Phonetics and Phonology: A broad overview
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Lecture 1
Articulation of consonants 1

Hello. This is one of the courses of the NPTEL massive online open courses. This course is on Phonetics and Phonology and it is a broad overview of Phonetics and Phonology.

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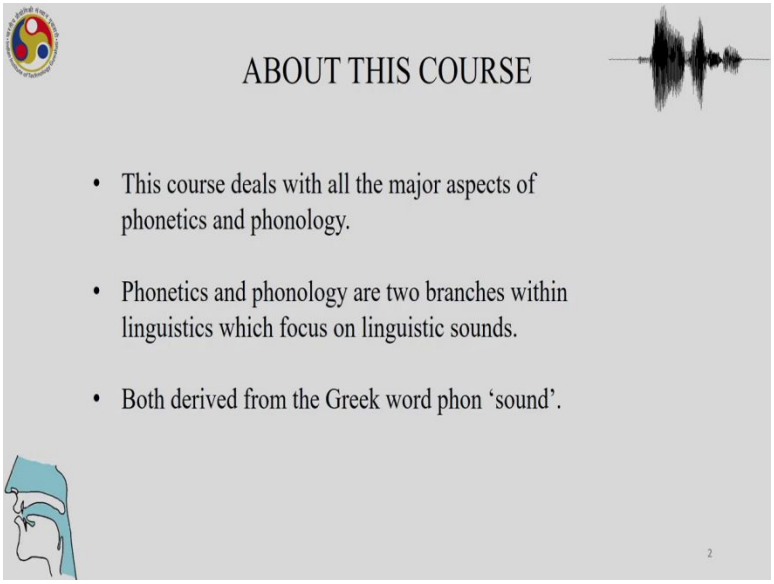

So, this course deals with all the major aspects of Phonetics and Phonology. And Phonetics and Phonology are two branches within linguistics which focus on speech sounds, linguistic sounds. And both are derived from the word phon that is sound.

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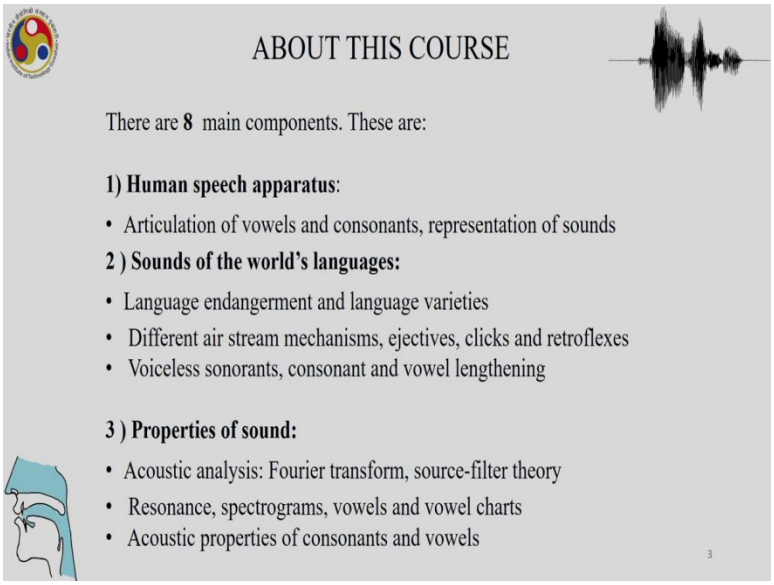

And as we have already discussed in the introduction these are all the components of this course – we will talk about the human speech apparatus, we will talk about the sounds of the world's languages, the variety that we see across different groups of languages and we will also discuss in great detail about the properties of sounds and also give you a basic overview of speech perception.

And also talk about Phonology which is about identifying Phonemes, Phonological Analysis and we will talk about Phonetics, Phonemics and Phonological Rules and also talk about diversity in terms of tone languages and also one of the components of speech that is intonation. We will also touch on the prosodic aspects of sounds. And this is your first class on Consonant Production, and we will also give you an overview of sounds before we delve into Consonant Production.

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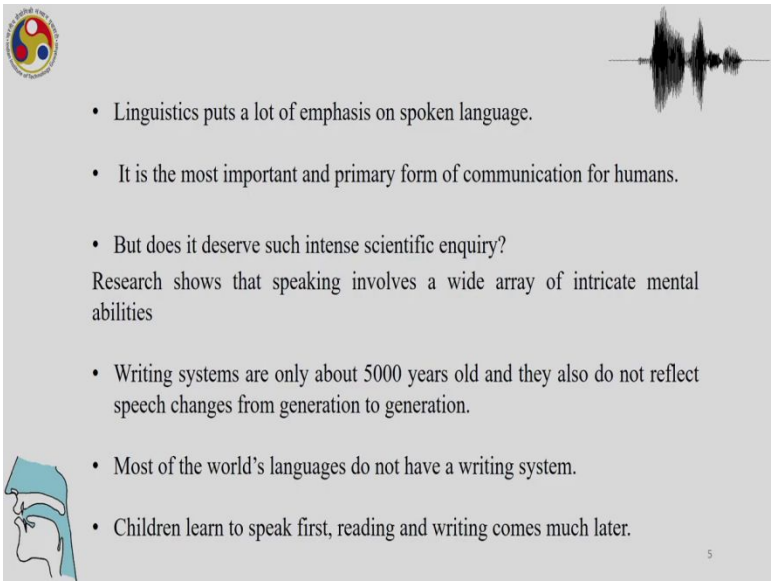

So, linguistics as a discipline puts a lot of emphasis on spoken language. It is the most important and primary form of communication for humans. But does it deserve such intense scientific enquiry is a question. And research shows that speaking involves a wide array of intricate mental abilities. And writing systems are only about 5000 years old and they also do not reflect the speech changes from generation to generation. Most of the world's languages do not have a writing system and children learn to speak first and reading and writing comes much later.

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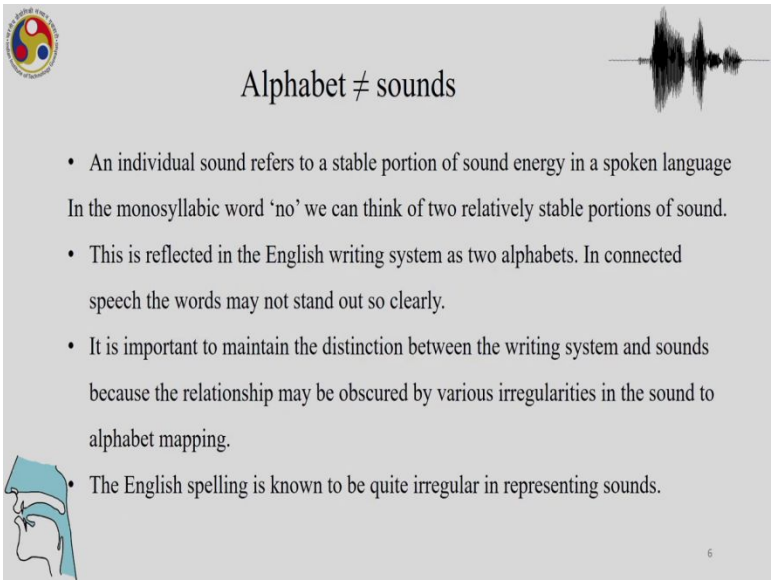

Also it is important to remember that an individual sound refers to a stable portion of sound energy in a spoken language. For instance, in a monosyllabic word like ‘no’ or ‘do’, we can think of two relatively stable portions of the sound. That much is pretty clear and transparent. However, it may not be always so. And this is reflected in the English writing system also.

And in ‘no’ and ‘do’ for instance or so you can see two alphabets. Firstly, in connected speech the words may not stand out so clearly. And also it is important to maintain the distinction between the writing system and sounds because the relationship may be obscured by various irregularities in the sound to alphabet mapping. And when we are talking about English, it is important to remember that the English spelling system is quite irregular in representing sounds.

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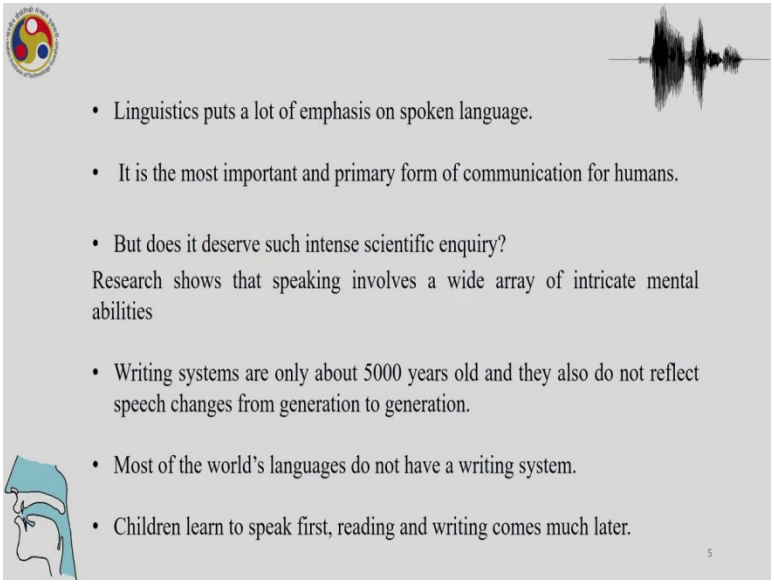

So, what we had said a minute before that writing systems are only about 5000 years old and they do not reflect speech changes from generation to generation is important to bear in mind when we come across some irregularities like that in English, because that may also be a result of speech change and sound change from one generation to another generation. And most of the world’s languages do not have a writing system and also children learn to speak first.

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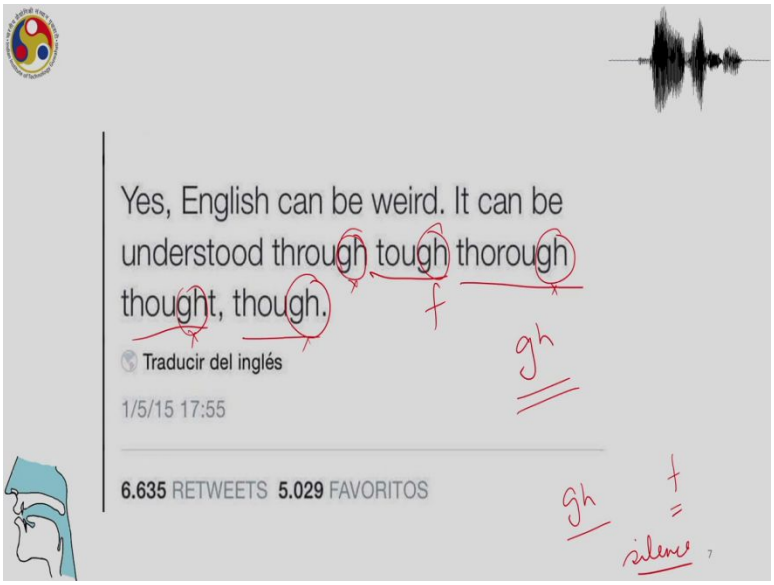

Now coming to irregularities, here is a tweet that I thought you might find interesting to follow- "Yes, English can be weird. It can be understood through tough thorough thought, though." So, what is noticeable here is that we are repeating a combination of two consonants. So, the two consonants which are repeated in all the words is g and h. And when you go from one word to another and you see through and tough, so in here gh, is not is silent. And in tough it is pronounced as f, in thorough again it is silent, and in thought again it is silent, and though again it is silent.

So, we can see the inconsistency here. And when you, when you think of g and h together, you think of other sounds. You do not ever think of f, or you do not ever think of silence. So, this is something we encounter almost on a daily basis if we know how to read and write in English. And this was just to point towards something, that you may one day suddenly realize that this is very inconsistent, although when you are learning the language you have to learn the spelling system without thinking of the regularities and irregularities so much.

