

**Basics of Language Science**  
**Professor. Rajesh Kumar**  
**Humanities and Social Sciences**  
**Indian Institute of Technology Chennai**  
**Lecture 3**  
**Fundamentals of the Course**

Topic, now which word of this is familiar to you, I mean in a way all the words will be familiar to you. But which word out of these three-four makes more sense to you?

Student: Language

Professor: Language, very nice. I was expecting that. How about natural language? Any idea? Have you heard about any other kind of language? Which is.

Student: Programming languages.

Professor: What is that called? If you are talking about programming language.

Student: Artificial language.

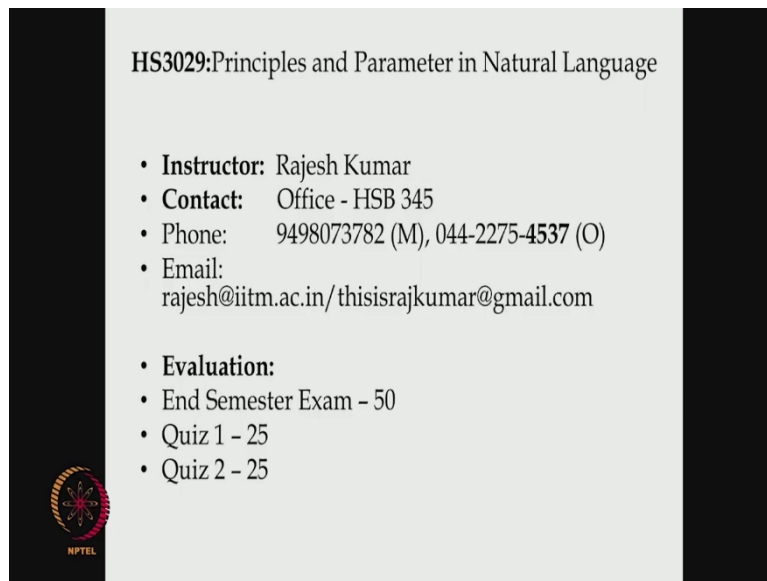
Professor: Artificial language and what is artificial about programming language?

Student: Manmade, humans made.

Professor: Humans have invented and do people speak that? No. So, right in the beginning, I want to draw your attention to this thing. Natural language means the language that people speak. This is not directly in opposition to what we know as artificial language. Artificial simply means the languages, languages or language that machines communicate with, am I right? about the programming language?

Only machines understand that language and some people who write that, who write several things using that language. People do not speak that language. So, that is the part of natural language. Principles and Parameters, I am coming to you in a few minutes. So that is, that is about the name of this course.

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HS3029: Principles and Parameter in Natural Language

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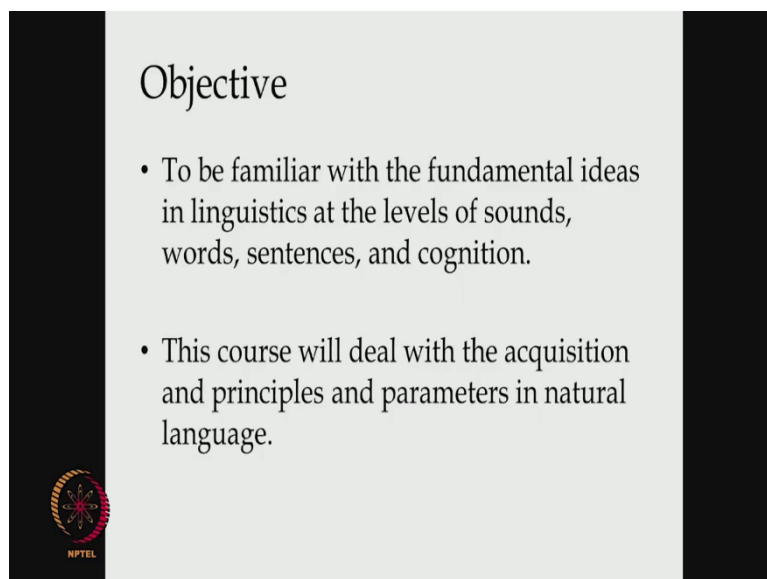
• **Evaluation:**

- End Semester Exam - 50
- Quiz 1 - 25
- Quiz 2 - 25




Here is a little bit of details about me and the course evaluation. My name is Rajesh Kumar, I teach in the Department of Humanities and Social Sciences. My office is located at HSB 345. These are my phone numbers, office number, mobile number, and email id.

