NBA Accreditation and Teaching-Learning Engineering (NATE)
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Lecture 03
Outcome Based Education

Greetings, welcome to module one, unit three on Outcome Based Education.

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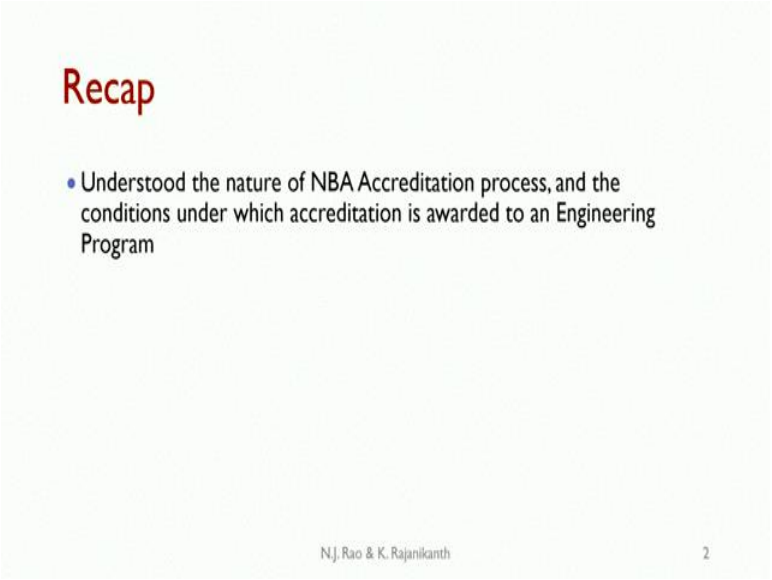

In the previous unit, we understood the nature of NBA Accreditation Process and the conditions under which accreditation is awarded to an engineering programme.

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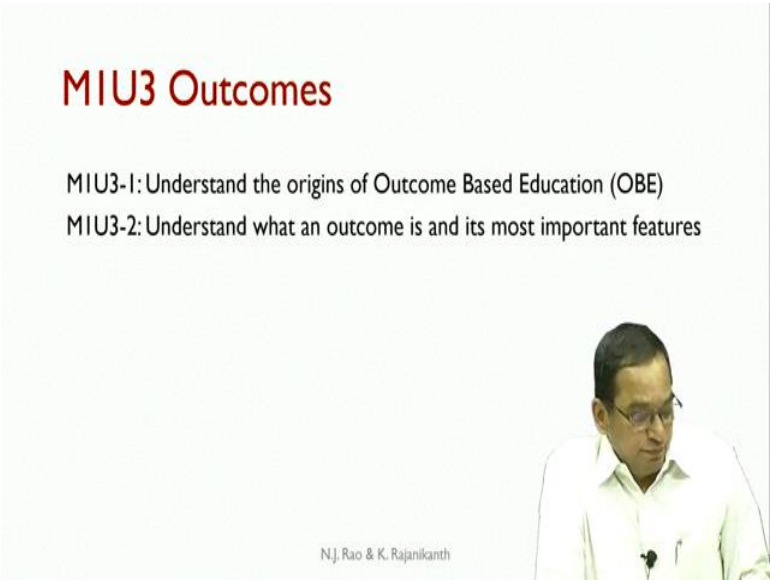

In this unit, we will look at the outcome based education as we saw in the last unit NBA requires all programmes to be designed and implemented within OBE framework now. So in this unit, we will look at the OBE framework in an overview fashion. And we look at the details of the OBE implementation in later units. So the outcomes for this you need, understand the origins of outcome based education, understand what an outcome is, and it is most important features.

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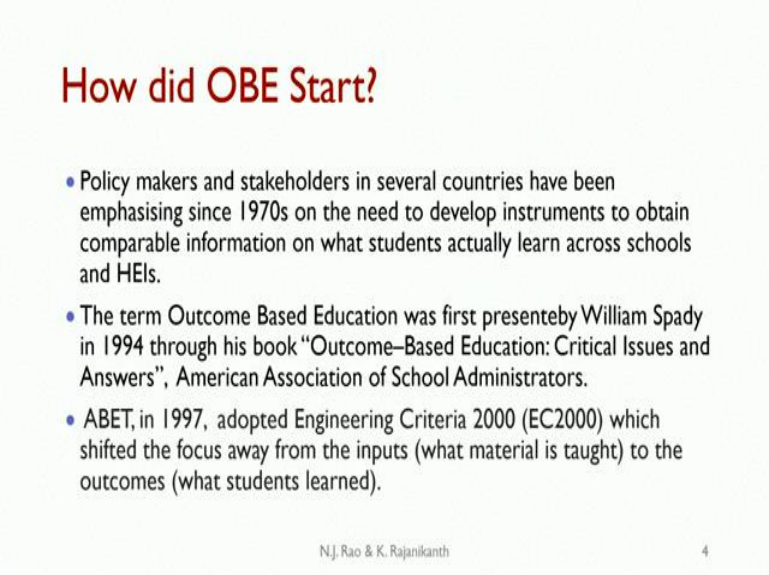

How did OBE is start? Since 1970s, there has been an interest in understanding what is the extent to which students are actually learning in schools. Many of these schools are funded by the public and the funding agencies are interested in knowing what has been the impact of such funding? So policy makers and stakeholders in several countries have been emphasising since 1970s on the need to develop instruments to obtain comparable information on what students actually learn across schools and higher education institutions.