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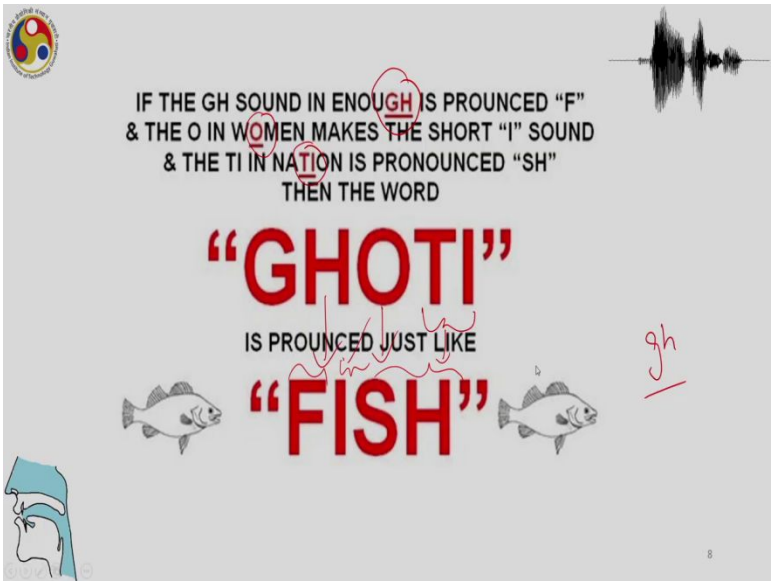

And again continuing with our gh sound combination, this is again attributed to various people. This particular saying that – If the gh sound in enough is pronounced f, and the o, in women makes the short e sound and the t in nation is pronounced as sh then the word GHOTI is pronounced just like FISH . That is if you take all these irregular pronunciations of GHOTI, then you might end up in this correlation where gh is f, o is equivalent to e, as in i this, the sound e, and ti, is equivalent to sh. So, this is again another humorous take on the irregularities present in the English language where you can see that gh, is sometimes f, and o, is sometimes e, and ti, is sh.

And of course the English spelling system is not going to change like this. It is only a humorous way of looking at the irregularities. So, coming back now to how to represent sounds of the world's languages we can talk about not just English, but we can think about all the other languages in the world. And we have mentioned in our first slide that many languages in the world do not have a writing system. How do we understand what the sounds of those languages are?

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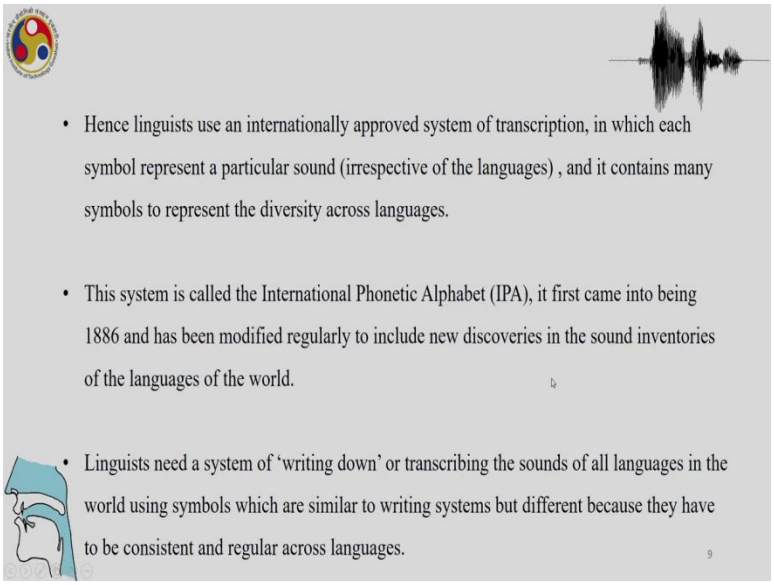

So, linguists use an internationally approved system of transcription in which each symbol represent a particular sound, irrespective of the languages. And it contains many symbols to represent the diversity across languages. The system is called the International Phonetic Alphabet (IPA), and it first came into being in 1886 and has been modified regularly to include new discoveries in the sound inventories of the languages as well.

So, now you understand that linguists have a way of representing the variety of sounds in the world's languages which we may not encounter in the most commonly spoken languages. And the sounds in those languages which are distinctive have to be represented and we have to understand, what is their manner of articulation, and what systems, what processes are involved in those in the production of those sounds.

So, linguists need a system of writing down or transcribing the sounds of all languages in the world using symbols which are similar to writing systems, but different because they have to be consistent and regular across languages. So, this is a system of writing down or transcribing the sounds of all languages in the world using symbols similar to writing systems but different. So, they are both similar and different and you will see that in a second.

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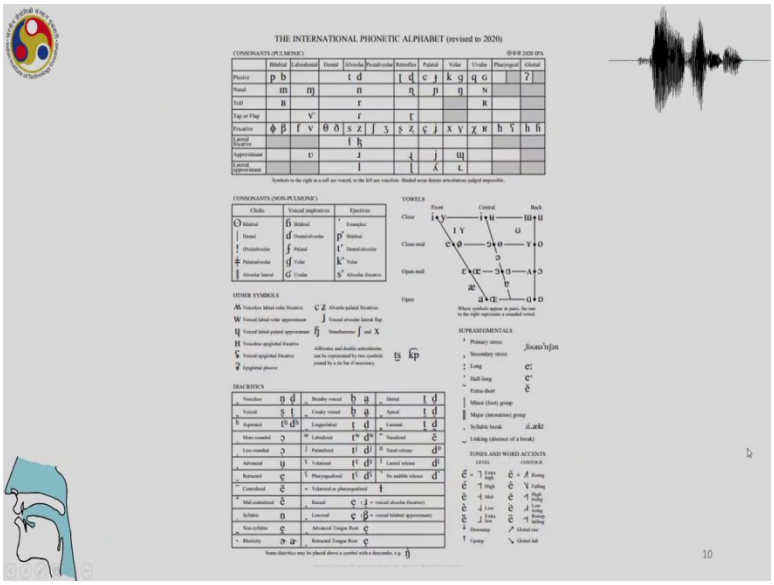

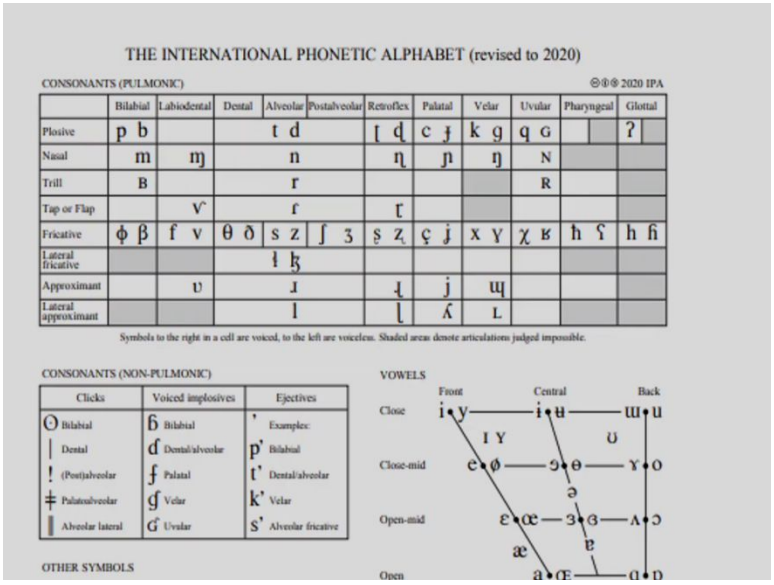

So, this is what the International Phonetic Alphabet is. This is how it looks like and I will draw your attention to the consonant inventory of the world's languages. You will see some very familiar symbols for instance p, b, here, t, d, here, k, g, here and also n, r and m, and others are from they are mostly Roman but you can see some Greek. So you can see s, and z, and you can also see f, and v. And these are symbols which represent particular ways of production of consonants which you will learn gradually in this course.

And as you move forward you will see that there are, of course, others which are vaguely familiar but not quite and there are slight differences between this v, and this one written slightly differently not written representing different sounds. And the alphabets the, the symbols are very important, they are appropriate. replication is very important because they stand for specific consonants.

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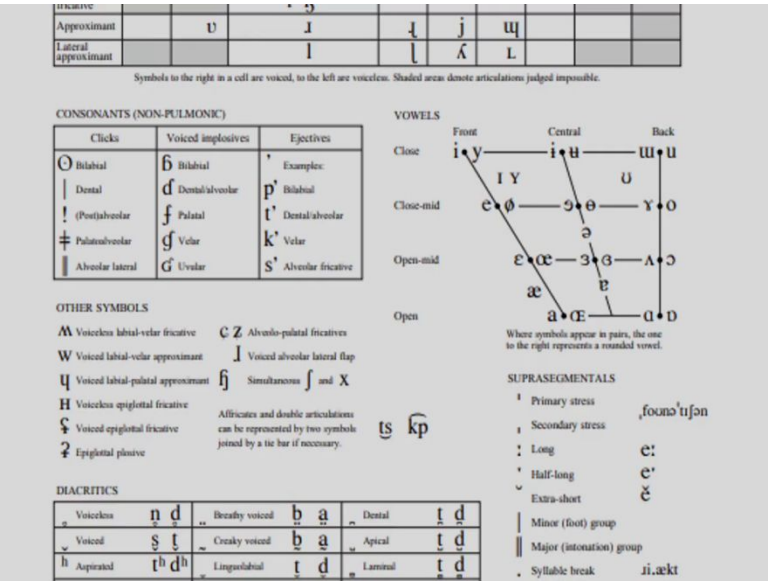

And another important thing that you may notice here is that where you see pairs of sounds, the one on the right hand side indicate the voice sound. And in this alphabet you see also sounds which are produced using the non-pulmonic air stream, and which we will talk about in great detail when you study those sounds different sounds of the world's languages.

And you also see the vowel inventory, a very precise sort of a diagram here where vowels are in pairs and we will talk about this diagram. Why do we represent vowels in this way? And why do we have pairs of vowels here? Why these symbols are here? The reasons as to why the symbols appear in the places that they do in the vowel chart. It is supposed to represent the place inside the mouth, inside the vocal tract where the vowels are produced.

So, this is a very precise diagram and it shows very precise locations. And of course these are called as the Cardinal Vowels. So, the most basic vowels and of course as we produce the vowels there are various changes from the cardinal set that is assumed in the vowel inventory.

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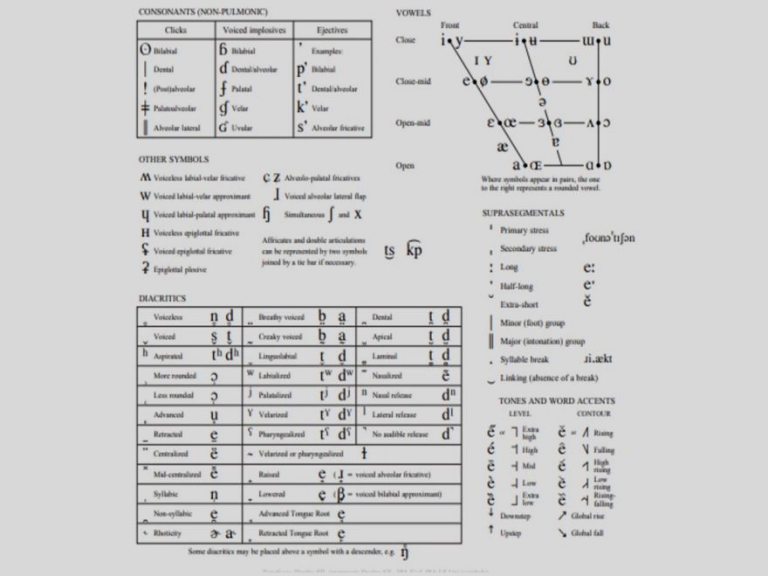

And then we have other symbols diacritics which indicate different nuances of the consonants and vowels, voicelessness, aspiration, roundedness and linguolabial, we will study what linguolabial sounds are, labialized, palatalized, velarized sounds, etc. And also suprasegmental prosodic aspects, so stress and length and syllable breaks and tones and accents etcetera are represented in this International Phonetic Alphabet which tries to be as rigorous, as much representative as possible of all the languages of the world.

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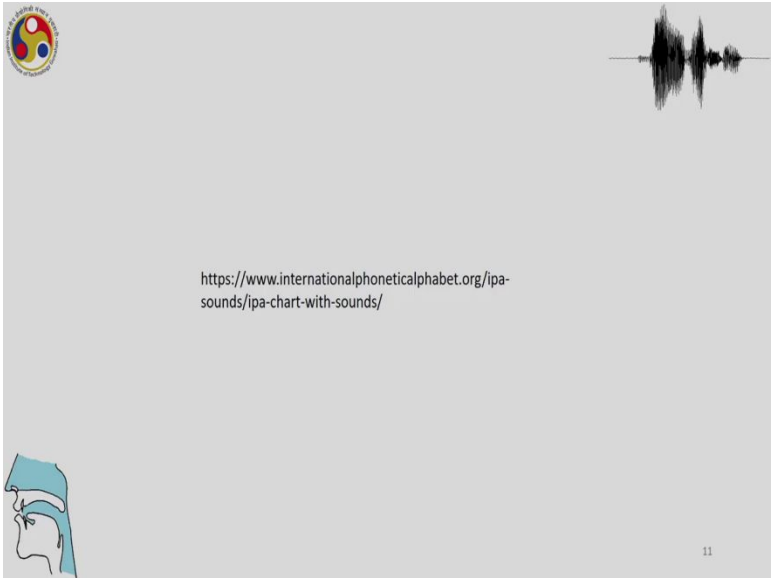

So, that is the International Phonetic Alphabet. If you want to see the ipa chart with sounds, there is this link that you can make use of. If you click on the individual sounds then you hear the way that they are produced, and following this link.

