NBA Accreditation and
Teaching – Learning in Engineering
(NATE)
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Lecture 18
Course Outcomes- 2

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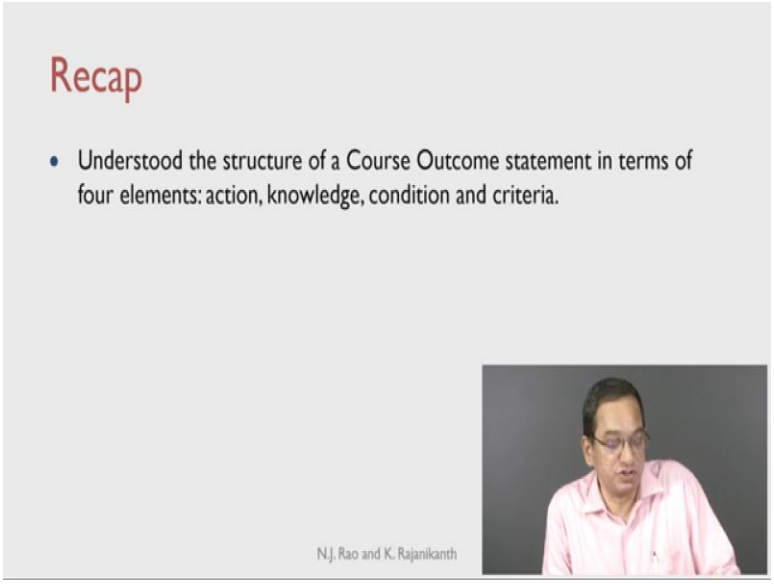

Greeting, welcome to module 1, unit 17 on Course Outcomes. In the earlier unit, we understood the structure of a course outcome statement in terms of 4 elements, action, knowledge, condition and criteria. We noted that of these 4 elements action and knowledge are mandatory, condition and criteria are optional.

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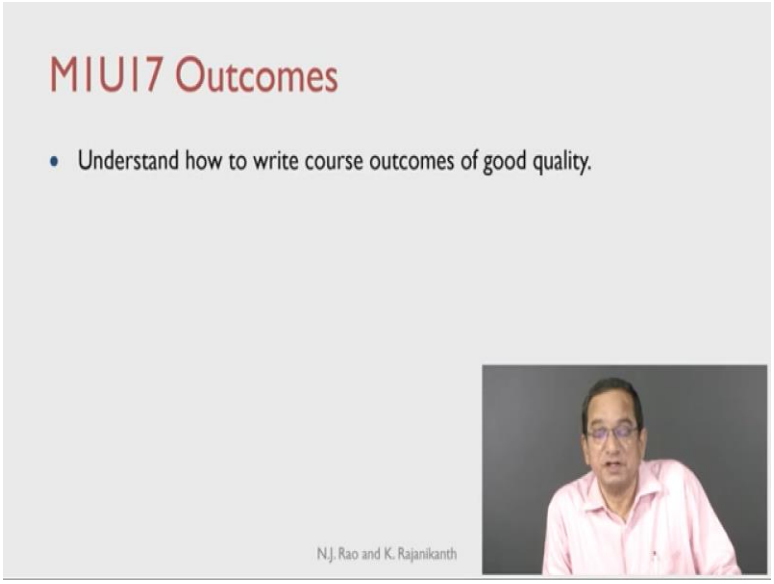

In this unit, we will look at how to write course outcomes of good quality. So the outcome of this unit is understand how to write course outcomes of good quality.

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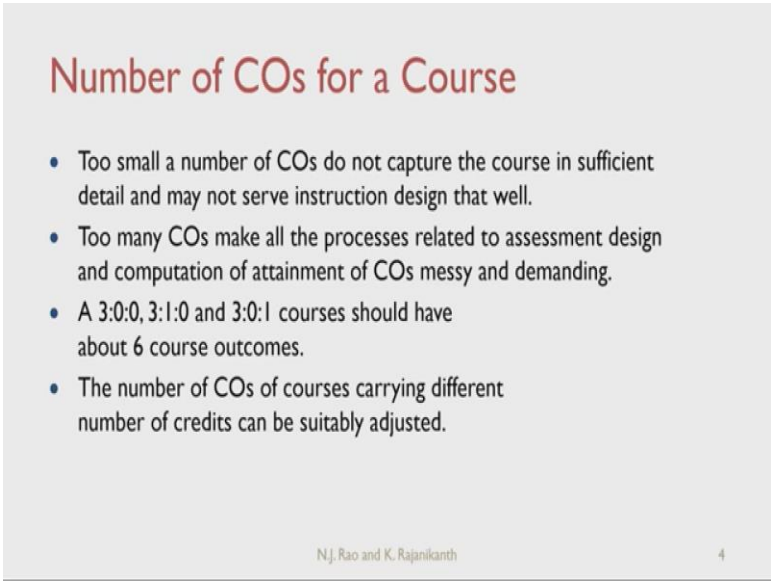

The first issue is how many outcomes should be return for a given course? If we have 2 small a number of COs then they may not capture the course in sufficient detail and may not serve instruction design that well. Even assessment may be somewhat difficult. On the other hand, if we have too many COs then the process related to assessment design and computation of attainment of the COs will be massy and demanding, then what is an ideal number of outcomes?