The term outcome based education was first presented by William Spady in 1994 through his book, outcome based education, critical issues and answers. This was published by American Association of School Administrators. It is interesting to note that the concept of OBE first started in the context of school education. In fact, even the Blooms taxonomy, as we will see later, first arose in the context of school education.

Subsequently ABET, in 1997, adopted Engineering Criteria 2000 or EC2000, which shifted the focus away from the inputs, what material is thought to the outcomes? What students learn and subsequently, most of the countries in the world have adopted the outcome based

education framework, even for higher education institutions and India since 2015, NBA requires all programmes to be designed and implemented within the will be framework.

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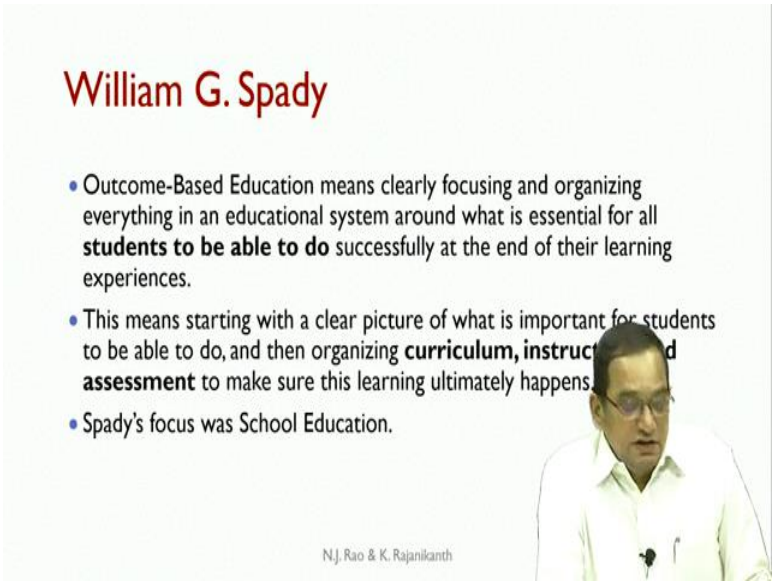

Now, what is the central tenet of OBE? Williams Spady in his remarkable book, states that outcome based education means clearly focusing and organising everything in an education system around what is essential for all students to be able to do. The key word is do, successfully at the end of their learning experience.

This means starting with a clear picture of what is important for students to be able to do. And then organising curriculum instruction and assessment to make sure this learning ultimately happens. As we noted Spadys focus was school education and with any academic programme, the three key issues of curriculum, instruction and assessment and Spadys idea was that the curriculum instruction assessment must emerge from a clear definition of the ultimate outcomes that the students are supposed to achieve and demonstrate.

Essentially, a clear picture of what is important for students to be able to do that should be the starting point. And his focus was school education and he visualised the OBE as the design organisation of curriculum instruction, the assessment to ensure the outcomes consumed at this start to be attained by the students or the learners.

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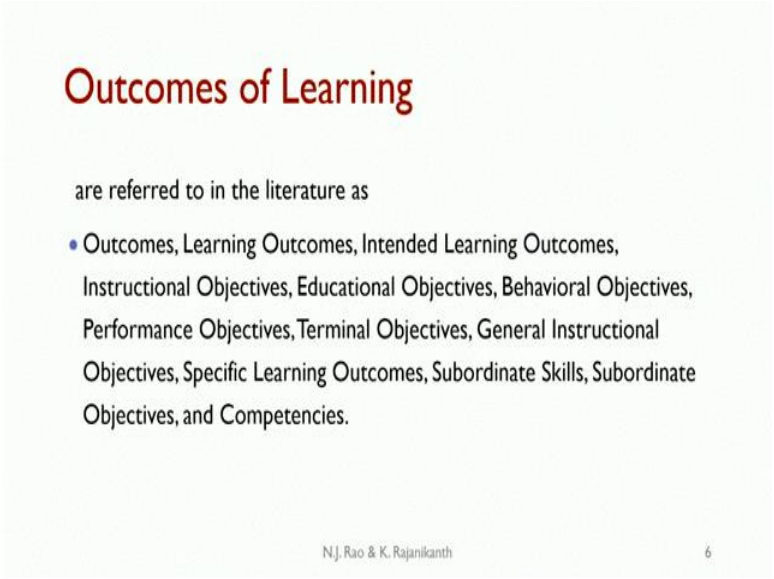

Outcomes of learning are referred to in the literature in a variety of terms will use the word learning outcomes, course outcomes, programme outcomes, programme specific outcomes in our unit. But in the literature, you will find several other equivalent words like intended learning outcomes, instructional objectives, educational objectives, behavioural objectives and so on. But what will be the term primarily we are looking at what the student should be able to do at the end of learning experience.