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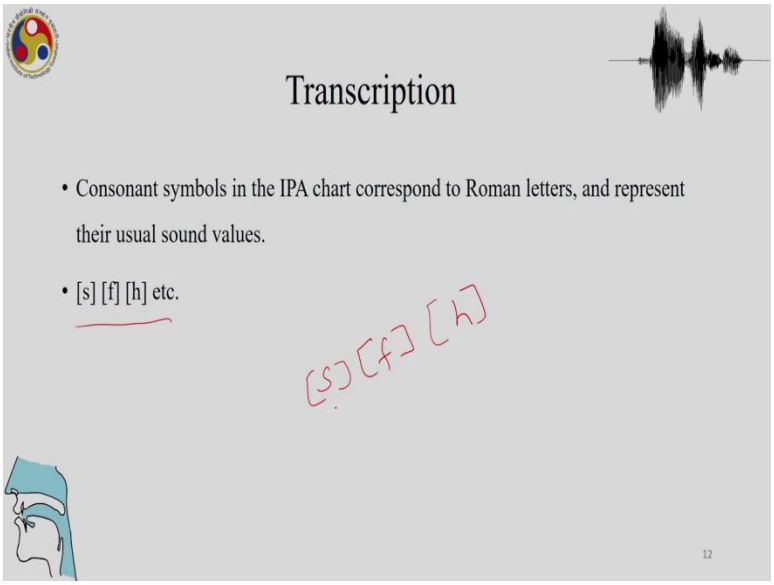

So, consonant symbols in the International Phonetic Alphabet chart correspond to Roman letters and represent the usual values. So, you have seen these symbols, and they are as you can imagine, they are what we produced them as in the Roman letters. So, this is s, this is f, this is h.

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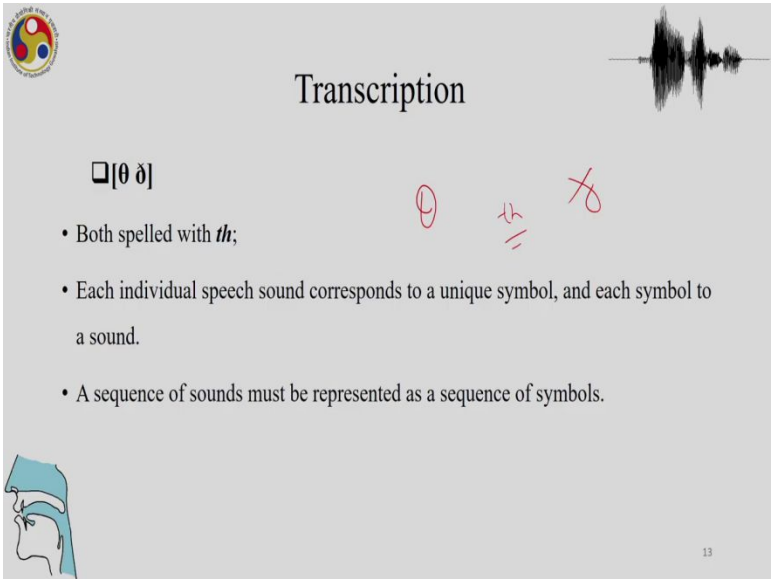

And then we have others which are not used in the Roman alphabet. So, like this one which stands for the voiceless dental fricative th and this one which stands for the voiced dental fricative. So, each individual speech sound corresponds to a unique symbol and each symbol to a sound. And a sequence of sounds must be represented as a sequence of symbols. So, every word will be represented as a sequence of symbols.

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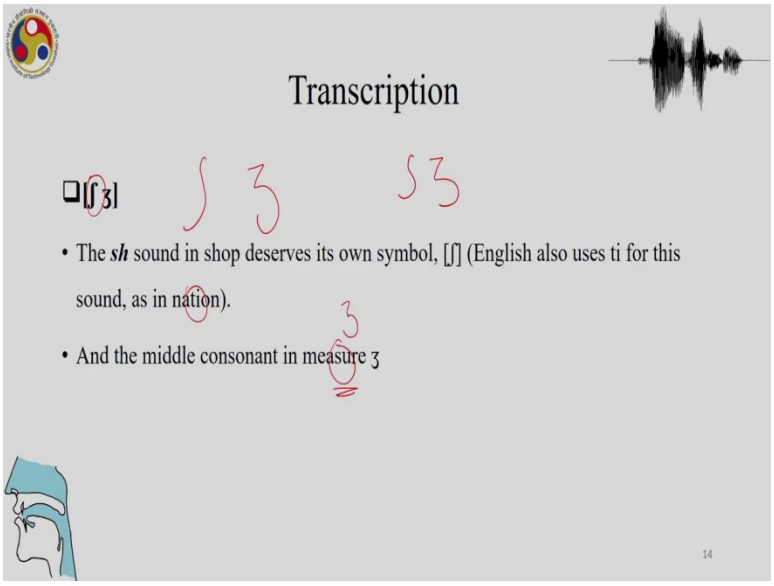

So, sh, ja for instance the sounds sha, ja, have their own symbols and slightly the sha, is this long sha, and ja is a curly. So, what are these sounds sha is as in nation sha, and measure this one is ja.

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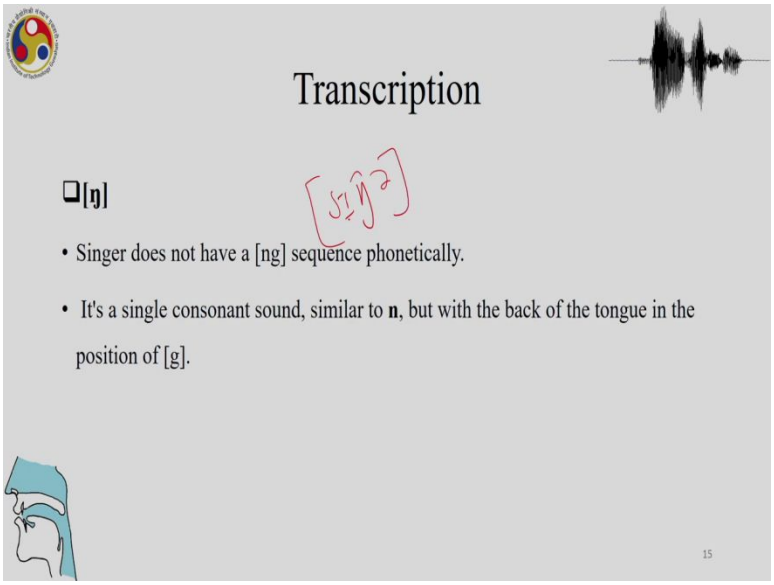

So, ng, singer does not have a ng sequence. Phonetically it is a single consonant sound and similar to na, but with the back of the tongue in the position of, ga. So, we would represent say ng like this because this is the consonant used there.

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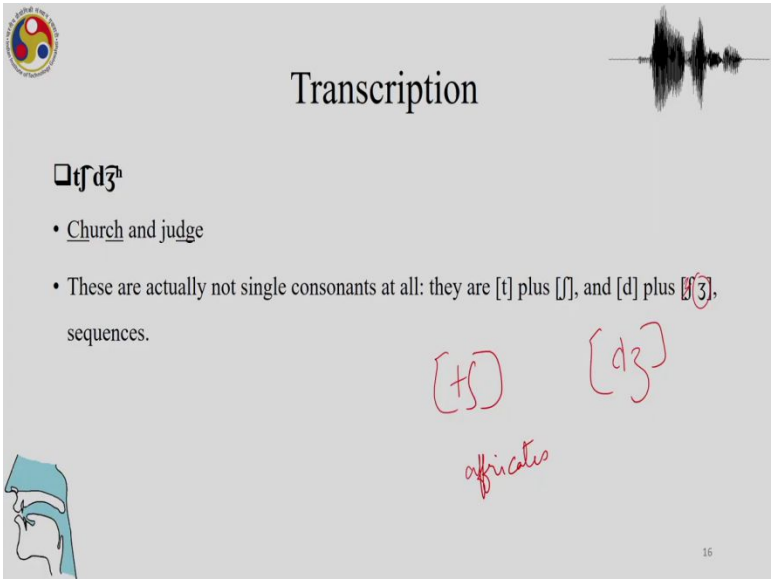

And then church and judge are actually not single consonants at all. They are ta plus sha and da plus ja in this particular. So, these are called affricates we will learn more about specific

articulation is different types of sounds in our following classes, in our following lectures and for the time being it is good enough to know how each symbol is pronounced.

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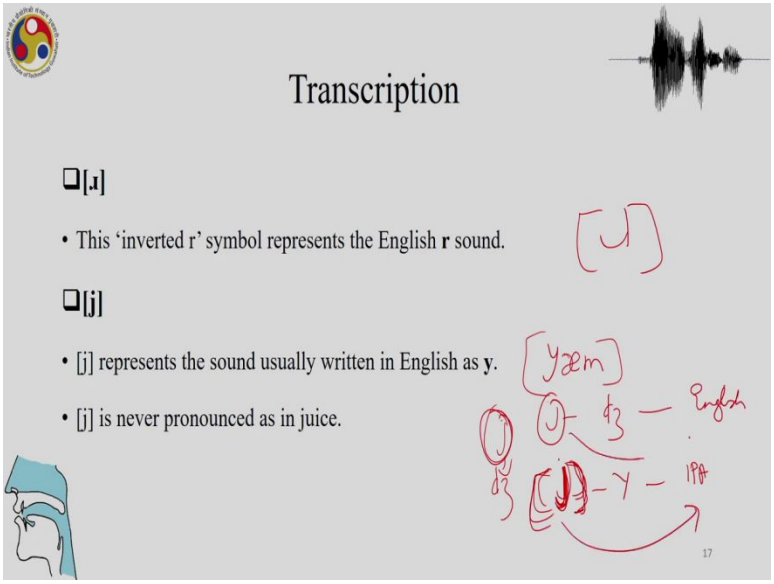

So, we have these affricates cha, ja and then we have the inverted ra which is as in the English ra and then we have ya, ya represents the sound usually which is in English y or as in suppose the word yaem. But then what we see in English as in Roman ja this is as in juice, juice this is the symbol for juice. And for ja, the ja in juice, ja in juice is not this. So, this and the way it appears in English as in ja and the ra symbol represented by this, by this symbol they are not the same. So, in English alphabet system this represents ja and not, not ya as in the ipa and this ja is English and this ya is in ipa.

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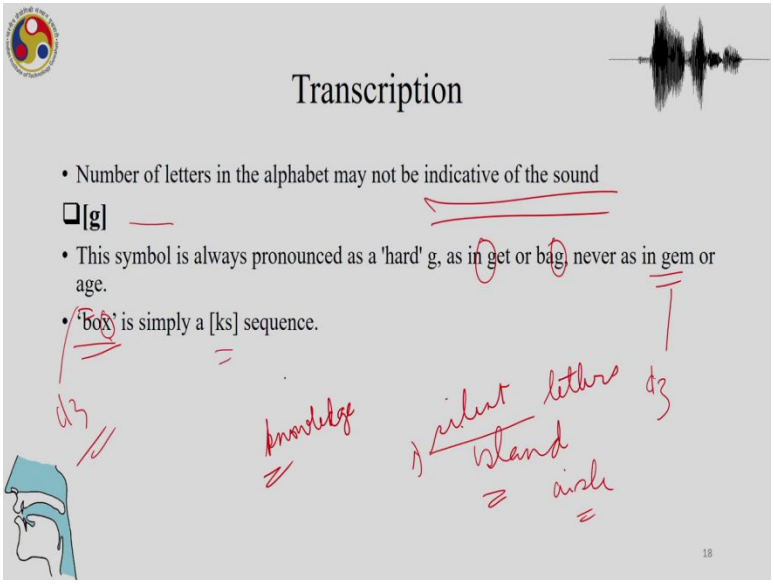

And the number of letters in the alphabet may not be indicative of the sound. So, there are many instances like that. And we have many examples for instance if we take words like island the s is not pronounced there or aisle the s is not pronounced there. And there are many such examples or as in knowledge the k is not pronounced there. So, the number of letters in the alphabet may not be indicative of the sound and may be completely silent or maybe pronounced differently from word to word.

