Experimental Stress Analysis - An Overview
Prof. K. Ramesh
Department of Applied Mechanics
Indian Institute of Technology, Madras

Lecture - 4.3
Naming of Experimental Methods

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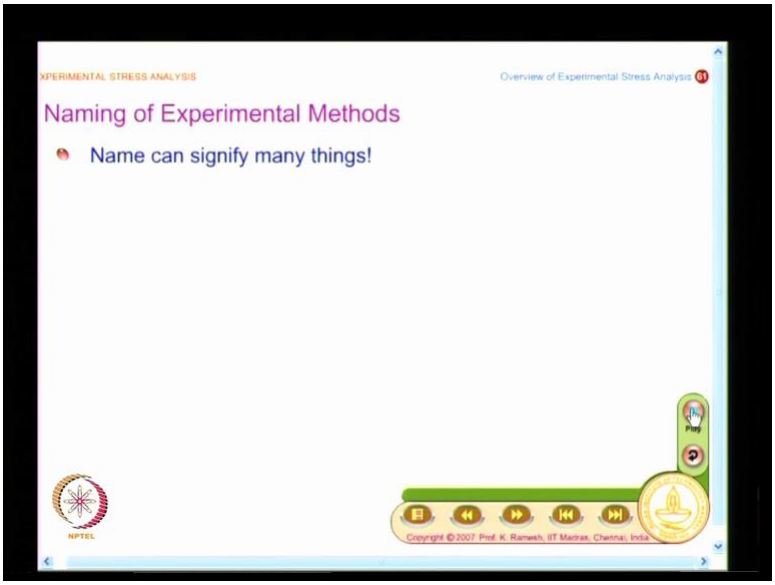

Let us have a very interesting discussion on Naming of Experimental Methods. You may wonder name can signify many things. You know if you look at the development of languages.

If you look at a Sanskrit, even for nouns they find out a route and then, they explain because of such and such reason this is named like this. And it is a very well developed and it has a grammar which is scientifically proven and people find it easy for implementation in the computer. In fact, for natural language processing Sanskrit grammar is so convenient, you can translate from one Indian language to another language; the intermediary Sanskrit and then go to it.

And if you look at, you know because we are looking at naming of experimental

technique. Let us also look at what way names are given in Sanskrit, I will give you one example in Sanskrit the sabda is very important. And the phonetic rendition of the word has some idea of what the word connotes and if you want to a talk about the tooth, the Sanskrit name for this dantam. And you will be surprised if we do not have a tooth you cannot pronounce it. It is very interesting, you know the why you say Sanskrit is so perfect. I am not getting into you know language division and things like that. When there is a positive and scientific aspect attached to a particular language.

As scientist we should recognize that merit. And it is so interesting, it is dantam you call it I can call the tooth by a several different names and phonetic rendition as a link to the meaning or what it connotes. So, if you are not having an understanding then you can find out and think about it, and go to the route and find out what the meaning is. So, it is not arbitrarily name. So, dantam you pronounce it, you need tooth for it and it is a tooth it indicates. Now, let us look at have we named our experimental techniques scientifically.

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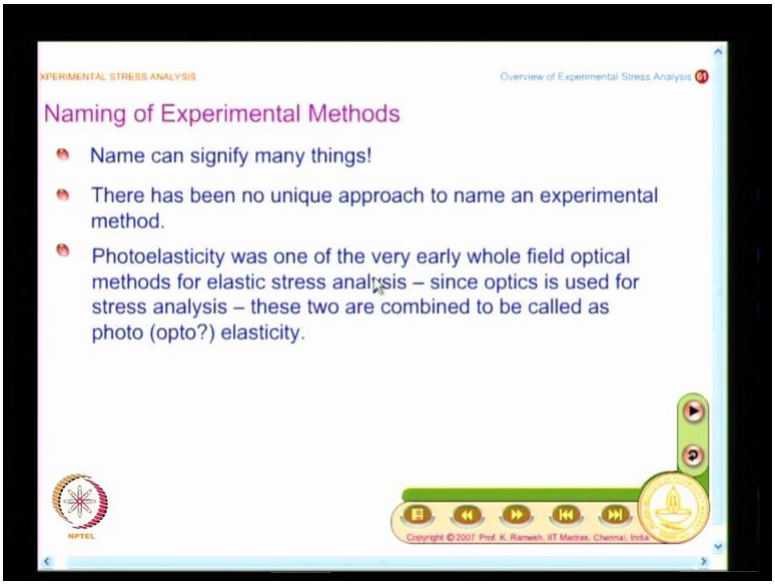

If you look at one of the first technique was cf. And there is a discussion, you know, there is no unique approach to a name an experimental method. And if you look at 1930's, one of the earliest optical methods that came into existence was, Photoelasticity.