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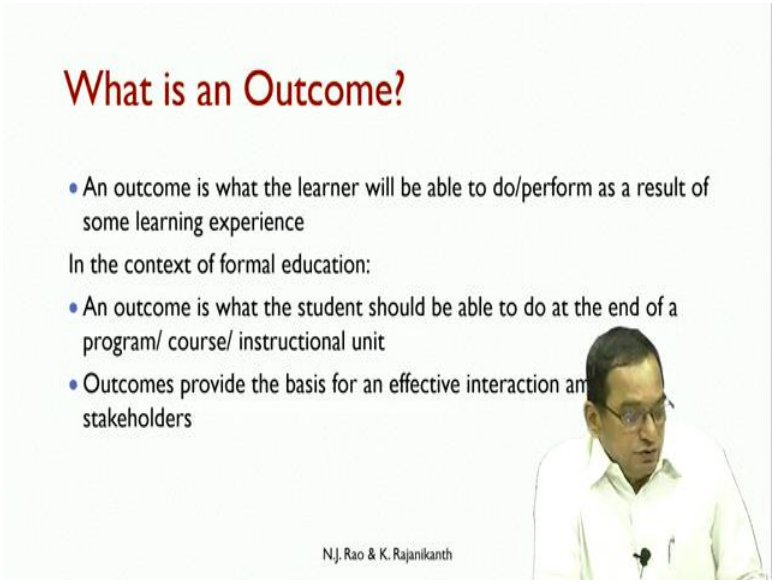

So, what really is an outcome? An outcome is what the learner will be able to do or perform as a result of some learning experience. In the context of formal education an outcome is what the student should be able to do at the end of a programme, a course or an instructional

unit. A programme means, in the case of undergraduate engineering is a four year programme. So, at the end of the four years, what are the competencies that the student can demonstrate? What the students will be able to do at the end of the four year undergraduate engineering programme?

Is specific course, which spans one semester? At the end of that course, what are the things that the students will be able to do? Or it can be even one instructional unit, which generally focuses on one particular outcome or competency. So we can say that an outcome is what the students should be able to do at the end of a programme, a course or instructional unit in the context of formal education. And the outcomes provide the basis for an effective interaction among all the stakeholders.

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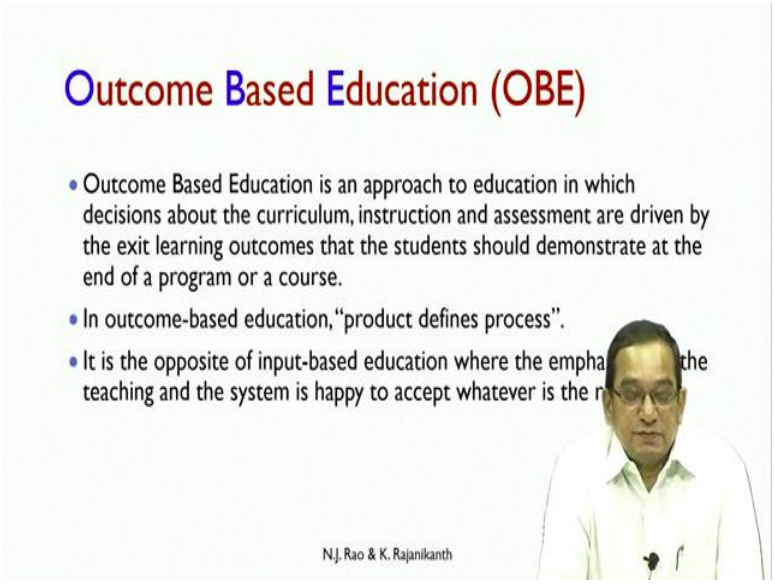

So outcome based education is an approach to education, in which decisions about curriculum, instruction and assessment are driven by the exit learning outcomes that the students should demonstrate at the end of a programme or a course. So, the starting point is actually the end point. We begin with what should be the exit learning outcomes and from them, we derive the curriculum, instruction and assessment.

So, in outcome based education product defines the process. The exit learning outcomes determine the curriculum, the instruction as well as the assessment. It is the opposite of input based education, where the emphasis is on the teaching and the system is happy to accept whatever is the result.

So the focus is on providing inputs, focuses on providing inputs in the form of physical infrastructure, in the form of learning resources, in the form of human resources, the focus is on providing good inputs and then accept whatever is the final result. Whereas in OBE, we start with the exit learning outcomes and from that point of view, we work out the curriculum, instruction and assessment to ensure that those exit learning outcomes are attained by the learners.