And g this symbol is always pronounced as a hard as in g as in get or bag, but never as in gem or age. So, this symbol stands for the g that we get in get or bag and not ja as in gem or age. That is still what we, in gem or age it is this symbol ja, whereas in g it is, is in get or bag. And when you are talking about number of letters in alphabet, it may not be indicative of the sound, we talked about how we may have silent letters. And we can also have two sounds in the English orthography, we may have one alphabet as in box x it represents two sounds k and s.

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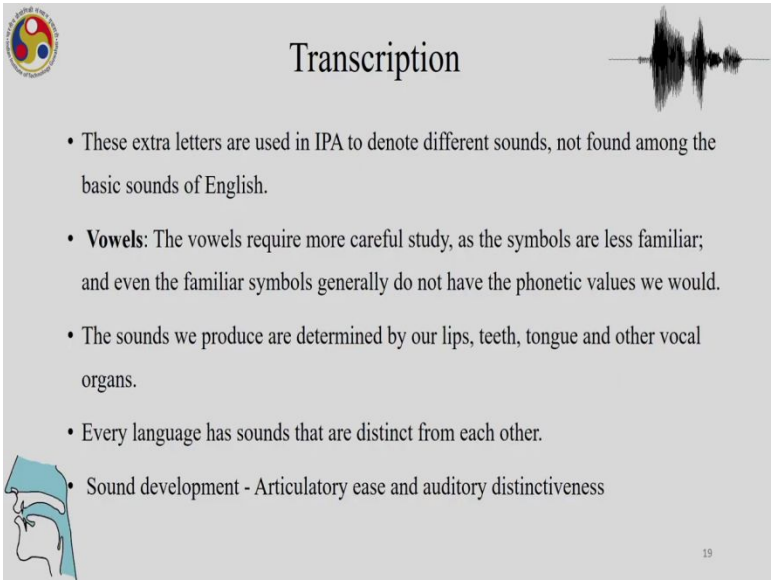

So, the extra letters used in the symbols used in IPA denote different sounds, not found among the basic sounds of English. So, the extra sounds are these like this ng and this sha and ja and sa and za. So, these are extra sounds and there are many more extra sounds they are not found in the basic sounds of English. So, what we will see in the IP alphabet is not just what you find in English but also a few symbols apart from what you find in English.

The vowels also require a lot of careful study and the symbols are less familiar and even the familiar symbols generally do not have the phonetic values we think that they would have. And the sounds you produce are determined by our lips, teeth, tongue and other vocal organs and every sound has sounds that are distinct from each other.

So, to talk about sound production which we will shortly discuss, consonant production, we have to remember that the sounds are produced by the specific combination of the lips, teeth and tongue in our vocal tract. And every language has sounds that are distinct from each other. So, that would basically make the inventory of sounds and you need an inventory of sounds of consonants and vowels so that to maximize the number of words in the language and which will constitute its vocabulary the lexicon that is required to make the sentences of the language.

And while well production of sounds may seem quite easy there are a lot of complicated mechanisms involved thereof and however in the production we have to make sounds in such a way that they ultimately have some amount of articulatory ease and in the production, the way that the hearer will hear those sounds, there has to be some auditory distinctiveness.

And even though the words that we want to produce seem to come out magically out of our mouth and there are many complex mechanisms involved and when we finally produce the sounds, the sounds that make up the words and that is heard by a listener and made sense of. They are complicated mechanisms involved right from the articulation till the part of perception and also comprehension of those sounds.

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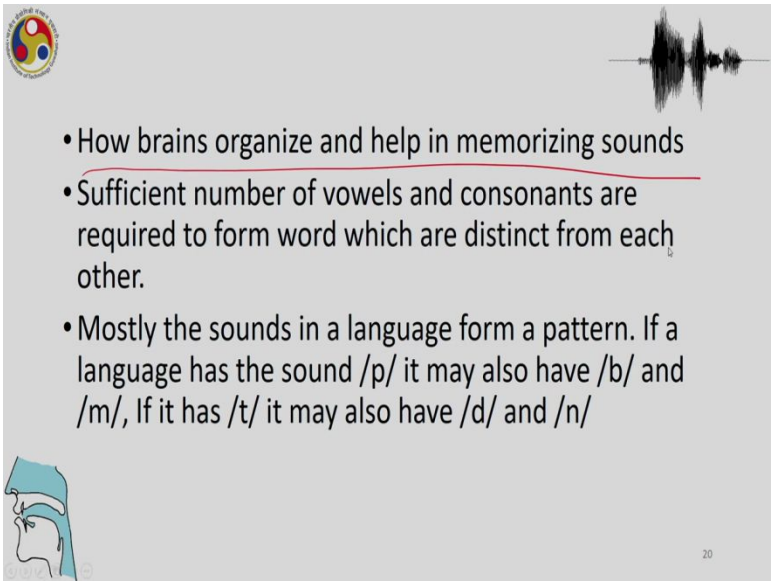

So, hence one of the important things while we study sounds is also how brains organize and help in memorizing sounds and a sufficient number of vowels and consonants are required to form words which are distinct from each other and mostly the sounds in the language form a pattern. If a language has a sound p, it may also have b, and m and if it has t, it may also have d, and n.

So, linguists have studied patterns in languages. So, if one language has this sound we may also find the other sound. So, if a language has b, it may also have p, it may have the labial. It may also have b, and m, if a language has t, it may have the other alveolar sounds d and n. They are pretty close as we will see when we learn more and more about consonant production. And all this understanding is to help us understand more about the process of how the brains organize and help in memorizing these sounds.

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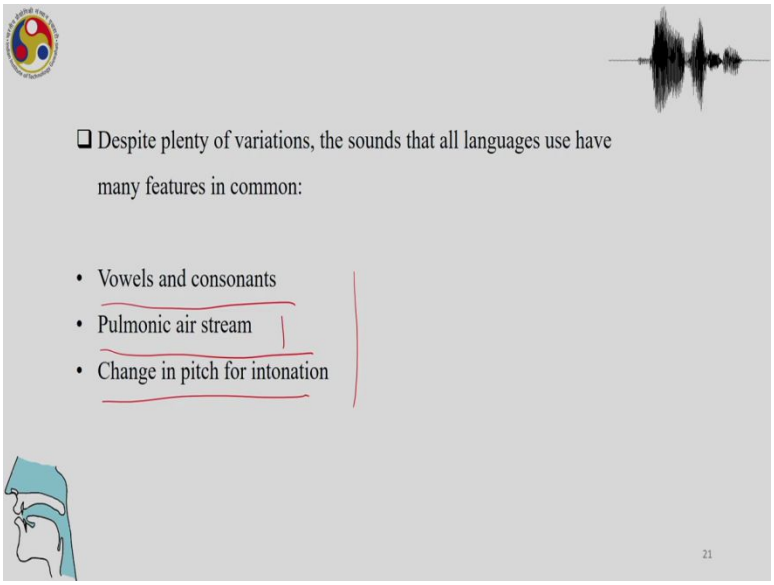

And despite plenty of variations the sounds that all languages use have many features in common and the commonality is that all languages will have vowels and consonants. So, we will make up the words of the language and it is not possible to have anything else other than vowels and consonants and also almost all languages use the pulmonic air stream, that is, the air pushed out of the lungs to make these vowels and consonants.

We will see that apart from the pulmonic air stream, the glottalic and velaric air stream mechanisms are also used by languages but not all sounds are produced by the glottalic and velaric air streams because they are sort of the more difficult sounds produced and most of the other sounds are produced with the pulmonic air stream.

And change in pitch for intonation is also supposed to be another feature which is there across languages of course to different extents because tone languages may have lesser intonation and other languages may have more intonation. But then generally to ask questions versus statements, most languages will make use of pitch distinctions to encode those differences.

Now that we have an overview of sounds, how they are represented by linguists with the International Phonetic Alphabet, that the international phonetic alphabet has symbols which may be unfamiliar to you because they are there are representative of sounds in different languages. Some may be familiar from your acquaintance with the Roman alphabet system but some others

may not be so familiar. But you have to remember that this is meant for the different languages of the world and as we know there are about six to seven thousand languages in the world.

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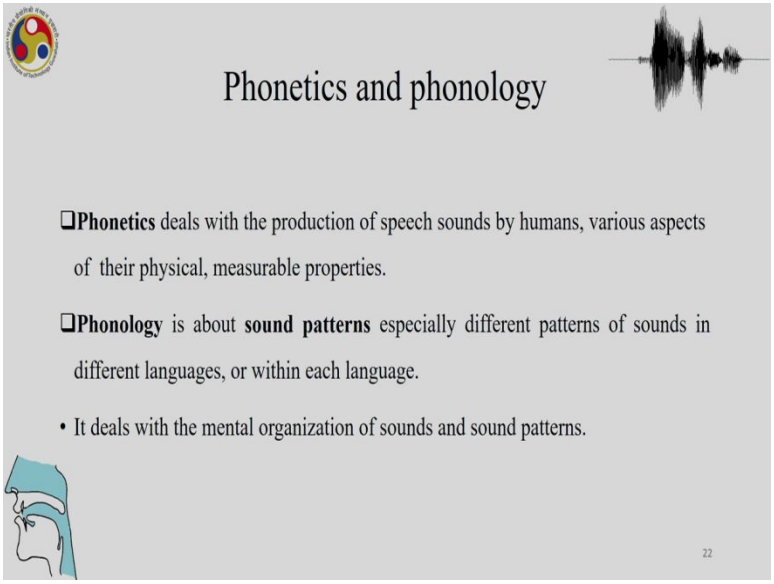

So, coming back to our main topic of this course Phonetics and Phonology, Phonetics deals with the production of speech sounds by humans various aspects of their physical and measurable properties and Phonology is about sound patterns, especially different patterns of sounds in different languages or within each language. It also deals with the mental organization of sounds and sound patterns.

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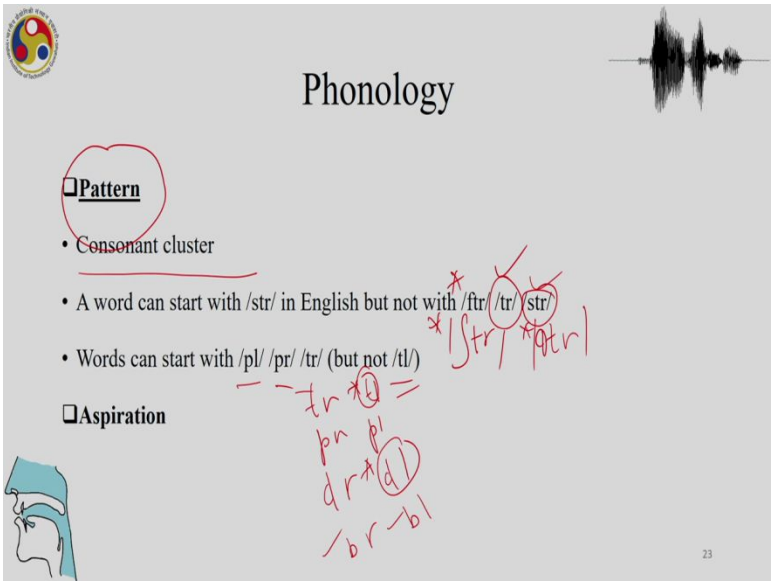

So, what is Phonology study? Let us take something that we just talked about pattern. So, let us talk about consonant cluster. A word can start with str in English but not with ftr and of course it starts with tr, it starts with str but not with ftr and not with str either not str, either. So, words can start with, pl, pr, tr but not with, tl. So, tr, is possible, pr, is possible and dr is possible. But tl is not possible, pl is possible and dl is not possible. Similarly, br is possible, bl is also possible. So, some are not possible, some are possible when we talk about consonant clusters.

Why does this happen? So, why will we not get words in English which starts with tr, but not with cla, or starts with pr, pl and dr, but not with dl, but both br and bl are possible. So, what makes these patterns possible? And similarly with regard to Aspiration, Aspiration in English is not contrastive and whereas in other languages it is contrastive. So, there are aspiration rules in English, so the word initially in stress position we have Aspiration in English but in other languages those rules do not apply because there are words which are meaningful based on the difference in Aspiration.