Why call it as Photoelasticity? People have used optical methods to reveal the stresses. So, they have combined optics and stresses. And photography was also a prevalent at that time, when they were recording the information. So, they instead of combining optics and elasticity, they called it as Photoelasticity. They call it as photo mechanics, and even now there is a debate should be called it as Photoelasticity or photo mechanics or optomechanics.

There is a school of a scientist who feel we have to go and rename all the techniques. Because we are using optics, why do not we call it as optomechanics. So, if you look at Photoelasticity, you have just combined the sensor. Optics is used as a sensor and you are analyzed for elastic problem. So, you called it as opto elasticity, Photoelasticity. So, that is how we have named it.

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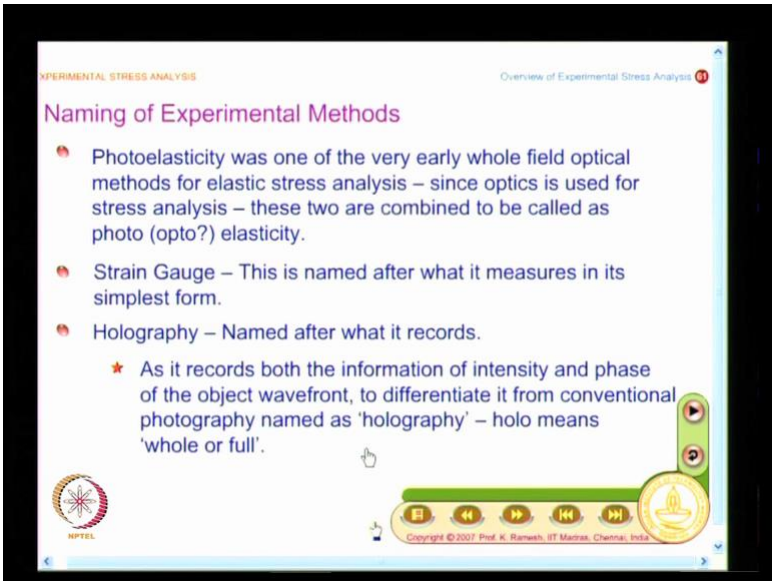

When you come to strain gauges what do you do. This is what I caution, because people named it as strain gauges. There is a danger that you get strain tensor, it is not so, it is measures only a component of strain, because it basically measures strain they have called it as strain gauge. And in if you go to strain gauge literature you find special grid configurations where you find out the stresses. So, you called that as strain gauge you have a shear stress gauge, torque gauge, likewise you name it. So, strain gauge as got it is

name from this. Then you have a holography.

Holography, it is named after what it records. And what we find here is I have mentioned that holography records both intensity and phase of the object wave. 'Holo' means whole or full. Because I record both the information together following the example of photography, they are called it as holography. And we have also seen it is a very fundamental contribution to the scientific community. So, whoever has developed the holography he got the Nobel prize for it, such a very important a development.

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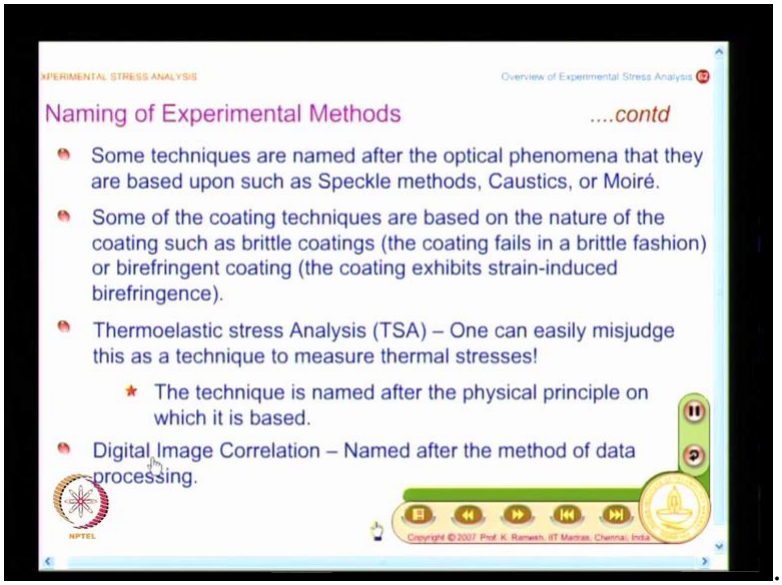

Then, what we have? You also have techniques, where you use the physics. I said that in the method of caustics, you employee the principle of caustics, in the formation of the shadow. And you name it directly as method of caustics. Whenever you have a two grids super imposed, you get moiré fringes e and you call that as moiré.