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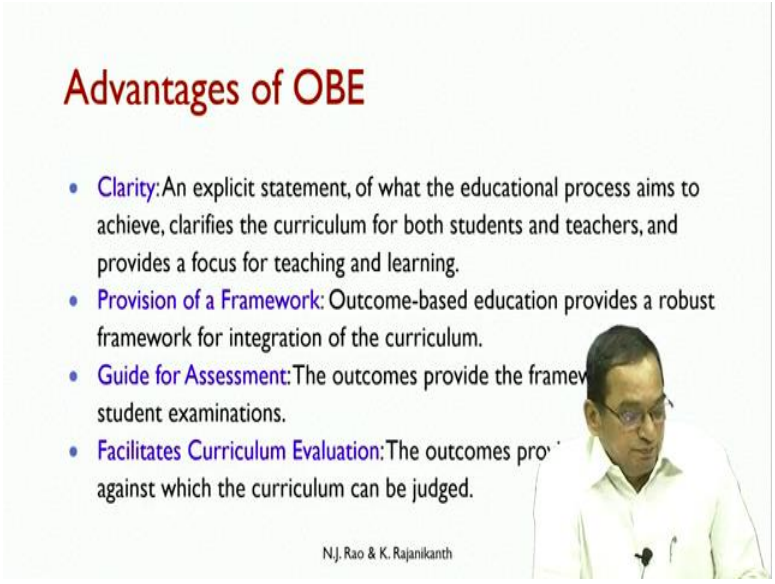

There are several advantages of OBE and these advantages are now been realised, in practice also by several Institutes. First is clarity, in exclusive, explicit statement, in explicit statement of what the educational process aims to achieve. Clarifies the curriculum for both students and teachers and provides a focus for teaching and learning. The outcome statements become the focus for teaching as well as learning and it provides a framework.

Outcome based education provides a robust framework for integration of the curriculum, guide for assessment. The outcomes provide the framework for student examinations. The assessment is to really assess whether the intended learning outcomes have been attained by students and does the outcomes provide the framework for student examinations also facilitates curriculum evaluation. The outcomes provide a framework against which curriculum can be judged? We can compare two different curricula also by looking at the kind of outcomes that these curricula intend to achieve

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Of course, there are also reservations about OBE, there are views that it is against the spirit of education. Education should be a free enterprise providing an opportunity for learners to explore the world of knowledge in practically unrestrained fashion that is one view. Some people also believe that the OBE is a straightjacket will see that actually these two are not all that valid. They are somewhat misplaced perceptions about OBE as we move along this course, will see that OBE does provide considerable freedom to the faculty while implementing the OBE faculty can innovate can think of novel methods of instruction, novel methods of assessment, none of this is prevented by OBE.

So, will be is not a straitjacket and given the limited resources and limited time in which the programmes have to be run, particularly the formal programmes. OBE does provide a very convenient framework to ensure quality learning by the students, will see that it is not even against the spirit of education. But the third reservation that there is a documentation overload is to certain extent justified.

OBE does require proper documentation of all the plans, the activities, the implementations, the feedback, the mechanisms for improvement, all these things need to be documented and some faculty do seem to feel that this is an overload. In later units will examine how realistically one can make the documentation less of a burden by using appropriate information and communication technology tools. But certainly OBE does require certain additional amount of documentation for the processes to be implemented properly. So, there

is some justification in this reservation, but it can be certainly overcome through appropriate use of tools.

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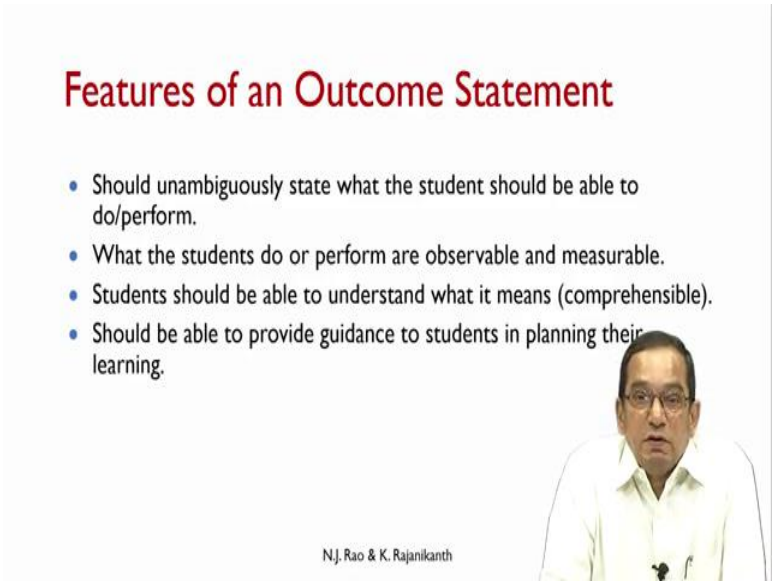

What are the features of an outcome statement? An outcome statement should unambiguously state what the student should be able to do or perform. At the end of the learning experience, at the end of an external unit or a course or a programme? What is it that the student should be able to do or perform that must be stated unambiguously? What the students do or perform are observable and measurable, the way, they the outcome statement is formulated the actions, the demonstrations by the students must be observable and measurable.

We need to know the extent to which the intended outcomes are being attained by the learners. We need to measure the extent of attainment of the outcomes. So, the way the outcome statement depicts the action it must be observable and measurable that is the second important feature of an outcome statement.

What the students do or perform are observable and measurable? Students should be able to understand what it means comprehensible. That is, state the outcome in terms which make easy sense to the students so that the students understand what really, they are expected to be able to do at the end of the learning experience.

So, it is easy for the students to connect to the outcome statement. Then, the outcome statement should be able to provide guidance to students in planning their learning. It should help them in planning their learning. So the statement must clearly state what the students are

expected to do, demonstrate at the end of the learning experience. It must help them in planning their learning and what they do must be observable and measurable. These are the features of a good outcome statement.