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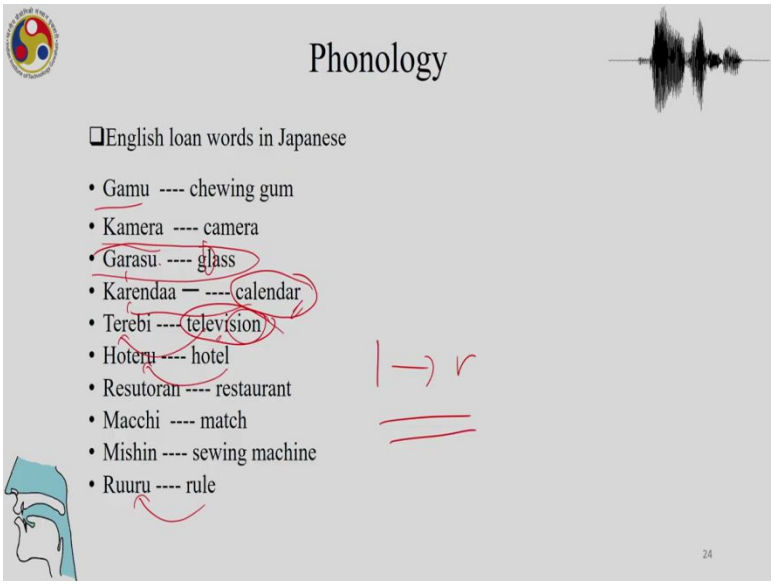

Also, in Phonology, we can understand in greater detail as to why some changes happen in languages when words are borrowed from one language to another language. So, we can see that, suppose we take these Japanese examples, very simple ones if we take the example of chewing gum which is called gamu or camera which remains kamera and but once we move to glass, we see a massive change there, la changes to ra and then we insert a final u.

And again more changes as we move on to calendar, so if we see here that la is ra and the final consonant is deleted and more complicated as we move on to television, so a part of this entire word is not there so it is called terebi and again la changes to ra and va changes to ba. And then hotel is hoteru and resutoran stands for restaurant and macchi stands for match and mishin for sewing machine and ruuru for rule.

So, something that we see consistently is the change of la to ra. So, la goes to ra in Japanese loan words borrowed from English. And we see that they are very much become like Japanese words and not English words anymore and only the meaning is derived from the English lexicon. So, why do these changes happen? So, what is there in the Phonology of Japanese that changes the English word into something Japanese.

So, we would study this in terms of how the Japanese Phonology influences the words which are borrowed from English to make them have their specific phonological shape. And as we go on to

study speech production from Phonology, that is, we saw patterns, we tried to understand why certain changes will happen if one Phonology takes over when new words are borrowed into another language say Japanese. And also you saw how some clusters for instance in English are not possible when we study those kind of organization in the mental organization of sounds, so that is the Phonology.

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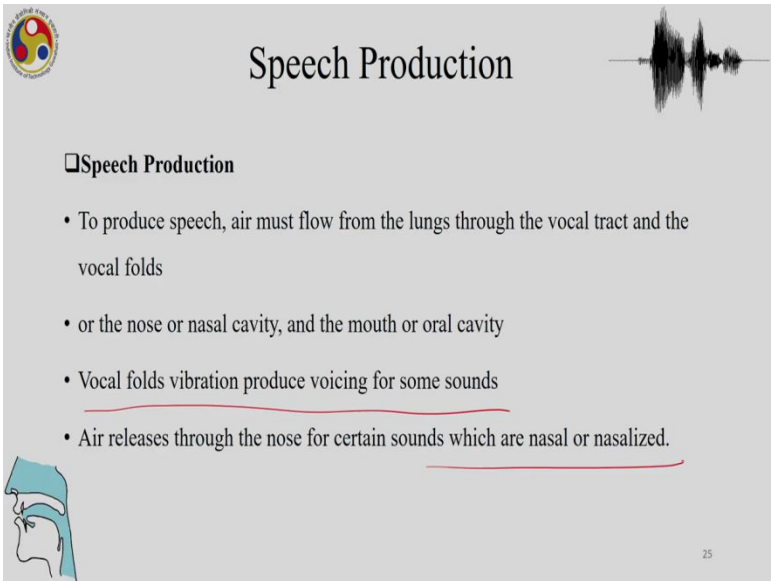

And when we move on to speech production we study more of Phonetics. So, to produce speech air must flow from the lungs to the vocal tract and the vocal folds or the nose or nasal cavity and the mouth or oral cavity. And vocal folds vibration produce a voicing for some sounds and air releases through the nose for certain sounds which are nasal or nasalized.

Now these are your ability of speech production which gives specific sounds their specific qualities for instance nasal sounds. So, air releases through the nose and that is why you get a nasal or nasalized sound. And vocal fold vibration is important for the distinction between voice and voiceless sound and this is what you would study in speech production and understand how the different distinctions between the sounds in terms of the production is brought about.

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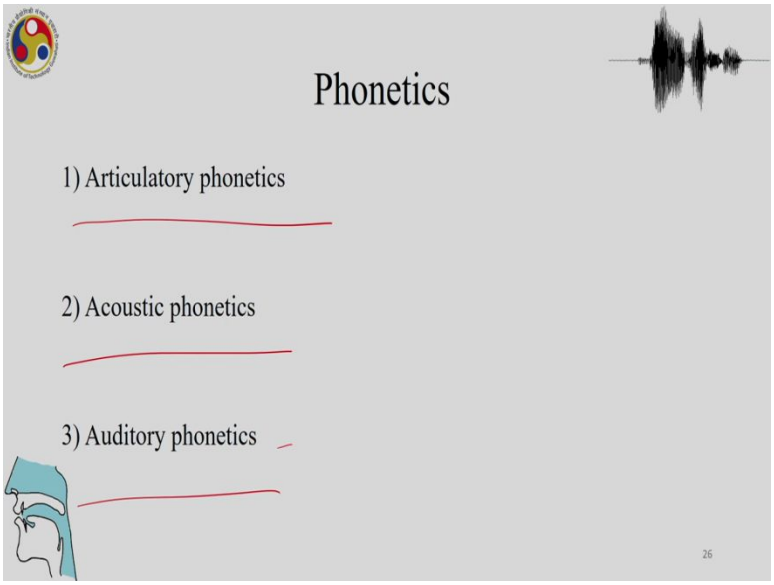

So, from there we understand that Phonetics must be about Speech Production. So, speech production is not just about passing the air through the nasal cavity or the specific production of vowels versus consonants, it involves many, many different complexities, so first is Articulatory Phonetics where you will study the production as we just saw and articulation can be also studied with various tools nowadays with ultrasound etc.

And from the imagings you can understand articulation in great detail with not just the movement of the articulators in terms of the description but also measure and see visually, and also get the images of our articulators and understand in great detail, in minute detail as to what happens when we are producing the sounds.

Now there is Acoustic Phonetics where also we study and obviously a speech but here we look at not just the articulation but also the properties, the acoustics, that is, how the fundamental frequency or the amplitude or duration, etc. are different in the sounds that we produce and apart from that we also can study more. We can conduct more advanced studies apart from just the fundamental frequency or the amplitude with many tools which are available to us.

And we can study all aspects of phonation and the changes in the f0 and what particular changes involves which particular sound and how one sound is different from the other based on the acoustics. So, while Articulatory Phonetics will tell you about the articulation, acoustics will tell

you about those acoustic properties and all of these can be studied with the use of technology. Auditory Phonetics is about how we hear sounds, the audition aspect of it and partially also speech perception is a part of Phonetics and can be studied as part of acoustic Phonetics and Auditory Phonetics as well.

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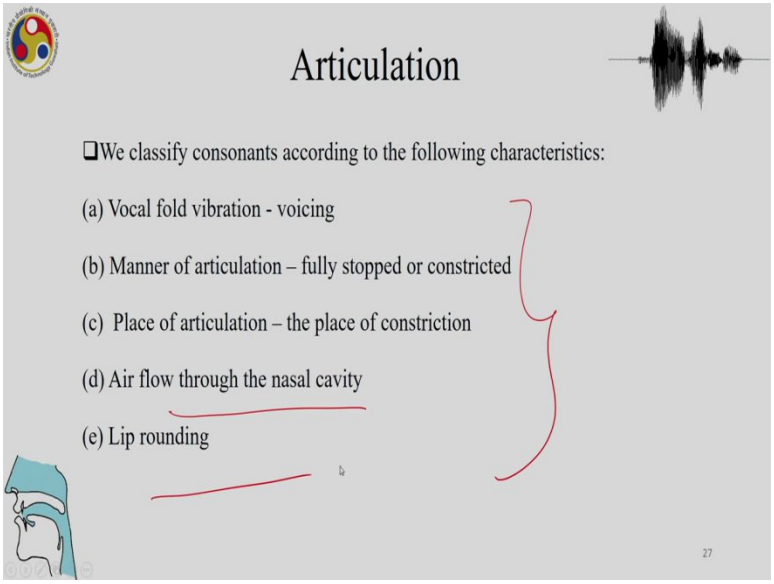

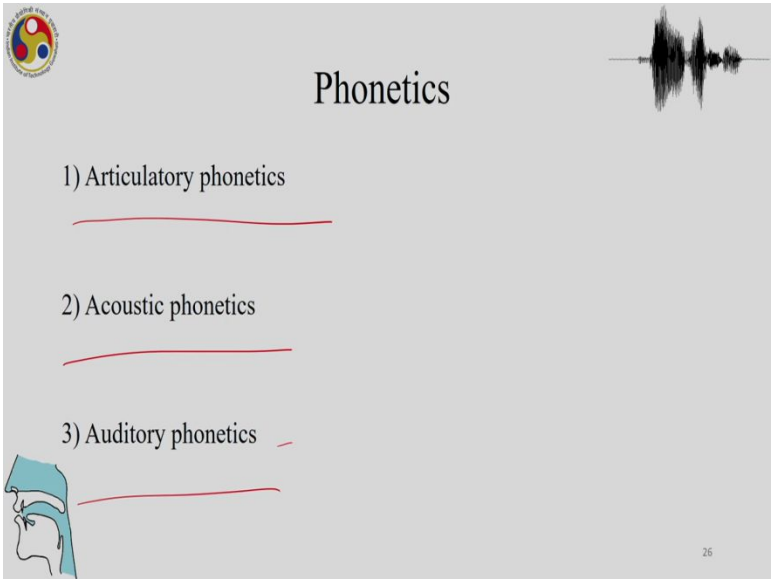

And when we move to Articulatory Phonetics there are some of the basic. These are some of the very basic things that we will study in articulation and remember that we will study not just Articulatory Phonetics, we will study even Acoustic Phonetics in quite a bit of detail in this

course. So, we now start with Articulation, let us have a look at just the very basic aspects of articulation.

So, we classify consonants according to the following characteristics, vocal fold vibration which gives you voicing differences, and in manner of articulation where you have the occlusion or what kind of constriction, occlusion that you have in the production of consonants and the place of articulation is of course the place where the occlusion all the construction happens inside the mouth and also other aspects like air flow through the nasal cavity, lip rounding etcetera which gives particular a shade through the different sounds that we are producing and all these aspects are a part of Articulation.

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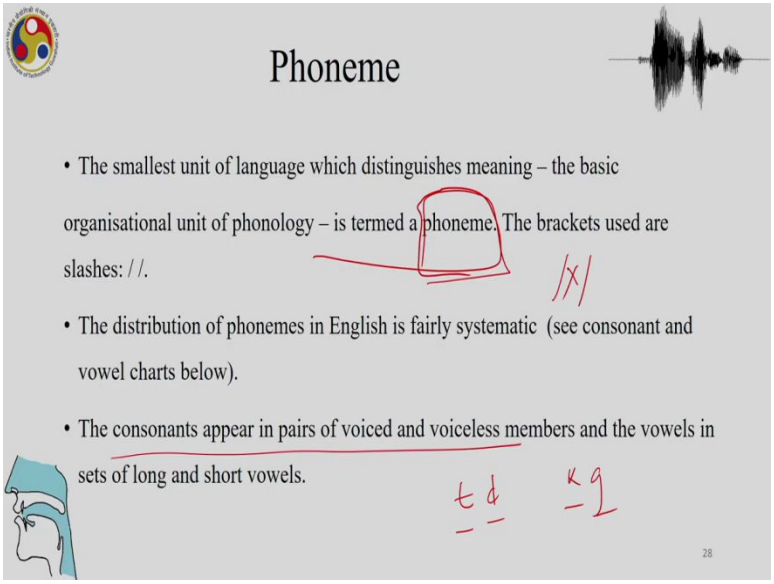

So, now we have to understand a bit about the basic units of sound as we move on to study Articulation and Sounds and Speech Sounds in greater detail. Now we have to understand this because we have to know what we are studying. We are studying about sounds but can we just take a string of sounds and try to understand them? No, but we have to know what in the sound that we are trying to understand.

