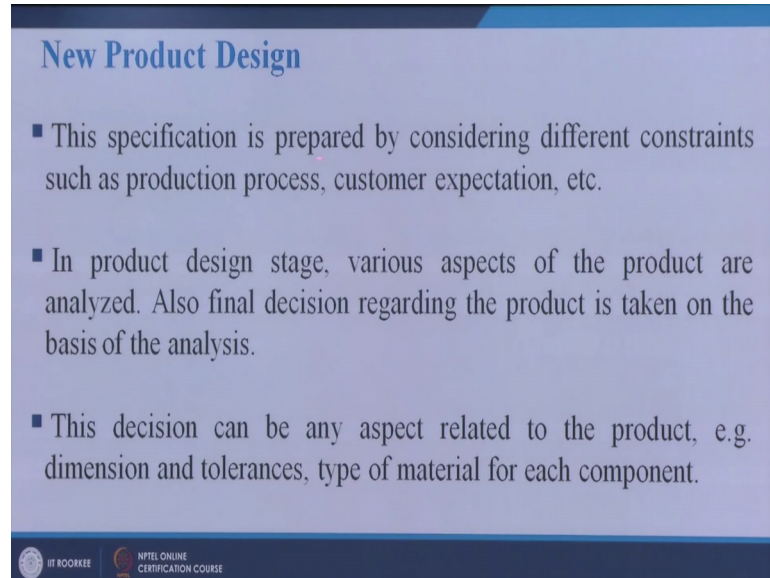
Let us see now the basic process and why there is a need to design new product. Now every organization has to design develop and introduce new products as a survival and growth strategy. Now you can see if I ask you that the room in which you are sitting or the class room where we are sitting, if you see around you may be note down the 5 products and just try to evolve that how these products have change or how the technology related to these products has change or how the designs related to these products have change. You will see that you will be able to write at least 10 pages on these 5 products that initially these products use to be like this and now the products as evolved over a period of time and has been converted into a new product.

So, you that is the importance as a survival or the growth strategy companies always keep on doing research and development always generating new and new ideas always doing different types of innovation like; incremental innovation or the break through innovation to come up with new and new products. So, that either they are able to maintain their market share or they are able to grow or first is survival another is growth. First is to ensure the survival in the market and second is to further increase their market share by launching new and new and improvised products a related to the field of specialization.

So, that is one thing why the new products are being developed and the second thing is the product design is conceptualization of an idea about a product and transforming of

the idea into the reality this I have already explain that in our course we will try to see from idea generation to it the culmination of that idea into the final product.

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New Product Design

- This specification is prepared by considering different constraints such as production process, customer expectation, etc.
- In product design stage, various aspects of the product are analyzed. Also final decision regarding the product is taken on the basis of the analysis.
- This decision can be any aspect related to the product, e.g. dimension and tolerances, type of material for each component.

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And to transform the idea into reality a specification about the product is prepared, this we will try to understand when we will see in detail that how the product development process takes place.

Now, new product design again thus this specification is prepared by considering different constraints such as production process, customer expectation etcetera. So, we will see that when we will design the product we will see the constraints such as the production process the as I have already explained, that in week 4 our focus will be to see that what are the various specifications which are dedicated to specific manufacturing process. For example, casting that when the product is cast what are the guidelines to be kept in mind if the product has to be made by forging process then what are the guidelines to be kept in mind all that we will see, I will outline all the guidelines that if the product is made by casting process what are the factors or guidelines to be taken care of.

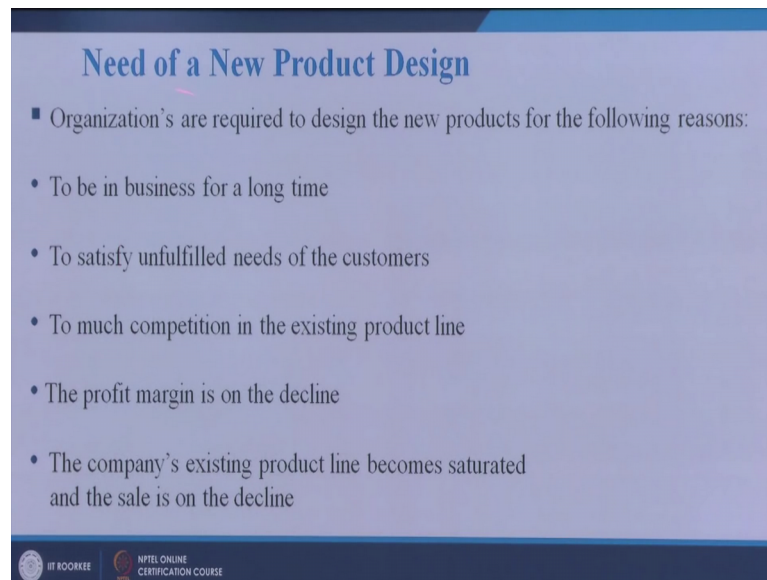
Similarly in the product design stage various aspects of the products are analyzed. Also final decision regarding the product is taken on the basis of analysis. In week 2 we will see value engineering which is one of the analysis tools and specifically focus on the cost of the product. In week 1 our focus will be on the analysis procedure we will see the