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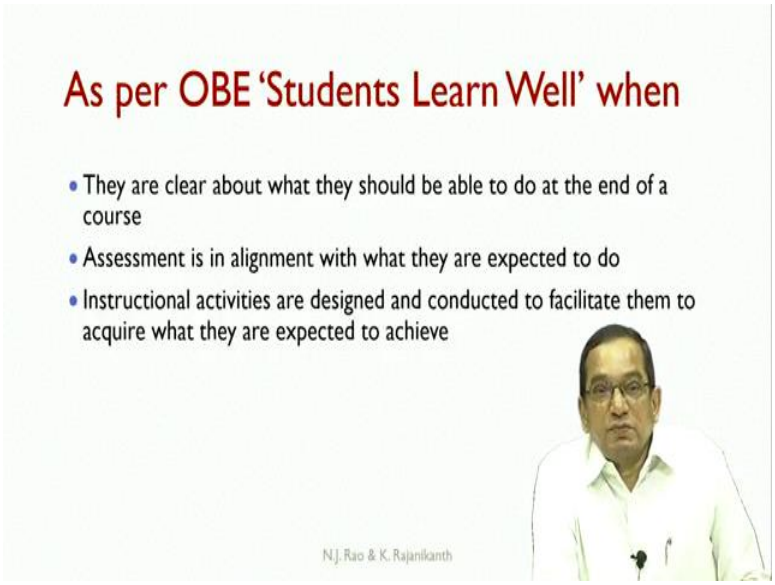

As per OBE students learn well, when the three conditions stated here are met, this has been empirically observed and validated in any number of learning situations. When the learners are clear about what they should be able to do at the end of a course, assessment is in alignment with what they are expected to do. An instructional activities are designed and conducted to facilitate them to acquire what they are expected to achieve. These three conditions must be present for students to learn well.

One, a clear statement of the outcomes communicated to the students so that the students are clear about what they should be able to do at the end of a course. Assessment must be in alignment with the outcomes, what the students are expected to do. An instruction must be designed and conducted in such a way that it helps the learners acquire the competencies which they are supposed to demonstrate at the end of the learning experience. So in certain activities are designed and conducted to facilitate the learners acquire, what they are expected to achieve, when all these three conditions are present, students learn well.

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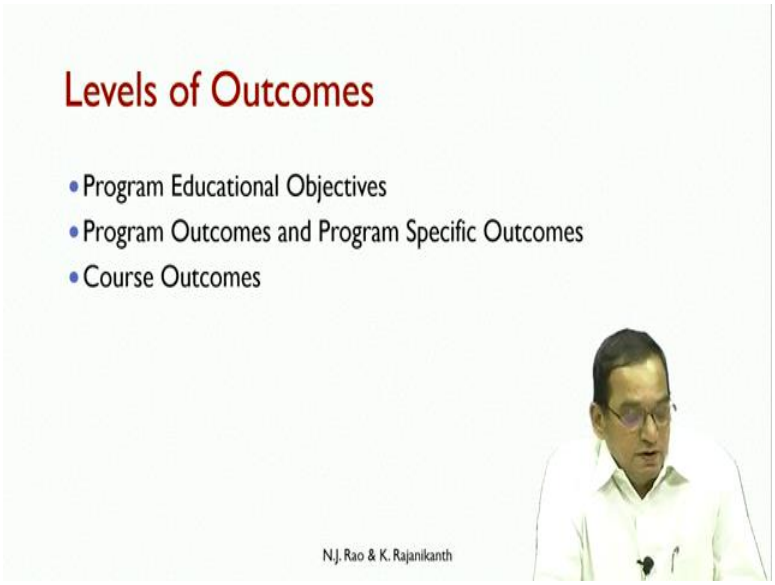

Now, let us look at the levels of outcomes. The formal engineering programmes in India as per the NBA requirement, have outcomes at three levels? At the highest level, we have programme educational objectives. Notice that the word here is objective, in fact is the only place where they would object to appears in the NBA documentation. At the next level is programme outcomes and programmes specific outcomes. At the next level, we have course outcomes.

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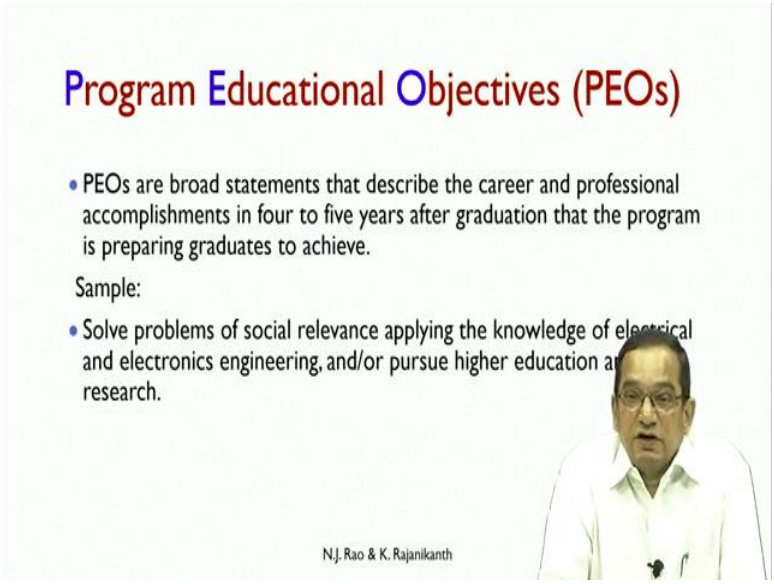

Very broadly, programme educational objectives or statements that describe the career and professional accomplishments in four to four years after graduation that the programme is preparing graduates to achieve. In other words, these are kind of a promise that we are

making to the learners, students or their parents that three to four years after graduation or students now alumni of course, would be in such in such a position are their achievements will be so and so.