If we think about looking at sound in a structured way then we have to think about the smallest unit. So, the unit that we are targeting to understand would be the smallest unit. The smallest unit of language which distinguishes meaning, we would call that the basic organizational unit of

Phonology and also in Phonetics is termed the Phoneme. So the smallest unit which distinguishes meaning and most of the time Phonemes are shown with brackets, slash, forward brackets and inside that you represent the sound and that is the Phoneme.

So, the distribution of Phonemes in English is fairly systematic and the consonants appear in voiced and voiceless members, and the vowels in sets of long and short vowels. So, that you had seen that the consonants appeared in voiced and voiceless members when you saw the International Phonetic Alphabet chart so ta, da, k, ga the voiceless, voice, voiceless, voice vowels, short, long and also vowels in the vowel chart will be represented with rounded and unrounded sets.

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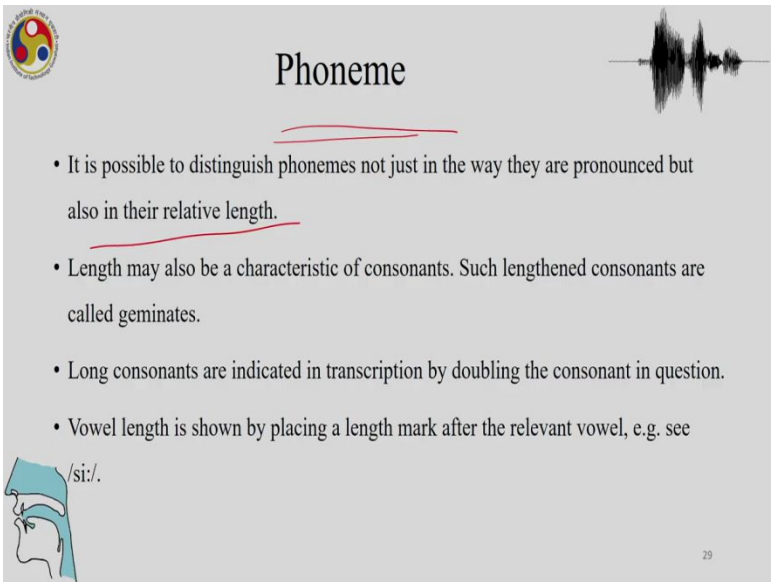

We are still continuing with understanding Phoneme which is what we call the basic organizational unit, the smallest unit. It is possible to distinguish phonemes not just in the way they are pronounced but also in their relative strength. So, what do we mean by that? The relative strength here is it means that consonants would be different in the way that they are pronounced. So, some consonants would be longer so that when the consonant release happens a bit later.

So, the strength is different there from a singleton consonant. Long consonants are indicated in transcription by doubling the consonant question. Vowels are shown by placing a length mark.

So, why we are talking about this is that Phonemes can be just singleton or can also be lengthened and that is also a feature of some languages.

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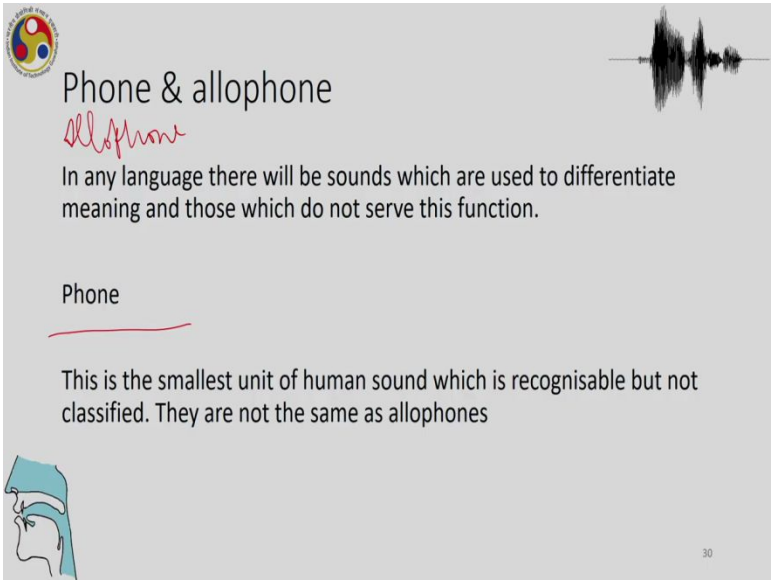

Okay, now that we have understood a bit about Phoneme as an organizational unit, as a smallest unit of representation, let us also see if there are other units of sounds that we need to know about. Yes, there are other units of sounds that we need to know about and they are called Phones and Allophones. So, what is an Allophone? In a language there will be sounds which are used to differentiate meaning and those which do not serve that function.

So, which means there will be some sounds in languages which hearers will not even know that they are pronouncing that sound differently from the distinctive sound that they are supposed to pronounce. So why does that happen? That happens mostly because of the environment in which that sound occurs and when an environment changes a sound and makes it slightly different from its basic sound then that sound is called an Allophone.

Now this might be a bit confusing for you at this moment but as we go along and we study more and more about sounds you will understand what this means. And another important term which is also used in understanding sounds is called Phone. So, what is a Phone? This is the smallest unit of human sound which is recognizable, but not classified.

And it is not classified in the sense it is not a Phoneme, it is not the basic distinctive underlying sound, abstract sound. It is the sound which occurs on the surface and it is the one that you recognize, that you identify but it is not which is probably the speaker stores it in his mind or the underlying sound from which all the other changes happens. So, generally any sound can be called the Phone if it is not an Allophone, and if it is not the underlying distinctive sound.

So, we will talk more about these distinctions as we move along we will study in Phonetics how sounds are produced and the acoustic properties of the sounds about the different sounds in the languages of the world and then we will move on to Phonology where we will study all these aspects of how sounds change in the given environment and a lot more about how morphology changes those sounds in various contexts.

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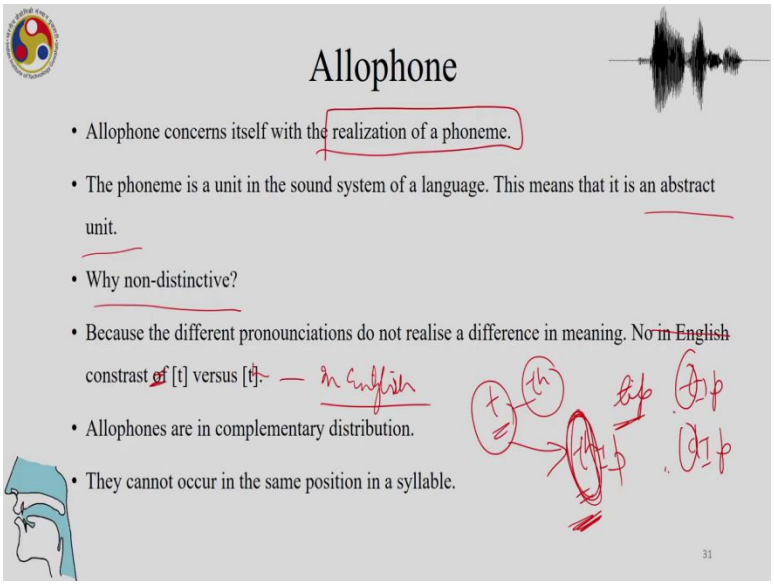

So, briefly a word about Allophone, Allophones concerns itself with the realization of a Phoneme. So, a phoneme may be realized in different ways. Phoneme is the underlying distinctive sound, the one that is the minimal unit of organization. But its realization may be different. The phoneme is a unit in the sound system of a language and this means that it is an abstract unit.

So, while the phoneme is an abstract unit the other sounds which appear on the surface have different names, for instance an Allophone and that is why the Allophone is non-distinctive. It

cannot be distinctive because its shape will be determined by the environment. Because the different pronunciations do not realize a difference in meaning and in English there is no contrast between ta and tha.

Why is there no contrast between in English between ta and tha? Because ta and tha will not make different words with different meanings in English. So, in tha will appear as the sound of as ta, let us say as the sound which appears on behalf of ta whenever there is a certain environment. Suppose the environment is that this is word initial as in the word tip. So, on behalf of ta, tha will appear because this position governs the shape of ta and makes it tha.

So, Allophones are supposed to be in complementary distribution and this is an important aspect of Phonemic Analysis which we will study when we will look at Phonology and complementary distribution because in this position it will be tha and however so, tha, is an Allophone of the underlying ta.

But when it comes to da, for instance, suppose there are two words and there are two words in English tip and dip. Tip and dip, ta and da can occur in the same position in the initial part of a word and they can mean two different things. They do mean two different things. They are completely different words but that does not apply in case of ta and tha. Because tip is just the way you pronounce it, the underlying ta.

And this is called Contrastive Distribution, this is called Complementary Distribution. Basically, ta, tha is appearing as the sound of ta in that particular environment and that is why it is Complementary Distribution. Whereas, this is contrastive because the occurrence of da in this position instead of ta will make a completely different word.

So, to understand sounds it is important to know that sounds can be distinctive, all the distinctive sounds in the language make up the phonemic inventory of that language and all the different articulations, all the different changes given the environment is, those different sounds produced because of the environment do not constitute the phonemic inventory of that language and that is very important to understand, that is why the phonemic inventory is much smaller and all the Allophones of the different phonemes can be very many.

Given that we have now had a brief introduction to what the sound is, what we are looking at, when we are looking at speech production, that is, we are looking at how phonemes are pronounced, produced and the environment will lead to a lot of changes in the phonemes and there will be Allophones and the surface production of the phonemes will be quite different. There will be Allophones, the ones which you see on the surface will be called Phones, they will not be the Phonemes.

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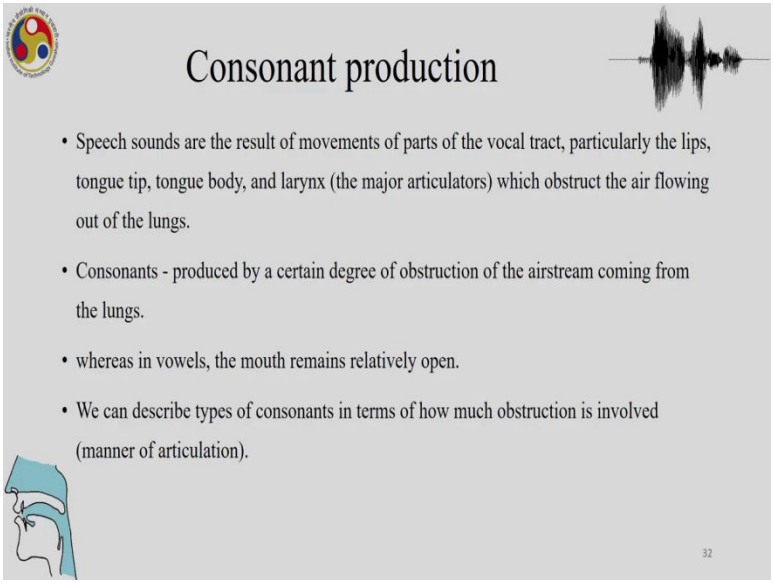

And speech sounds are the result of movements of parts of the vocal tract particularly the lips, tongue tip, tongue body and larynx, which obstruct the air flowing out of the lungs and consonants are produced by a certain degree of obstruction of the air stream coming from the lungs. Whereas, in vowels, the mouth remains relatively open and therefore there is a fundamental difference between the production of consonants and production of vowels.

Consonants involve occlusion, vowels involve the mouth remaining relatively open for the production of vowels that is almost important that vowels will be produced when the mouth is open and consonants will involve some degree of occlusion, either the occlusion is going to be very rigid or it is going to be less. So, we can describe types of consonants in terms of how much obstruction is involved and that is called the manner of articulation.