marketing aspects the product characteristics like durability and dependability the economic aspects and we will see the various reliability aspects. Those all aspects broadly we call them the analysis of the product, you have an idea then you have to analyze it using the standard technique and the standard analysis procedures are followed. I have just give an example of few standard procedures that are followed to analyze the product. So, that analysis is also an important part of the product design then this decision can be any aspect related to the product for example, dimension and tolerance is type of material for each component.

When we do the analysis we will understand all these things we will see that what should be the dimension of the product, what should be the tolerances specified for that product should be made of which type of material, and further whether each component should be made up of the same material or it should be made up of different material. Now if you try to relate this concept of product development with your life you can see you may be right now using a desktop or a laptop for using for listening to this particular discussion.

Now, you can see the materials the one can have a metallic or body to the laptop; one can have a plastic body to a desktop. So, why there are 2 different materials the type of selection of material is also very very important. Some of you may be using a pen to write down some points now sometimes may be having a metallic body, sometimes may be having a plastic body, some may be even using a pencil to do the same task. Now it means that selection of a material for a particular product is also equally important so, all that also we will see when we will do the product analysis.

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Need of a New Product Design

- Organization's are required to design the new products for the following reasons:
 - To be in business for a long time
 - To satisfy unfulfilled needs of the customers
 - To much competition in the existing product line
 - The profit margin is on the decline
 - The company's existing product line becomes saturated and the sale is on the decline

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Now, again I am coming to the same point because that is the most important point if you are doing a course on product design and development. First answer you should have in your mind is that why new products are required, when we are leaving a very when we are leaving very comfortable life, we are having the close to we are having food to eat we are having a house to leave, then why there is need for new and new products. We should try to understand that why new products are required as I have already told you that there is a need for the companies to either survive or to grow. Therefore, new products is a necessity for the organization to keep their business going.

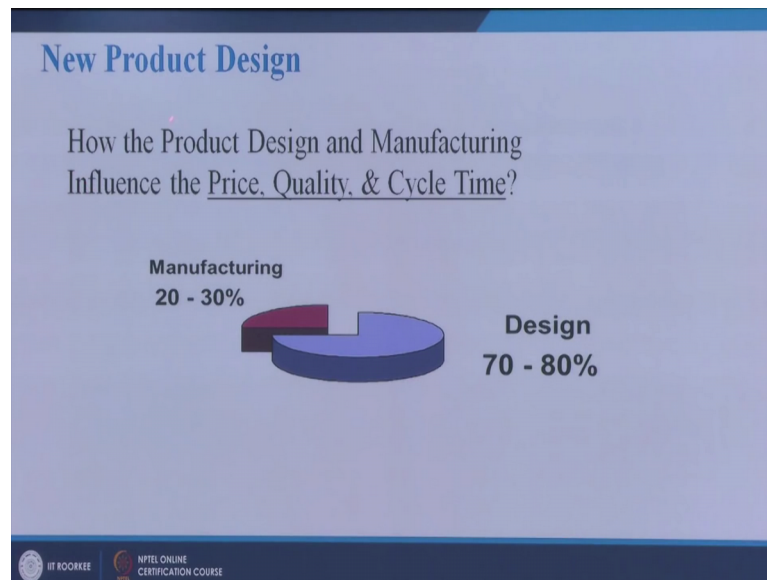
This points further high light the need of a new product design I will just reed it for you, Organizations are required to design the new products for the following reasons, To be in the business for a long time, which we can say is a survival for the company if they do not come with the new products. They will parish there is the very famous saying if you do note absolute your product you will be absolute it from the market, what does that mean that mean that you have to automatically or you should make your product absolute and come up with a new product, otherwise you will be absolute you will lose your business and I do not want to name here, but there are number of companies in India which were not able to come up with innovative new designs of their products and ultimately your eliminated from the market.