So, essentially, these are broad statements that describe what the graduates would be accomplishing three to four years after graduation. So, we are talking of a scenario down the road three to four years after they complete their formal four year engineering programme. A sample for this could be solved problems of social relevance, applying the knowledge of Electrical and Electronics Engineering and they pursue higher education and research. This could be the PEO for a BE programme in Electrical and Electronic Engineering.

This is just an overview in this unit. We are looking at it in a very broad perspective. In later units, we look in detail how the P O was are to be arrived at? What is the process by which PEO have to be determined and how they should be validated? We look at these issues in a later unit. But in a broad sense PEOs described the carrier and professional accomplishments four to four years after graduation.

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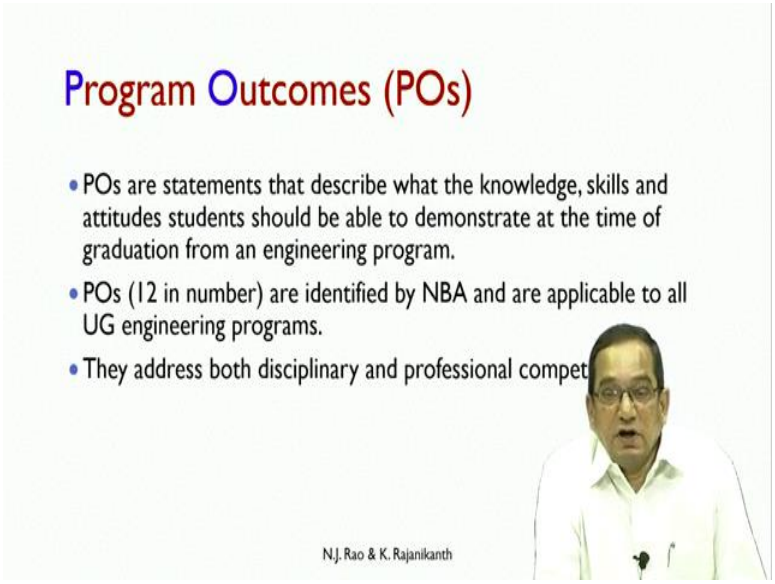

The programme outcomes are the statements that describe what the knowledge, skills, attitudes, students should be able to demonstrate, at the time of graduation from an engineering programme. While POs state what the graduate from accomplishing four to four years after graduation. POs state what the graduates are capable of demonstrating just the term of graduation after completing the four year programme. So POs are statements that describe what are the competencies of the graduates just after completing the four year

programme. There are full programme outcomes, which have been identified by NBA and they are applicable to all UG engineering programmes.

Independent of what is the specific branch of specialisation. All engineering programmes must ensure that their graduates attain these 12 outcomes at the programme level. We will later look into all these 12 POs in detail. These 12 POs address both disciplinary and professional competencies.

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This is one sample of programme outcomes specified by NBA PO3 design development of solutions. Design solutions for complex engineering problems and design system components or processes that meet the specified needs, with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations. Notice that it is fairly elaborate, there are 12 such POs and the programme has no choice of altering these POs. These are given by NBA and the programme must be designed and implemented to ensure that all the graduates attain these programme level outcomes.

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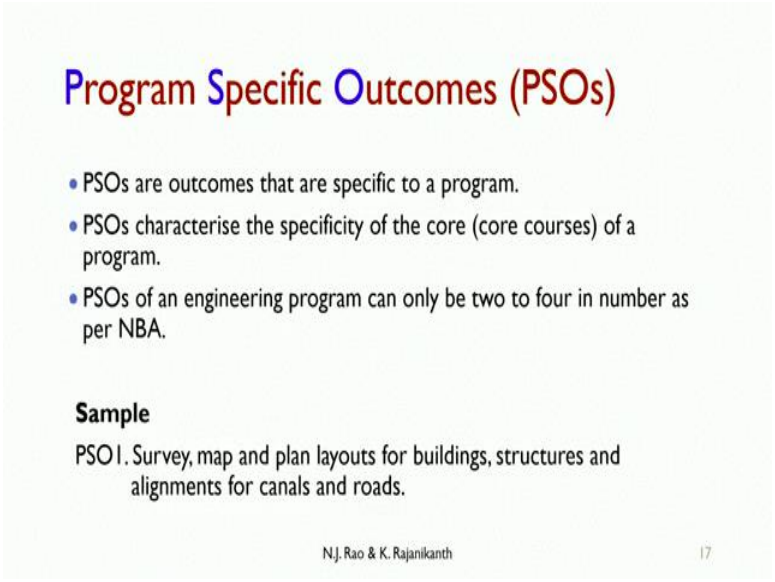

Programmes specific outcomes, are outcomes that are specific to a particular programme. They characterise the specificity of the core courses of a particular programme. While POs

are applicable to all engineering programmes. PSOs are what characterise a particular programme. For example, a BE programme in Computer Science in Engineering will have its PSOs and they would be different from the PSOs of a beta programme in Electrical and Electronics Engineering.