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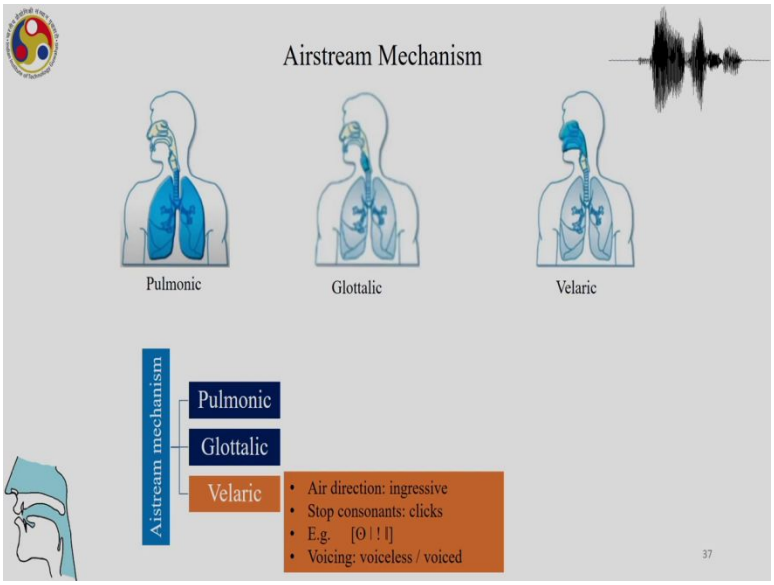

Another important aspect which we will look at a lot in this course is Airstream Mechanism and the shaded area there is the part which is involved in Airstream Mechanism, the air pushed out from that part involves that organ. So, we have the Pulmonic Estrogen Mechanism where lungs are involved, the lungs push out the air which is given shape through by the vocal tract and the glottal region and then the shaded region is the glottalic region. The air trapped in the glottalic region can also produce sounds which are called glottalic and then we also have the velaric sound, so air in the velaric region will produce sounds.

So, we have egressive sounds as pulmonic egressive most sounds in the languages of the world are produced with the pulmonic egressive airstream air coming out. And then egressive can be produced only in the glottalic and velaric airstreams. The glottalic egressive are called ejectives. The ingressives are called, which is ingressives are produced with the air, not the air which is coming out but the air sucked in and those are called implosives. And we have ingressive sounds produced by the velaric airstream and those are called clicks we will look at these sounds in great detail when we look at the different diversity in the languages of the world.

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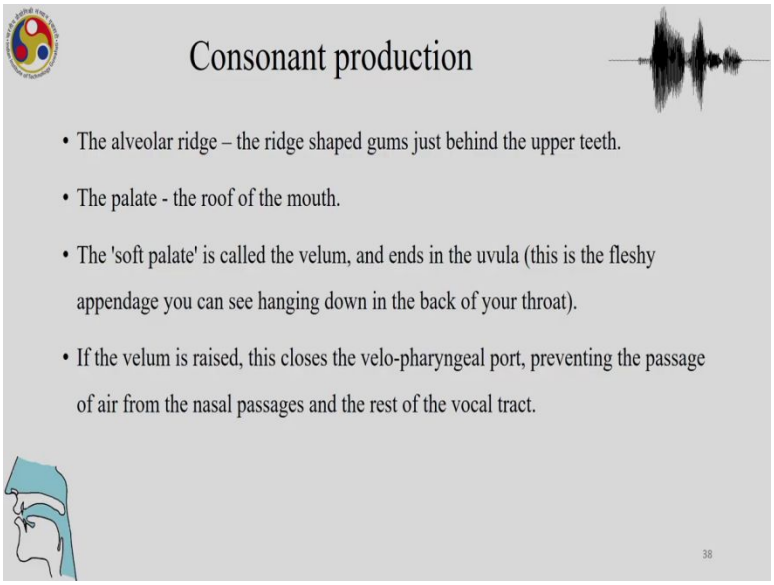

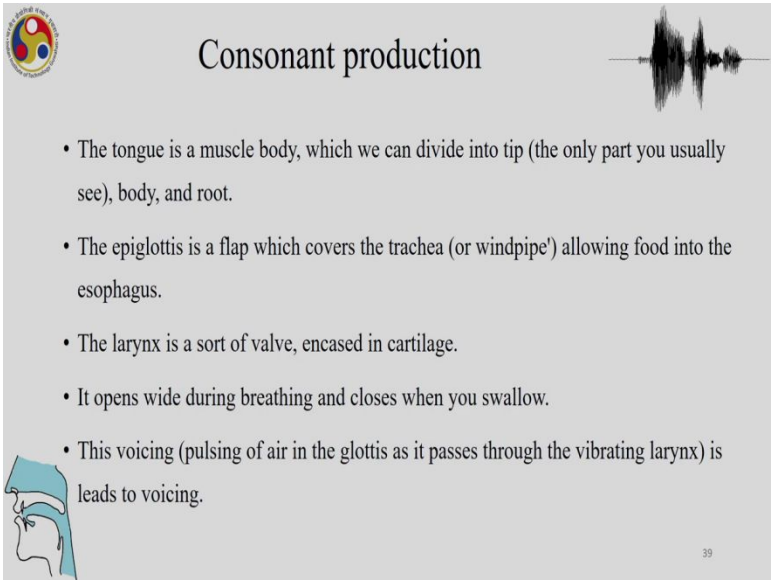

And then we have the Consonant Production which involves the different places in the mouth the alveolar ridge, the palate and the velum and then we have the tongue which is the active articulator, the epiglottis and the larynx.

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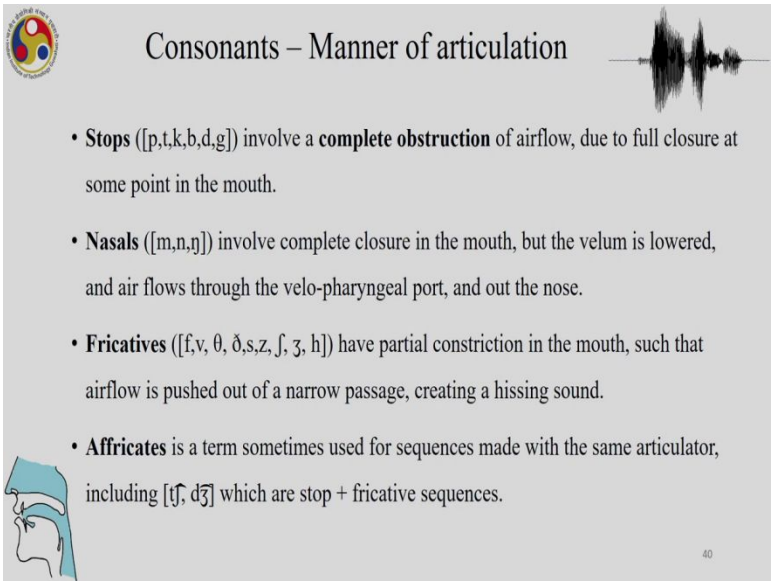

And then we have different consonants based on manner of articulation. Where there is complete obstruction and then we have stops and full release. We have stops, we have nasals also which can be stopped when the velum is lowered and then the air flows through the velo-pharyngeal port, and out of the nose and then we have nasals. We have fricatives, where we have partial constriction in the mouth such that air is pushed out of the narrow passage creating a hissing sound and we have affricates which is a combination of stop plus fricative sequences. Where we have complete obstruction and then slow release like a fricative.

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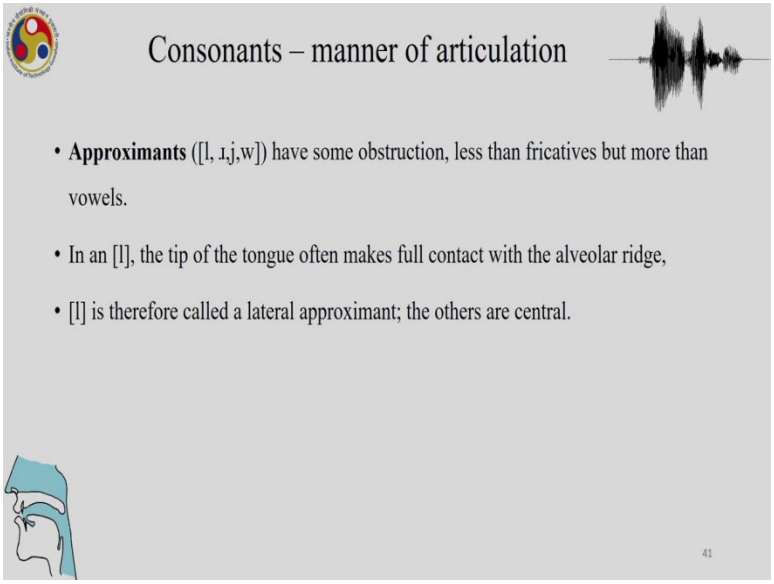

And then we have approximants where we have very little occlusion and then, but definitely more than vowels and then we have in approximants, we have the lateral approximant.

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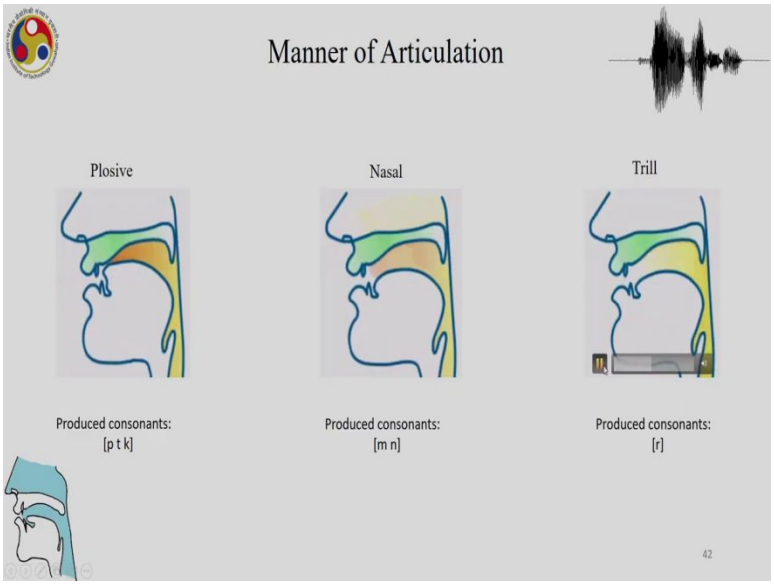

So we have stops which are produced with complete obstruction, sudden release we have nasals where air is released through the velo-pharyngeal port. We can have trills, we do not have a narrow occlusion, but we have that repeating pattern.

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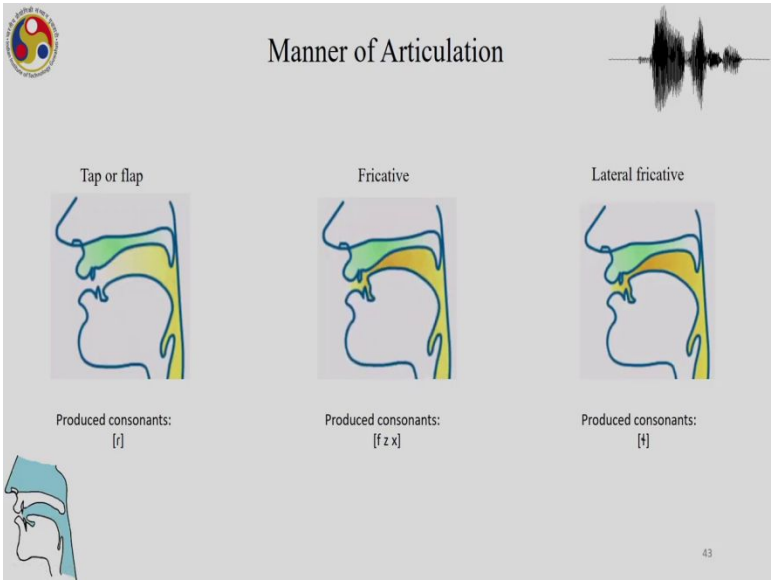

We have taps or flaps with less rapid occlusion there and the fricatives we have the occlusion is not as rigid as that of the stop.