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## Objective

- To be familiar with the fundamental ideas in linguistics at the levels of sounds, words, sentences, and cognition.
- This course will deal with the acquisition and principles and parameters in natural language.




This is the objective of this course; I must tell you right in the beginning this is what we are going to do throughout this semester. In short, if I have to summarise everything that I have to do, I can talk about it in two sentences. We are going to talk about some fundamental ideas about how we study a language.

And again, when we talk about a language, we mean natural language, language that we speak, we will be talking a lot about that, we will be setting up several parameters with that.

But keep in mind, when we, there is something else which is obvious when we say natural language. Natural language is not the language that is written. So, we are not going to be discussing textbook languages or written languages, we are only going to be talking about spoken language which is a natural language that people speak.


And particularly how we study that and how we learn a language is going to be part of that and then we will be looking at that, at the level of sounds, words, and sentences. In particular, we will be looking at sentences that are language at the level of sentences. Since we are beginning with language and its fundamental ideas, we will briefly go through sounds, words, but we will be spending most of our time at the level of sentences.

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## TOPICS

- What is linguistics? Domain/branches of linguistics
- What is Language? What is scientific about the study of language? How many languages does India speak? Language vs. Dialect
- Competence and performance --- Form and Function
- Biological Foundation of Language; Critical period hypothesis/ Mother tongue/ First/ Second/Foreign/Heritage Language
- Generative Foundation of Language Acquisition; Language Acquisition Device; Universal Grammar;
- Structure of Language around Sounds, Words, and Sentences; Constraints on Word Formation; Introduction to Morphological Rules; Order of Words in Sentence (Subject-Object-Verb);

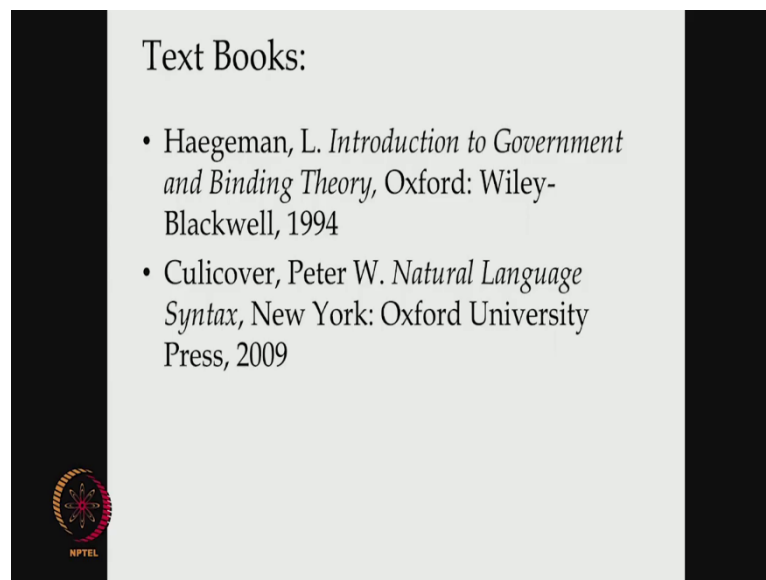


- X-bar Theory (Specifiers vs. Complements, Arguments vs. Adjuncts);
- Theta-Theory; Theta Role Assignment;
- Case Theory (Abstract, Inherent, and Morphological Case, Exceptional Case Marking, Nominative-Accusative vs. Ergative-Absolutive patterns);
- Binding Theory (Conditions A, B, and C, Role of Structural Relationships such as C-command, Locality, Binding Domains);
- A-Movement (Raising Movement, Distinction between Raising and Control (PRO and *pro*), Movement in Passives, Case as Motivation for Movement);
- A-bar-Movement (Wh-Movement, Constraints on A-bar Movements, Subjacency and Empty Category Principles; Argument-Adjunct Asymmetries in Movement);

