Introduction to Research
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Lecture - 34
Research in Civil Engineering

Prof. Prathap Haridoss: Hello, So, today we have with us Prof. Gettu Prof. Ravindra Gettu, he is professor in the Department of Civil Engineering here at IIT, Madras. He has a PhD from Northwestern University in Evanston in the United States of America and he works on concrete technology. He is also the associate Dean for Industrial Consultancy and Sponsored Research at IIT, Madras. So, he has a lot of experience working with you know various funding agencies, working with various sponsoring agencies and so on and as a very good in sight into what are the kinds of you know activities that go on as in the institute as a whole and certainly with respect to civil engineering. So first of all welcome.

Prof. Ravindra Gettu: Thank you.

Prof. Prathap Haridoss: To this interview. We just like to start with civil engineering, I mean most of us realize that it is been along for a long time and in fact wherever I go think that comes to my mind is that the first people who arrived here were civil engineers because the road is already there and the building is already there. So what are traditional areas of civil engineering that people do research on, but have been around for a very long time as areas of research?

Prof. Ravindra Gettu: Well, first of all thank you for having me here. It's good that people are interested in civil engineering. Lot of time, we think that people take civil engineering for granted and they don't think any research goes on. Well, at least in our department in most of the places we would have say 4 or 5 major areas of civil engineering. Structural engineering, which deals with the construction of facilities like building, bridges and so on. And then we have Geotechnical engineering which deals with foundation, how these structures are built on? The mechanics of soils and how safe

should the foundation be.

Then we have Environmental engineering, which deals with how people and constructed facilities effect and interact with the environment. We have Water Resources or what can be also called Hydraulic engineering, which deals with facilities like canals, dams and water supply as well as say sewage networks and sanitary networks. Then we have Transportation engineering, which I am sure anybody who has used any road or any system of transportation in our country understands the intricacy and the complications. So, they deal with how to make traffic flow better, viability of different systems and they also look into the future to see how planning should be done.

Then we have a group such as ours, where I come from which deals with construction management and management of projects and to make them more efficient, safer, cost effective and delivered on time. We also deal with materials, materials technologies that are particularly what I do. I work on concrete and other construction materials. Then we also have a group which works on building Physics, like to make sure that our buildings are more comfortable ventilation, thermal, comfort and lighting. So, these are the different aspects. So in each of these areas there is lot of research which goes out. So, I am sure that any one who is interested in research in civil engineering would find an area that is suitable for him.

Prof. Prathap Haridoss: In these range of activities that you are mentioning is there something that's relatively recent that has come on that people have gotten on to in let say, in last 10, 15 years as supposed to something that is been around for a much longer period of time?

Prof. Ravindra Gettu: Well, Civil engineering research like you said in the introduction as being around, there are lot of new things coming in. I works in materials, so the first thing that comes to mind is the new type of materials which are coming in. Polymers are being used extensively in civil engineering. Civil engineering materials where traditionally stone and brick and cement, motor and so on. So but the polymers are coming in very big. Then other technologies, for example, Information technology is affecting a lot, how we model and how we predict anything going from traffic flow to

how a structure behaves and what are the interactions of environmental on a structure. Environmental engineering has become very big now.

This boom in environmental engineering I would say started of long back in other countries, in India may be much later, but in the past decade we have seen so much of research in environmental engineering within the realm of civil engineering. So, there is a lot of lot of studies being done on how to make a water supply safer and how to make sure that the waste that we generate is treated well and disposed off in safe conditions.

Prof. Prathap Haridoss: Ok

Prof. Ravindra Gettu: So, there are a lot of things coming up.

Prof. Prathap Haridoss: When students come to your department for their post graduate degree. So, they all typically would have some kind of a you know under graduate degree on I mean related to civil engineering and they come, most of them I will assume may be you do take students from other backgrounds to. Are some common issues that they face in settling in into a research environment coming from, I mean a course related environment which is what they would have done during under grad or even otherwise just settling into the kind of research activities that go on you know in advanced civil engineering department are there these specific issues that they tend to face?

Prof. Ravindra Gettu: Well generally they do not face any major problems. One thing that comes up often is the way that they have studied in the bachelors or some times even in the masters, is not really amenable to how we expect research to be done. To give an example, lot of students have studied answers for specific questions. And then what we find out is they are not able to analyze new situations or when we have them to do research, they expect or they seem to feel that it would be a series of steps, where the guide tells them to do this and they come back. But when we expect them to analyze the results we find that to be lacking and this comes back to the fact that when they have studied they always being told to study a certain set of answers, for certain set of questions that out of those questions they are examined. So we find out that sometimes that analysis or the ability to handle new type of questions, new type of problems is

lacking. So, we spend say better part of the first year bringing the students up to this level that we required and I would say most of the students who finish say the PhD or their masters now go out with a ability that we expect in a good research.