So, these are specific to a particular programme. And these are in addition to the common POs specified by NBA and NBA states that the programme can have two to four such specific outcomes. PSOs of an engineering programme can be two to four as per NBA. This is a sample, one PSO, survey, map and plan layouts for buildings structures and alignments for canals and roads. So, this would be an outcome that is specific to a betel programme in civil engineering. Thus, while POs are generic, PSOs are specific to a particular programme.

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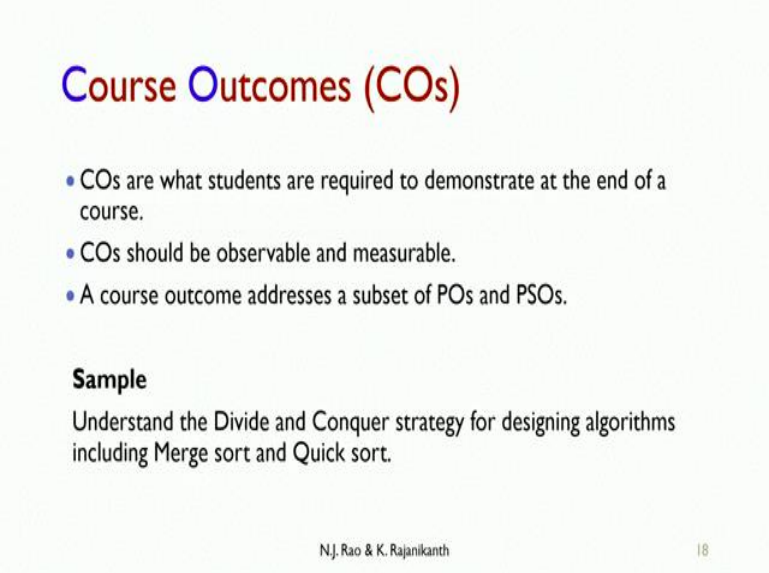

The next level will be course outcomes. COs are what the students are required to demonstrate at the end of a course. In some universities the course is also referred to as a paper or a subject. But within the NBA framework, we continue to use the term as course only and COs are what the students are required to demonstrate at the end of the course. Obviously, today almost all the programmes are semester oriented.

So we are talking of a course over a period of about three and a half months running in one semester at the end of the course. What are competencies that these students can demonstrate? COs should be observable and measurable. A course outcome addresses a subset of POs and PSOs. In other words, actually the programme outcomes and programme

specific outcomes are realised through course outcomes. And that is the basic framework of an outcome based education for engineering programme.

One sample can be understand the divide and conquer strategy for designing algorithms, including Merge sort and Quick sort. This could be an outcome for a course on algorithms in computer science and engineering programme.

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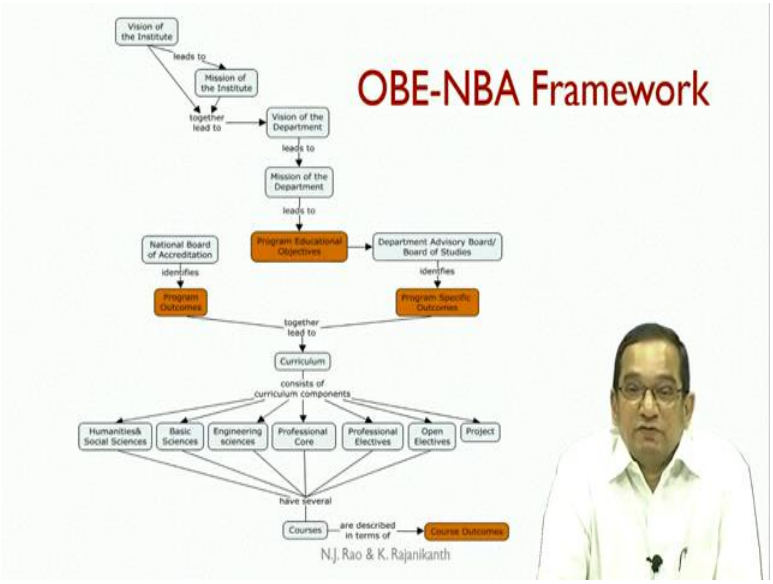

So, if you see the broad OBE framework as required by the NBA, we start with the vision of the Institute and that leads to the mission of the Institute. In a later unit, we will see how these are eroded and the self-assessment report of NBA requires the programme to state what are the vision and mission statements of the Institute? That will be the starting point for the entire framework, the vision and mission of the Institute.