Again, I have tried, I have listed some of the topics that we will be discussing, you are more than welcome to take a look at these topics. There are 12 of them and again, I am going to send you these topics and we will stick to these topics. I will try to cover each one of them in a week. So, far I have a design for 12 or 13 weeks, I have kept 1 or 2 weeks free. If we need more time to spend on a topic. We should have scope for manually.


So, we will begin with general things like what is Language and linguistics and how do we study them? How we learn a language in the first week and then we go on and on to look at it. In the second week or so, we look at language at the level of words and sounds and words and then soon after, we will be going at the level of sentences. So, these are the 13, 12, or 13 topics that will be looking at.

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Text Books:

- Haegeman, L. *Introduction to Government and Binding Theory*, Oxford: Wiley-Blackwell, 1994
- Culicover, Peter W. *Natural Language Syntax*, New York: Oxford University Press, 2009



These are the two textbooks, which we will be using for this course. I have not listed them in chronological order. Culicover's book is more recent that was published in 2009. However, I have put them in the order of priority. A more important book for this class is going to be Lillian Haegeman's book, what is known as introduction to government and binding theory.

It is a voluminous book, it should be available online, too. However, both the books are available in the library, please try to, last year or sometime somebody had sent me a link of this thing available online. I do not have that link ready, please find it out for yourself and if you find a PDF link for either one of the two books or both the books send it, send that to me too. But whether you need a hardcopy or softcopy do get hold of these books, these are the two books we will be using for this class.

And most of the topics that I have shown you and that we are going to be discussing, you will find in these two books. So, let us look at some of the preliminary things that we started discussing with the names of this course, and even before I look at these things, I wanted to ask you this question.

What do you think? What were you looking forward to? When you walked into this course, when did you register for this course? What do you think? What did you think you will be learning? And again, if this was your first-year class or second year, I would have framed this question differently. But let me ask you this question directly. Since you have gone through several classes, can I get some of the responses? What do you think you were expecting when you registered for this course?

Did you have any idea when you registered for this course? What will be this course about? What are your majors? How many of them, how many of you are from electrical engineering? Computer Science?

Student: ((??)) (8:05)

Professor: Nobody?

Student: Only Mechanical?

Professor: So, electrical engineering and mechanical? Nobody from computer science. So, and the rest of you are from mechanical engineering,

Student: Yes.

Professor: Alright.

Student: Aerospace

Professor: Aerospace and others. Anybody else from any other departments? No aerospace, electrical engineering, and mechanical engineering. You may conclude with these three or anything else, so now I am still waiting for your response or you were just, how do you get into this kind of class; do you choose or you have been sent?

Student: Choose.

Professor: You have chosen this class, then it is a more relevant question. So, when you had an option to choose for this class, I am not asking you why you chose this class. That is not

important. That is not very important. After you chose this class, what did you think you will be learning in this class?

And please do not tell me the things that you have seen in the slides. Just tell me what you thought. It cannot happen. You know why I am asking you this question. It cannot happen that you did not think this is not a class on advanced applied mechanics or some obscure topic of either electrical engineering or mechanical engineering.

This is something different from what you do in general, what you do or what you have been doing regularly. I am only trying to repeat my questions again and again. Please tell me. No, you did. Are you saying that you did not think about anything? You thought about...

Student: Tokenization and stemming of words.

Professor: Tokenization and stemming of words. That is, how words are built.

Student: ((??)) (10:25) something related to computer science.

Professor: Alright.

Student: Processing natural language.

Professor: Processing natural language, someone else?