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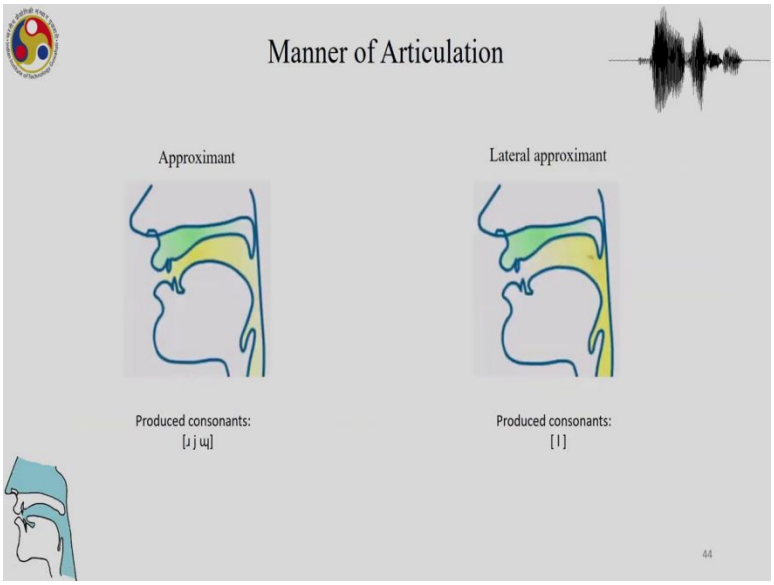

And then we have approximants.

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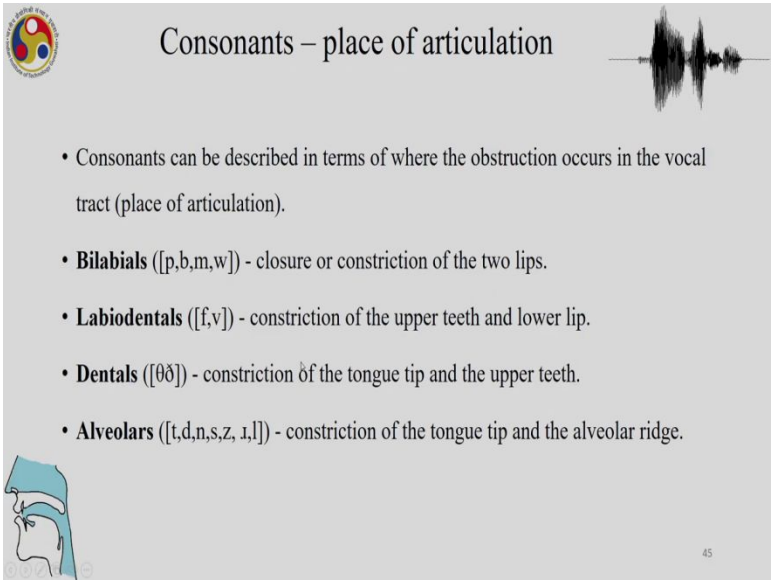

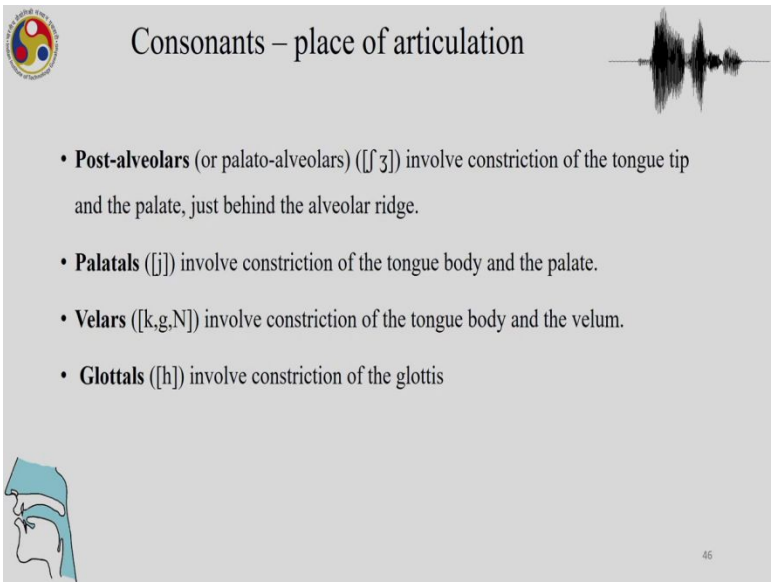

Also we have to talk about place of articulation of bilabials, labiodentals, dentals, velars post alveolars.

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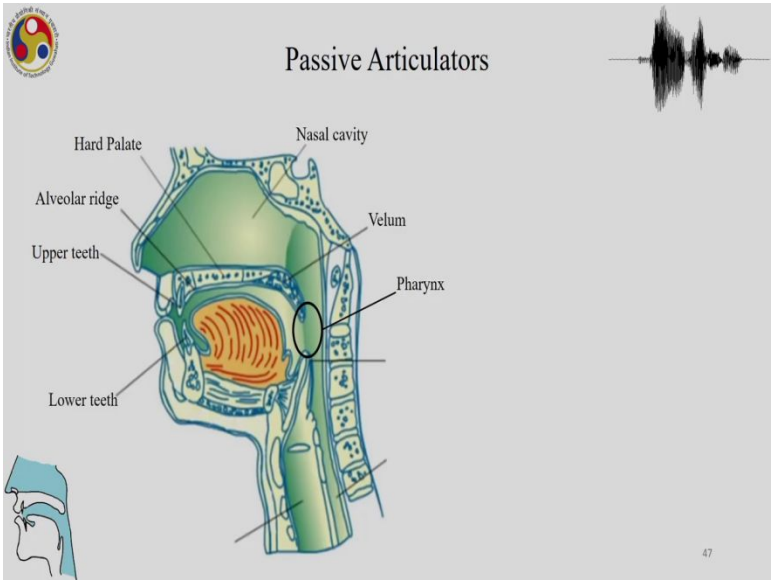

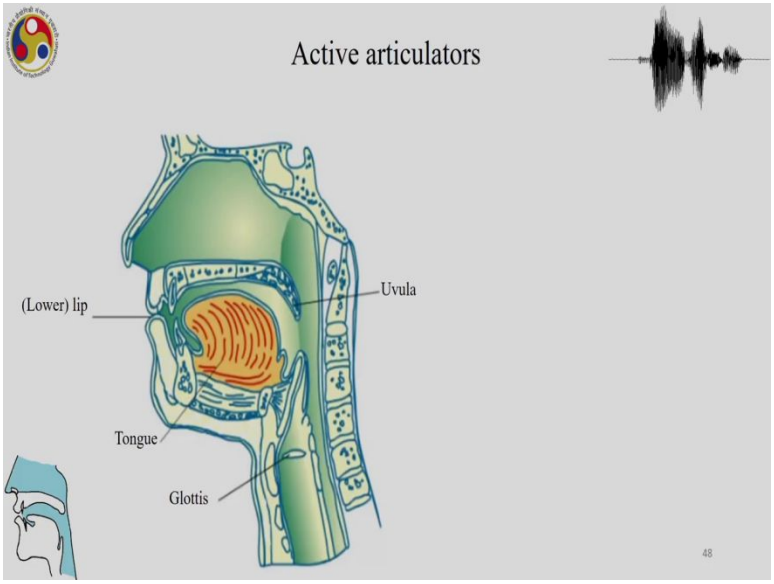

And these are all the places of articulation which we will look at in the next lecture.

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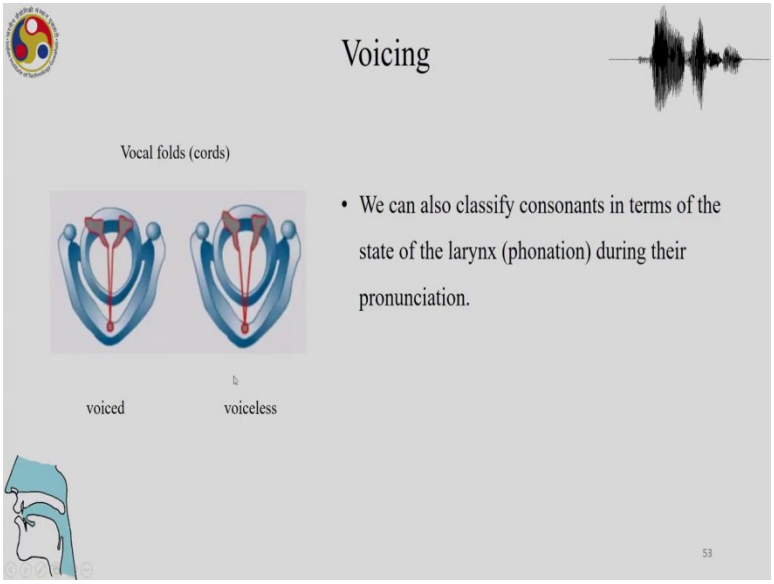

We will wrap up today's class, with today's lecture with a bit about Voicing. Voicing is occurs when you have vocal fold vibration and you can see that here is the vocal folds, which are vibrating, producing voice sound and this is the voiceless.

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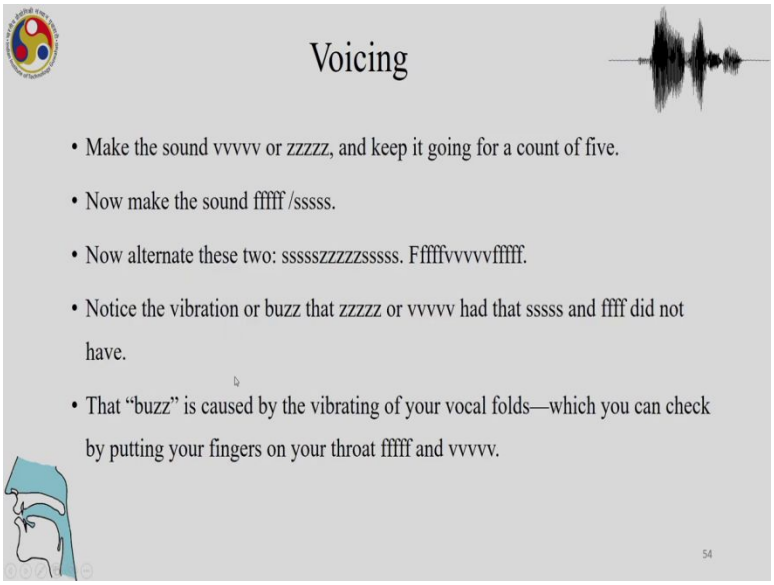

So what is the difference between voiceless and voicing? So, when you produce us make a sound like vvvvvv or zzzzzz, and you can produce that vvvvv, zzzzz, and you can continue up to count of five and contrast that with ffffff, sssss, and then you will see that when you are producing vvvv zzzzz, you have a vibration and this buzz is created by the voicing of your vocal folds.

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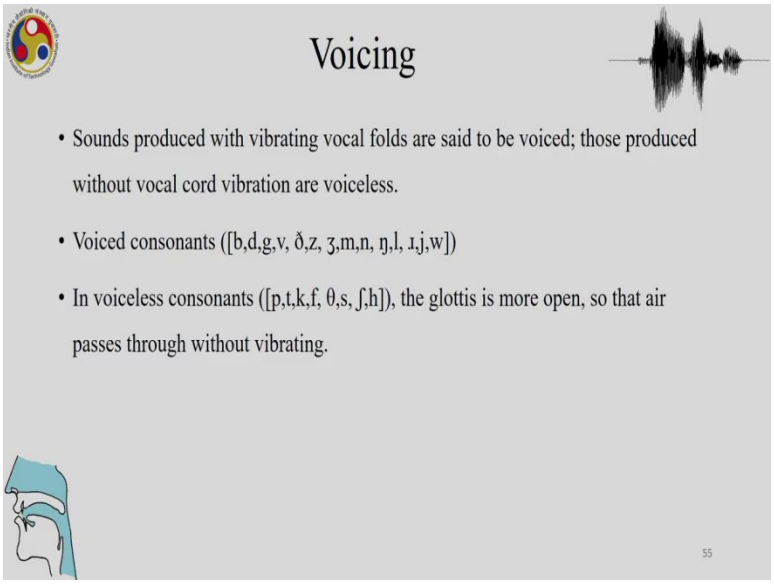

And that is voicing sounds produced with the vibrating vocal folds are said to be voiced and those produced without the vocal fold are voiceless. So, in voiceless sounds the glottis is more open so that air passes through without vibrating.

That brings us to the end of today's lecture, we have looked at a lot of things today about Sound Production, about the Representation of Sounds, about Phonemes, Allophones and also a bit about Consonant Production, Manner of Articulation, Place of Articulation and Voicing. That brings us to today's lecture, to the end of today's lecture and in the next lecture we will look at Sound Production, Consonant Production in greater detail. Thank you for your attention.