Together, they formed the basis for deriving the vision and mission of the department offering a particular programme. Starting with vision and mission of the Institute. The department has to develop its own vision and mission and that leads to the programme educational objectives and the programme educational objectives in turn, are taken as the input by a departmental advisory board or departmental board of studies, you can name it in any way, but an appropriate body which is associated with the department has to determine the programme specific outcomes.

And NBA itself has given us 12 programme outcomes. So we have 12 POs specified by NBA, 2 to 4 PSOs arrived at the department level through an appropriate body. So, overall

we will have 12 plus 2, 14 to 12 plus 4, 16. So, 14 to 16 outcomes to be realised at the programme level. After the completion of four years B.Tech, BE programme these are the competencies that the students must be able to demonstrate. And these together will determine the kind of a curriculum that we need to design. The curriculum must help the students acquire these competencies. The curriculum must help the students attain these POs and PSOs.

So based on the POs and PSOs, we need to design the curriculum. And the curriculum will have several different components, humanities and social sciences, basic sciences, engineering sciences, professional core, professional electives, open electives, project and they all have essentially, the several courses in all the streams and they courses are described in terms of the course outcomes.

Because this ideal scenario, in practice, a tier two Institute may not have a choice of designing the curriculum. It has to work with the existing curriculum and see how best to do make the curriculum achieve the programme outcomes and programmes specific outcomes. But this is the ideal OBE, NBA framework.

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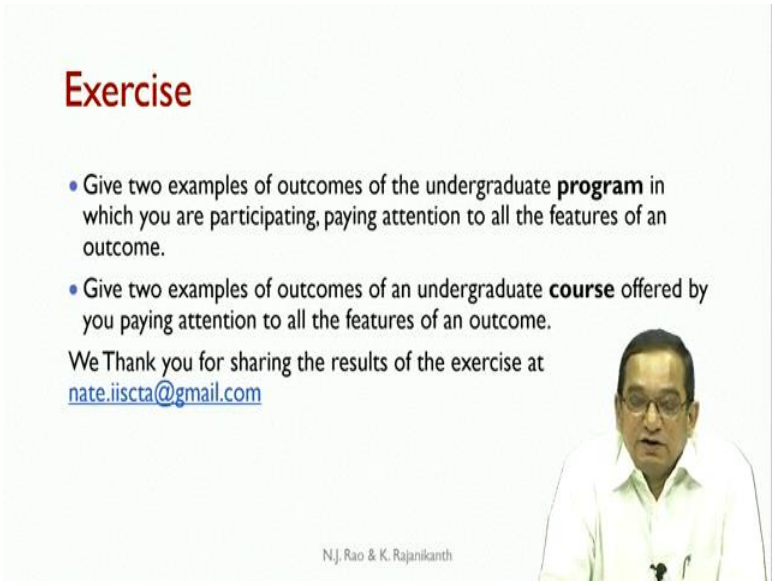

So, two exercises for you, give you two examples of outcomes of the undergraduate programme in which you are participating at the programme level. So, if you are participating in B. Tech, Electronics and Communication Engineering, two outcomes at a programme level. The entire four year duration at the end of it, what are the competencies that the students will be able to demonstrate? Two examples of outcomes of the undergraduate

programme in which you are participating, paying attention to all the features of an outcome that are desirable.

Give two examples of outcomes of an undergraduate course offered by you, again paying attention to all the features of an outcome. As just now we saw a course is what some Institutes would refer to as a subject or a paper running or one semester, a specific course. So give two examples of outcomes of an undergraduate course offered by you paying attention to all the features of an outcome statement. We thank you for sharing the results of the exercise at nate.iiscta@gmail.com.

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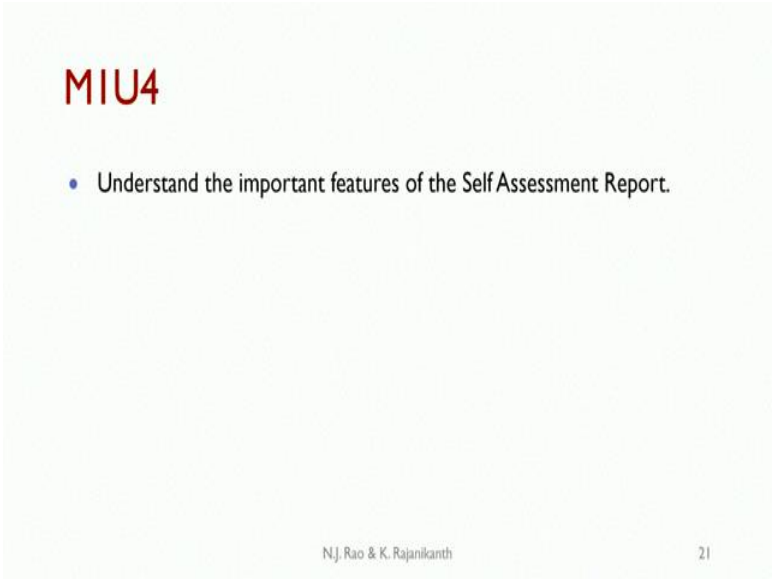

In the next unit, will understand the important features of self-assessment report. A birds eye view of what is contained in SAR, and what are the salient features of SARs. Thank you and we will meet with the next unit. Thank you.