Student: More about natural language ((??)) (10:39)

Professor: That is how we learn language. Anybody? Anybody else?

Student: How languages are evolved over the time and how are natural language ((??)) (10:52)

Professor: How is natural language considering, more, no?

Student: I find English pronunciation difficult to navigate through, so I think I can understand the nuances of pronunciation through this course.

Professor: Alright more, no? I get an idea. However, before I begin saying something, I must tell you, you will be, you will need to speak. Despite the cameras around, I will make sure that you speak. It does not happen that you do not speak and I continue giving you a monologue from here.

Like I said, this is going to be something new for you. Something that you do not do on your regular schedule. So, it is important for me to make sure that you understand what I am

saying. Only then we move together, we move further together, there is no point me going one, going from one topic to the other, without taking you together.

That is one of the things which is going to be important for me and I will try to make sure I will need your help. The reason why I am talking, I am saying this is, I will need your help for that. So, please talk and let me know that you understand, not only on quiz one, quiz two, and final exams, on a regular basis, so that we move together.

I will, the things that you mentioned, we will be talking about all of them. For sure, and I am positive, even though we are not going to be talking about directly, talking about how to improve your vocabulary or pronunciation directly, it is going to go, if you pay close attention to some of the things that are going to help you for sure.

And also, it is required for me to tell you most of the things that we are going to be discussing here are going to be helpful in understanding how natural languages are processed through machines. But how we had words in a smaller piece we will be talking about that from the perspective of natural language, but not from the perspective of processing in a machine.

So, that will be left to you to use how, what do you learn here and how you use them for processing them in machine. Let me say a sentence or two about that. I have been interacting with many people, not a lot of them who are working on this campus on natural language processing, but in other places.

And to tell you the truth, honestly, I have not worked on natural language processing. Myself, however I know about the field and I am familiar with the discussions in that field. We deal with natural language and when it comes to the use of understanding how language works. I am using a broad term, how language works and application of all that to make an intelligent machine you, I think you understand what we mean by intelligent machine and as you know, in the last not even 20 years, 15 years or so or even 10 years.

If you look at machines 10 years ago when you look at machines now, we definitely find much more intelligent machines, beginning from a mobile phone to a camera or computers. In all these things, the contributions of computer scientists, people working on natural language processing and to be modestly acknowledging people working with natural language as well.

They have a huge contribution in that however, when it comes to the interaction between language and machine, as you know, languages work with artificial, machines work with

artificial languages. One of the goals of scientists and particularly computer scientists and people working with language, whether we, whether they are working on natural language processing or natural language itself or machines in general computer scientists.

One of the goals in modern time, has been a goal for last 50 years and it is going to continue for another 50 years or I hope until people have achieved that, to design a machine which works the way humans do, particularly with a machine that works the way the human mind does, we will be taking up a couple of topics to see how human mind works.

And as a matter of acknowledgment, we do not have machines that work like human minds, we do have machines that work to a great extent, we can, we can press one on phone or say one on phone and the machines are capable of transmitting that verbal signals into electrical ones and transmitted to another machine and get you some more information, more relevant information.

We have seen this thing in a variety of ways in our lives nowadays, this has changed, changed many industries. However, we need people to work on that a lot and probably I will talk about a couple of topics of that too. But mostly we will be moving around natural language and how that works. How we learn and what it is in a way.

So, let us start with this, with a couple of fundamental questions and these are whether we are talking about principles and parameters of natural language or any course related to language. These are some of the elementary questions we need to understand and answer. Have you heard the word linguistics? What does it mean?

Student: Study of languages.

Professor: Study of languages. Now, we will refine that in a moment. But you are right. Anybody else? I think that is about it. That is in short, it means it is a discipline, which studies language. We will talk about language in a moment. If I ask you a question, what is the difference between language and languages?

Besides being, besides the distinction between singular and plural, what does it mean to you? Language and languages. Like we understand the distinction between artificial language and natural language, at least on the first day of this class, I want you to understand the difference between language and languages and then it will make more sense when we discuss things further, any idea? No, if I ask you, how many languages do you speak? What is going to be the answer? How many languages do you speak?