So, you can yourself think this can be assignment problem that you can find out 5 companies in 5 Indian companies which did not innovate and finally, lost business. So, that can be one particular question in one of the assignments you can see first is the survival strategy for the company to satisfy unfulfilled needs of the customers. So, there can be. So, many example I will discuss in the next lectures where there was a need that existed in the market and there were companies which satisfied those needs and made huge profits out of it.

So, the second reason for New Product Design process or product design developing a new product is to satisfy unfulfilled needs of the customers third is too much computation in the existing product line. So, too you should write t plus t double O too, so the computation when we will see the product life cycle when we will draw that product life cycle you will see that there is a maturity phase in which there is a competition by the various companies. So, all those that competition also leads to if you see the automotive market very you good examples are there a companies making initially 2 variants only, but because of the competition setting in the divided their product variety or product line into 4 5 different automobiles.

So, the examples are well known to all of you. So, competition also leads to the new product development the profit margin is on the decline. So, that is also one good reason for coming up with the new product and these profit margins and the too much competition these 2 points are related to the product life cycle. So, when we will come to product life cycle I will explain these 2 points again there that why the competition leads to new product development and why the profit margin leads to new product development or the decline in the profit margin leads to new product development and the last point here is the company's existing product line becomes saturated and the sale is on the decline. So, that is also one good reason for coming up with new product.

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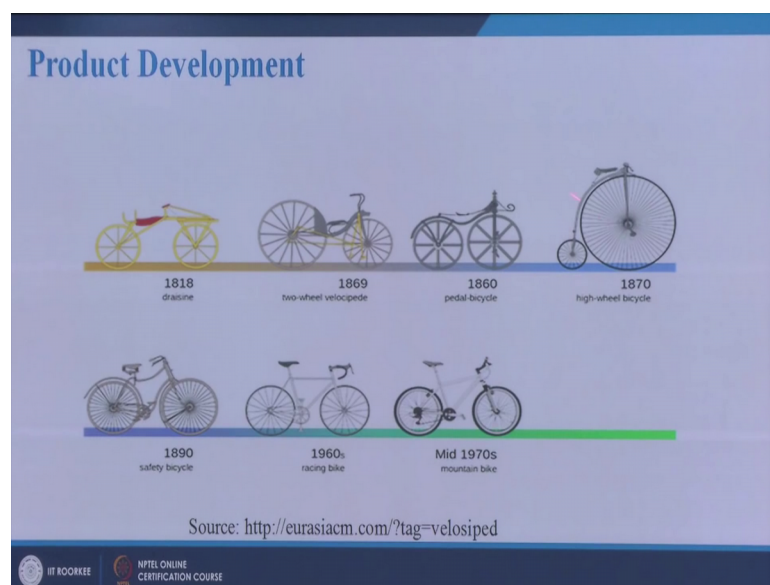


Now, how much important should be give to the design is where is easily or very importantly explained in this particular slide you can see how the product design and manufacturing influence the price quality and cycle time. So, 70 - 80 percent influence is exercised by design and only to 20 - 30 percent of the you can see influence is shown by or has been reported by manufacturing what does this mean this means that most of the things get logged at the design stage only not designing the output will be in the form of a drawing which will have a bill of materials. So, you will get that this particular product will be made by this material by this process this many may be nuts and bolts and screws will be used for this product. So, most of the things get freezed or most of the things get fixed at the product design stage only.

Once the things get freezed the things get fixed your price also gets fixed, quality of the products also gets fixed, and the cycle time also more or less gets fixed. So, the influence major is of the design and then the manufacturing also has some influence 20 to 30 percent. If you remember in today's class only in the very beginning I said that our engineer should focus more on the design philosophy or the design thinking rather than manufacturing. Now as a country as a whole we are seeing that we are manufacturing all the automobiles wherever design input into those automobiles is very less. So, that we need to improve and therefore, we are running such type of course, where we can slightly improve or slightly influence the design thinking of our engineers or our budding engineers.

So, this is you can see a very important diagram we shows the design is an important aspect for any product manufacturing yes 20 to 30 percent only design may be 70 to 80 percent influence not only on the price, but the quality and the cycle time. So, this thing has to be taken care of, this you can see a just a most simplistic example of the design of a bicycle you can see from 1818 to 1970 how the design of the cycle as evolved over the period of time and current may be this is showing this figure taken from this source is showing the design of the product till 1970s only. If you see the cycles coming into 2016 2017 the design may have further change from this design of the mid 1970s.