Prof. Prathap Haridoss: Okay so, in general as things as they leave the institution with the degree in other ways that you feel are the appropriate ways to measure success in their research activity, of course, they are getting a degrees so they have succeeded in some way, but is there something more suttle that you look at and you say this person was a successful researcher?

Prof. Ravindra Gettu: Well, how I would judge researcher say, PhD students still at IIT is, if that person has the ability to analyze and decide, reach decisions based on their results or their research I think they are good researchers.

Prof. Prathap Haridoss: Ok.

Prof. Ravindra Gettu: The proof of the pudding is when they graduate and go out, and they if we follow the career I would expect that say in 5, 10 years they should be one of the top researches in India then we are successful.

Prof. Prathap Haridoss: Ok.

Prof. Ravindra Gettu: In our work in bringing them out as research.

Prof. Prathap Haridoss: So, I think in fact, talking about you know what happens when students live the degree program, I mean in after they graduate, so of course civil engineering is very well connected with the industry I mean just direct link between what you do and may be what very large fraction of industry or that construction industry looks for. So, that link I think most of us understand. Other other industries which pick ups civil engineers where maybe the general public maybe not as aware of it, is there some unique situations like that you can tell us about?

Prof. Ravindra Gettu: Well in our country most of our PhD students go into teaching.

Prof. Prathap Haridoss: Ok.

Prof. Ravindra Gettu: We have, I think I would say about 90 percent or more of our PhD students would go into teaching. Lot of our masters students, those who do MS as well as M. Tech go into the industry. So, they have been people going from chemical manufactures up to structural designers. The whole range in whatever we deal with, there are people who go into the industry and in terms of PhD as I mentioned the openings that they get into are mostly in teaching, but we have had students who go into administration. We have people who go into the IAS, IES; we have students who have gone into the IFS, Indian Forest Service. So, some how civil engineering seems to give them the holistic view, which they hope will be useful them when they go into administration.

Prof. Prathap Haridoss: Okay very nice. So, may be some away bit of a mundane questions now coming of this more philosophical question. Students come in and they become graduate students here for may be say 2 years, 3 years, 5 years depending on their degree program. They go through various phases of learning courses doing research and so on. What do you think is a frequency with which students should meet their advisers and what can you give some input into the kind of interaction that guide and a student should have through the course their PhD?

Prof. Ravindra Gettu: Well it is sort of a difficult question to give a generic answer.

Prof. Prathap Haridoss: Ok.

Prof. Ravindra Gettu: I would say they should meet the guide as often as necessary.

Prof. Prathap Haridoss: Ok.

Prof. Ravindra Gettu: Now, as a thumb rule I think once a week is good enough.

Prof. Prathap Haridoss: Ok.

Prof. Ravindra Gettu: Once a week is good enough. I do not like students to come in every day and ask what they should be doing.

Prof. Prathap Haridoss: Ok.

Prof. Ravindra Gettu: And I think that does not show their independance and I think the guide also should not be doing this. But once a week at least is a good frequency and towards the end of thesis when the thesis has to be corrected, I think more often would be good.

Prof. Prathap Haridoss: Ok.

Prof. Ravindra Gettu: Now this interaction could be in groups. I know research groups like mind, where we have a research meeting of the whole group every week. So the interaction could be in a group or could be one on one.

Prof. Prathap Haridoss: Ok.

Prof. Ravindra Gettu: Depending on the students and I would say the guide.

Prof. Prathap Haridoss: So, may we close with this question, what advice would you give to an aspiring research student in your department?

Prof. Ravindra Gettu: Well, I think the most important thing that I would say and this is something that I ask students say in their comprehensive exam or research proposal. I ask students, how is your thesis going to make the world a better place? This often we do not think how is the thesis going to important. So, I expects students to believe in themselves, believe in the problem and believe in the solution and know what we are going to solve. So, this is something that sometimes students are caught by surprise.

Prof. Prathap Haridoss: Ok.

Prof. Ravindra Gettu: And this comes back when I was doing my masters. I was working in a problem I thought I was very exciting and when I was applying for a PhD somebody ask me, what is the use of what you are doing? And that made me think I went back to my adviser and said, why I am doing this? Where can I apply this? So, I always ask my students and I tell them, pick up a problem or work on something that is going to have some effect in some way and understand that and work towards it and that I think makes it more pleasant and I think holistically that is the better way.

Prof. Prathap Haridoss: Ok.

Prof. Ravindra Gettu: Certainly.

Prof. Prathap Haridoss: So, thank you Prof. Gettu.

Prof. Ravindra Gettu: Sure.

Prof. Prathap Haridoss: Thank you for joining us.

Prof. Ravindra Gettu: Ok.

Prof. Prathap Haridoss: Pleasure.

Prof. Ravindra Gettu: Thanks Prathap.

Prof. Prathap Haridoss: Thank you.