Student: Three.

Professor: What is your name?

Student: Manoj.

Professor: Manoj, Three.

Student: I Speak Three languages.

Professor: Such as?

Student: Tamil, English and Hindi.

Professor: Tamil, English, Hindi, you?

Student: Two.

Professor: And your name? Ali. And they are?

Student: English, Hindi.

Professor: Okay.

Student: Four.

Professor: Four, and your name is?

Student: Prashant.

Professor: Prashant and the languages are?

Student: Hindi, Tamil and Telugu.

Professor: Hindi, Tamil that is only Three.

Student: English, Hindi, Tamil and Telugu.

Professor: English, Hindi, Tamil and Telugu.

Professor: Great, is there anyone here who speaks just one language? Should I take it as no? Do you know anybody? These are very general and broad questions that I am asking you and I asked you not just like that. I do want you to think about these things as well. Do you know anyone who speaks this one language?

Student: Yes.

Professor: Yes sure, who do you know, who do you think speaks just one language?  
Somebody said yes this says you?

Student: My grandmother speaks only one language.

Professor: Your grandmother speaks just one language. Which is?

Student: Telugu.

Professor: You?

Student: I speak English, Hindi and Telugu.

Professor: English, Hindi and 3. Anyone else? Who knows someone who speaks just one language?

Student: Animals.

Professor: Animals, is that what you said and your name sir?

Student: Pawan.

Professor: Pawan, which language which animal do you know, which speaks just one language? Tell me the name of the animal.

Student: ((??)) (21:02)

Professor: You just can say anything? Every line, every animal? Deer, I mean you have talked to themselves. So which language do they speak? I am not, please do not get me wrong. I am not trying to make fun of you. Just generally asking which language do they speak?

Student: I do not know.

Professor: You do not know. But you are sure? If you do not know, then how are you sure that they speak just one language?

Student: It sounds the same, ((??)) (21:31).

Professor: Sounds same, it is interesting do you understand, understand this thing. Which simply means we need to understand, at one point, the difference between how humans talk or communicate or maybe how animals communicate. Are there similarities between two types of communication system? Are they totally different?

At this time, it will be safe to assume that they are different, because we do not understand. Do we, do you understand what they say? They sound like all the deer that you find on this campus or anywhere else probably they sound the same. But do they sound like us? So, there is definitely a difference between us and them.

So, that will be one of the things. At one point, I had that topic listed as the difference between human and non-human communications. But I deleted it, however, I will talk about that at one point in time. So yeah, go ahead?

Student: It may contain the body language, like just gestures.

Professor: The human languages too, sure definitely, so we can restrict that further by verbal language or when we say natural language, that the verbal part of it is embedded in that sign language or body language, or well of course, we have ruled out artificial language or my point is other types of communications are out of it.

Now, body language, sign language, all of them are also part of the language that we speak. It is not that if we speak a natural language, we do not use body language or we do not use symbols or science, they are all together combined. However, A, we will be talking about only the natural language part of that and B, there is no denying the role of sign language or body language in our communication system.

They play a huge role, huge, huge role in that. In fact, I have studied something which is not very authentic scientific research, it says when we talk to one another, more than 50 percent of communication comes from nonverbal means, more than 50 percent of what you understand out of that communication comes out of nonverbal part of it.

And I am being modest in saying 50 percent they go all the way of saying 80. It is that difficult for me to understand a little bit and then there is another professional ethical problem, that if only 20 percent comes from natural language, then are we spending that much time on just 20 percent of it? That does not sound right.

But nonetheless, that is a very interesting conclusion. So, as you see here, coming back, we speak several languages and if I take a summary of that let us say Hindi, English. English is definitely part of everybody's answer, Hindi may be part of a lot of people's answers. Tamil, Telugu and maybe a few more languages either as a replacement of these two or in addition to these two, am I right.