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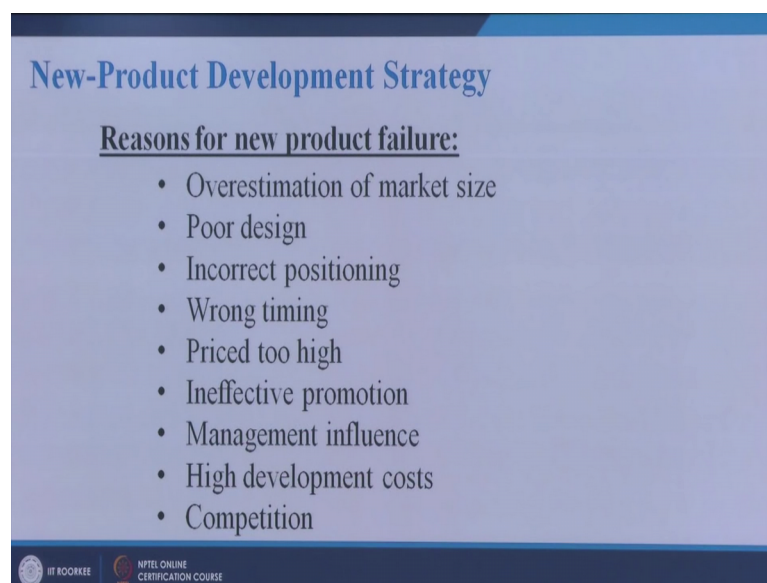


So, you can see change in the design 1869 the rear wheel is bigger the front wheel is smaller 1870 the front wheel is bigger the rear wheel is smaller and then equal size wheels.

So, how the design can evolve may be why there was. So, many design changes and still there are design change is change is continuing in the design of the bicycle why, we need to improve on the comfort of the rider, we need to improve on the efficiency of the rider, we want need improve on the effectiveness with which our force is getting converted it our power is getting converted into motion. So, we need to optimize all these things we need to optimize based on the ergonomic principles. Therefore, the design as evolved over so many periods so many years and current design may not be the final design may be another 20 years we may evens improvised design of a bicycle.

So, it is not that if we are using the particular product there is no scope of design change the design change can always happened and change is always should be or change should always be for the betterment usually we say change is the only truth. So, change is inevitable and we have to always keep on looking for change is or looking for the opportunities where we can further improved the durability, the dependability, the efficiency, the effectiveness of the products. And for that reason only we are under growing this small module of 10 hours which can further influence our design thinking and we can come up with ideas which can satisfy some needs of the society.

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New-Product Development Strategy

Reasons for new product failure:

- Overestimation of market size
- Poor design
- Incorrect positioning
- Wrong timing
- Priced too high
- Ineffective promotion
- Management influence
- High development costs
- Competition

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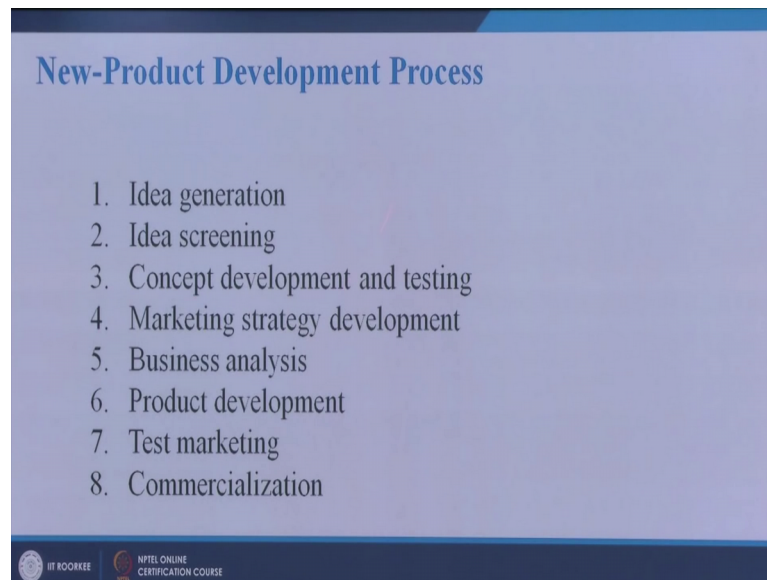
Now, all of us have so many ideas, but the reasons for new product failure usually the mortality rate of the ideas is maybe I should say that if you generate 100 ideas only 2 ideas will finally, we come successful product. So, there can be. So, many ideas floating around us, but only 2 percent of the ideas will reach to the market and the 90 percent of the ideas will died down. So, what can be the reasons that if you have a idea, but it is not becoming a successful product. So, with the knowledge available in the various books on product design this is a summary of the reasons, which lead to the poor design first one is the over estimation of the market size usually being for most optimistic in nature usually we say that the product that we are designing is going to have a bang effect on the market and is going to become the most successful product. So, we overestimate the market size and it leads to the product failure.