Similarly, wherever you use speckles. Speckles are formed on the diffusely reflecting surface, Specularly reflecting surface you qualify the surface and when you use those you call those methods as speckle methods and when, we go to digital image correlation it uses white light speckle, but call it by a different approach. And we have also seen coating techniques. What we have seen? We have seen brittle coatings, we have seen

birefringent coatings. Why do a call it as brittle coating? I have a coat that is put on the on the model it fails in a brittle fashion. In fact, when brittle coating was originally developed, they were all used for finding out plastic deformation. And when we have rolled steel you have scales that are formed.

So, they plate like a brittle coat. So, they were able to identify zones of plastic deformation. That is how the whole technique developed. So, you name the technique based on how the coating behaves. I said photo elastic coating, other name of photo elastic coating is birefringent coating. And I said in Photoelasticity, the physics used is temporary or artificial birefringence and that is what exhibited by this coating. So, you call it as photo-elastic coating, as well as birefringent coating. And we also have another technique, thermo elastic stress analysis. And I cautioned you again and again do not misconstrue that this technique can measure stresses due to thermo elasticity. It is not. So, the physical principle used employee's measurement of temperature, which is very very small and you call this as a thermo-elastic stress analysis.

So, it is based on the physical principle, and I said I have one of the emerging techniques now is, digital image correlation. It uses white light speckles; however, this is named after the method of data processing. I have digital images and then, I look at un deformed and deformed configuration. And then do a correlation. So, I call this as digital image correlation. So, techniques are named differently, I do not have a unique approach and if somebody wants to develop a new technique. He coins what is more appropriate. And what you see in coherent gradient sensor, why the technique is called coherent gradient sensor.

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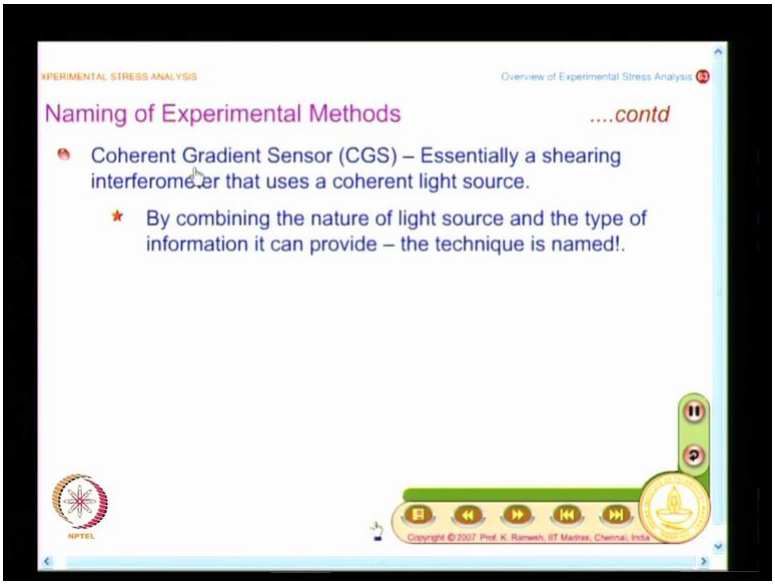

If you look at that, I use a coherent source of light. It is essentially a shearing interferometer by combining the nature of light source, and the type of information it can provide the technique is named. And you know you know researchers also want attention to their work. So, one of the reasons why they coined a technique is to attract the attention of others, to look at what this technique is all about.

So, coherent gradient sensor it is very famously known as CGS, which essentially a sharing interferometer. Now people call it as sharing interferometer. That is how they because it has become a general purpose analysis tool, people do it for thin vapors, in when you go for mems application, thin vapors are analyzed for out of plane displacements slope, curvature. So, you have this.

So, I combine the type of radiation that I use, I have a coherent source of light, and I measure the gradient. So, I call it as a coherent gradient sensor. In this class, we have looked at briefly, how to name an experimental technique some discussion on why a particular technique is given a particular name, so on and so forth.