Now, when we say let us say four-five of these languages, I will come back to more questions more related to that later. Are there similarities between these languages? Now we are talking about Hindi, English, Tamil, Telugu, Malayalam. Hindi, English, Tamil, Telugu, Malayalam and any other language represented here.

Student: Kannada.

Professor: Tamil, Telugu, Malayalam, Kannada, Hindi, English, anything else?

Student: Marathi.

Professor: Marathi, very nice. Anyone else? Speak fast, anything else? Just that is not important for me to figure it out at this time. Just generally curious in the names. Punjabi, anybody? Rajasthani, Marwari? No. So, any? Do you find anything similar in these languages? You do not, we do not have time to answer for that question. We will answer this question slowly later. Are these languages different from one another? Yes.

Student: Yes.

Professor: Very different. So much so that a Telugu speaker may have difficulty understanding Malayalam or Hindi speakers definitely have difficulty understanding Tamil. At the same time Tamil speakers understand either Kannada, Malayalam or Telugu or any other language. My point is that there exist differences among languages.

At the same time, there are similarities among these languages. When you hear someone speak Hindi or Tamil and you are not the speakers of these languages, you will definitely find something familiar, even though you do not understand much, is this point clear to you? Now, I will stop by making two points and then we will continue with the rest of the things later.

The two points that I am trying to make is which are related to the other two, other part of the title of the course languages that we speak or for that matter that anyone who speaks in the world, we are not only talking about five-six languages, we are talking about all the languages of the world that people speak.

There are similarities among all of them, all of them at one level or at many levels are similar to each other, the way they are similar to each or the reason why they are similar to one another is because they follow certain principles. So, that is the principal part of language and the differences that you find among languages they are, they are located around parameters.

Because there are a lot of parameters, parameters differ between one another, therefore they are different from one another. So, the principles and parameters part means, principle and parameter part mean the following, languages are similar to one another, following certain fundamental principles, following certain universal principles.

At the same time, along the lines of certain universal parameters, languages are different from one another. It is a natural question that comes to mind when we talk about language . If the purpose of language is to talk or communicate, wouldn't it be easier and nicer if all of us spoke just one language?

Then for the problems that a Hindi speaker may interact with, while talking to Tamil speakers or vice versa, would not exist. We do not have to learn English we do not have to worry about pronunciation. We do not have to worry about many things. Even though that will be easier, we do not have that.

Then naturally the question comes, which you are asking about the evolution of language? Why do we speak so many languages? If that creates some or many kinds of difficulties, or I do not want to say confusion with difficulties, then why do we speak so many languages? Get this question.

So, I just want to give you these questions to think about them and we will answer some of them, a lot of them over a period of time. Just the other part of that? Yeah, one more in the next one minute, I will wind it up. That there is a difference between the two words that I told you language and languages. When we say language, we are talking about common things among all the languages.

We are talking about fundamental principles of language; we are talking about the underlying system of languages. For example, a lot of you are mechanical engineers, from applied mechanics. If we say car, what is the fundamental principle driving all the cars beginning from Tata Nano to Rolls Royce or Mercedes or any other cars that you know? What is the fundamental thing? Fundamental thing that is common among all of them?

Student: Combustion.

Professor: Combustion. I expected that answer from you. Besides steering and other things. That is not an answer we expect from engineers. So, an auto combustion engine is the fundamental thing. Without that principle, we do not have a car, we do not have a machine

that drives a vehicle. So, like you find something common among all the cars, when we say cars, we do not mean Mercedes or Tata Nano.

And I am giving you these two names, only for two extremes. I am not talking about the value of cars. In short, similarly, when we say languages, we mean all these names that you have mentioned or many others, that we have not or that we do not even know the names of.

However, when we say language, we mean fundamental underlying principles, all the languages of the world. I have already drawn your attention to the fact that such things are called principles underlying language, we will be discussing that. So, is this making sense of the difference between language and languages, the difference between artificial language, and natural language, and to some extent, things that we are going to be doing and so we stop here.