Second is the poor design of the product. So, we are going we may not discuss this first aspect much in detail because it is relating to the marketing aspects, but we will be focusing on the design aspects. So, we will see that what is the poor design and what is the good design, than the incorrect positioning of the product wrong timing of launch it is prized too high if the product is not competitive cost wise then maybe we may not be able to capture too much of market and the product may not be successful. So, the prize is also important in effective promotion, again related to sales and promotion, management influence, high development cost and computation. So, the development cost is important so we will further see that how we can economize, how we can optimize the development cost of the product.

So, management influence is also equally important because sometimes if you are the complete support of the management the product may be is advertised properly, is marketed properly is given preference by the company which is a multi product company and therefore, the product gains in the market and it leads to the success of the product, but if the management is little bit appearance about the product. And there is not complete or management support for the product then sometimes it may lead to valuable that percentage of such cases maybe very very minimal.

The major factors in this particular case are the point number 2 that is product design and the second can be the high high development cost and third is the computation and may be to some extend the wrong timing of launching the product. So, majorly these 4 points we will try to address in our subsequent lectures and try to see that how we can take care of these 4 points and make a come up with a design which leads to success in the market so that we will try to see.

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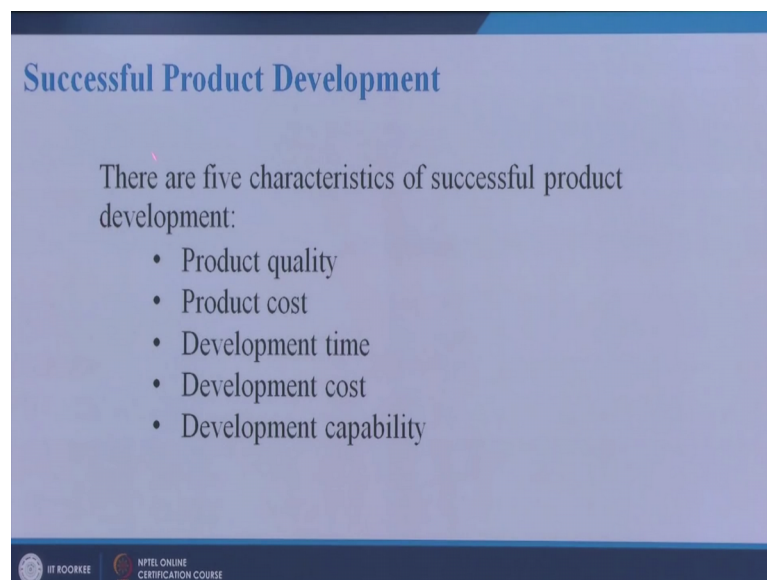
Now, this is just a basic concept we will have one complete session on the product development process, but this is just an outline that how do a develop new product a new product we have first the Idea generation has I have already told you brain storming can be one method of idea generation or reading different article related to the new products can be one good method of idea generation, then sometimes looking at the needs around you can be a very good method of idea generation. So, idea generation is the first thing.

Second is a screening of ideas may be we will come up with the better ideas and take them to the next level then the concept development and testing we will develop a complete concept about that product it can be a rough sketch of that product just with the pencil we will draw down what is there in our mind regarding that product rough sketch of the product will need to the concept.

Then the marketing strategy development suppose we have that concept and we have developed it we will try to figure out the needs and requirements of people or the customers who were going to used that product, business analysis a complete business plan BP usually we call that can be develop that, how much product should be sold in the market to reach to the brake even else is, how much money should be invested to develop this idea into a tangible product all those things will be sorry; all those things will be discuss that the Business analysis level, then the Product development, Test marketing and Commercialization.

I should I tell you that this is not the standard approach which is true in case of each and every product different segments of the products are there, and different segments of product different such approaches will be there, but we will try to develop a thought that for any idea what are the standard methods for developing or bringing that idea into reality or bringing that idea into a tangible product. So, this may not be the standard approach in different books you may find different approach is of product development and we will try to take out the best out of each approach or you can say summary of all these approaches and try to develop our thoughts related to the product development process.

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Now, for any successful product development they are 5 characteristics which we should keep in mind first one is a Product quality, Product cost, Development time, Development cost, and the Development capability. So, these are the 5 keywords for making successful products. So, our focus should be on quality, cost, time, manufacturing cost, and the capability of the company. If we can make best to possible utilization of the development capacity of a company we can a definitely come up with the products or should I say successful products and that is the only target that we should come up with successful products.

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Product Life-Cycle (PLC)

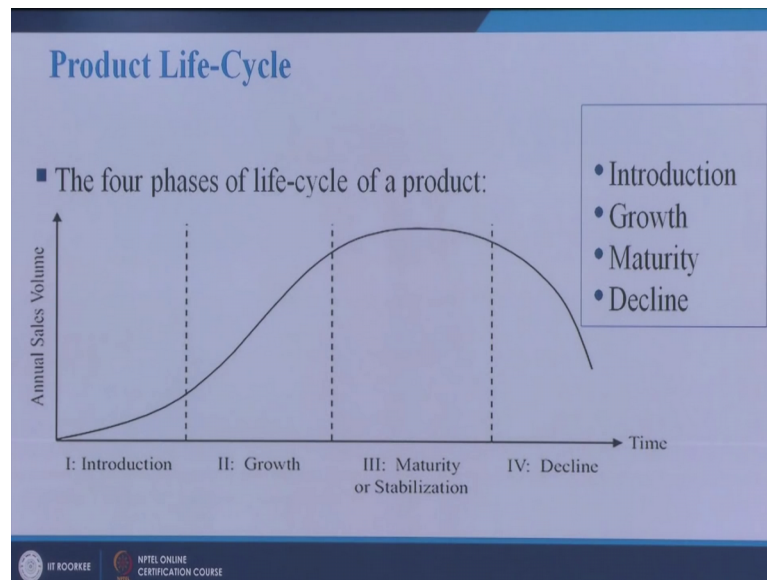
- Product life cycle (PLC) is the course that a product's sales and profits take over its lifetime
- The product life cycle concept is derived from a fact that a given product's volume and revenue follow a typical pattern of four phases



Now slightly I would like to introduce today a concept of product life cycle because this is important for the product development process or the new product development process and then may be in the next session we will have a complete discussion related to the product life cycle. The product life cycle is the course that a product sales and takes profits take over it is lifetime. So, again I will read it for you slightly I was a bit not correcting reading it product life cycle is the course that a products sales and profits take over it is lifetime in the next slide I will show you how a typical product life cycle looks like and second point is the product life cycle concept is derived from a fact that a given products volume and revenue follow a typical pattern of 4 phases.

Now, what are these 4 phases that we are going to see? So, how the sales of a product will change when it is lost into the market over a period of time that is usually called the product life cycle and there are typical behavior, which is observed for general type of products and that behavior we try to analyze and use it for our decision making related to the product development strategy and product development process.

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Next slide we can see the 4 phases of life cycle of a product are first one is a on y axis we see annual sales volume and x axis is the time, this is the time and the annual sales volume. The 4 phases of life cycles of product are first one is Introduction, Growth, Maturity or Stabilization, and Decline again to revise introduction growth maturity and decline. So, any product which is launched in the market will definitely under growth these 4 stages or the sales of that product or the demand of that product will go through these 4 stages for starting from introduction, growth, maturity, and finally decline. And these type of inform these type of information or these type of cycles usually will help us in our decision making related to the new product development.

So, I will finish today's session here with the brief very brief introduction of product life cycle, but in the next session we will definitely see product life cycle in detail and we will try to understand that what type of decisions we can make based on the product life cycle. So, to revise what we have covered into today's class I have given you brief outline of the topics that we are going to cover in this course on product design and development, then we I have seen we I have try to address why new products have to be develop we have taken an example of a cycle that how it has evolved over a period of time.

And finally, we have seen that what are the major reasons that lead to the failure of the product and in the last slide we have just seen a brief we can say in order to continuity

among the lecture we have just seen that there is a product life cycle and the annual sales of the product change is over a period of time and how the change is how the product annual sales change over a period of time in case of general products or in case of tangible products has been given. So, there are 4 stages first one is the introduction, second one is the growth, third one is the maturity, and forth one is the decline.

So, next lecture we will see that what decisions we can take off, if we have a product life cycle of a product available or a similar product available with us. So, thank you very much we will may be now interact again in lecture number two which will be related to the product life cycle.

Thank you.