There is no unique answer to this but by enlarge from experience it appears that 3-0-0 or 3-1-0 or a 3-0-1 course should have about 6 course outcomes. Probably 7 or 8 is also okay, 5 outcomes is also okay there is no hard and fast tool as to the number of outcomes. But, by enlarge it tends to be 6 plus or minus 2 course outcomes for a typical 3 or 4 credit course. The number of COs of course carrying different of credits can be suitably scale and adjusted.

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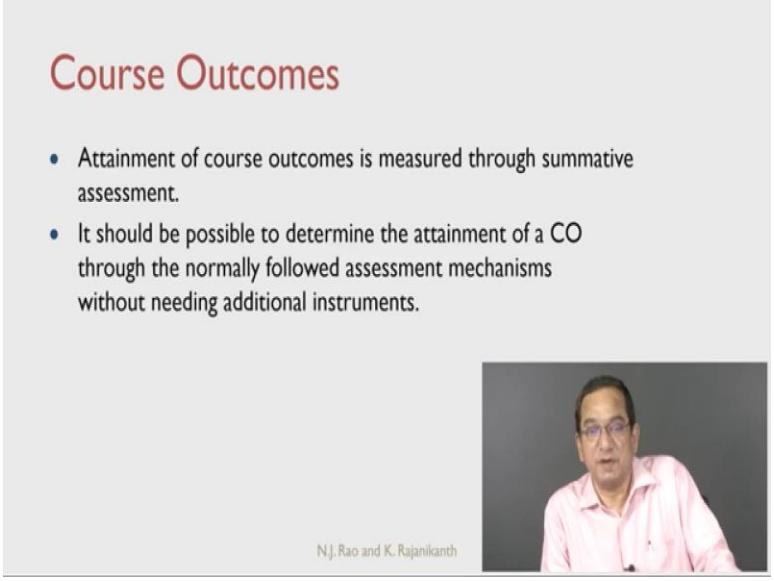

Attainment of course outcomes is measured through summative assessment. It should be possible to determine the attainment of a CO through the normally followed assessment mechanisms without needing any specific additional instruments.

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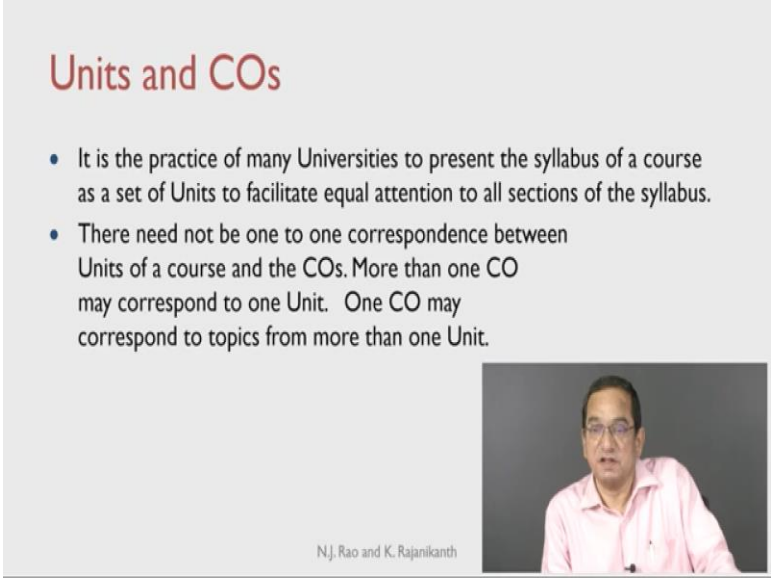

It is practice of many universities to represent the syllabus of a course as a set of units to facilitate equal attention to sections of the syllabus. Most of the universities have the syllabus organized as 5 units, sometimes it can be 6 but 5 is a more popular number. And often faculty think that there should be one outcome for each unit.

Thus if the course is organized as 5 units they expect the course outcomes to be 5 in number. But they need not be a one to one correspondence between unit of a course and the COs. More than one CO may correspond to 1 unit, one CO may correspond to topic form than 1 unit. Teacher based on her experience of the course content and the content of each unit can decide how many course outcomes must be there for the course as a total and corresponding to each unit.

Still it is quite popular to have 1 outcome per 1 unit but that is not mandated by NBA nor it is a requirement of any quality standards.

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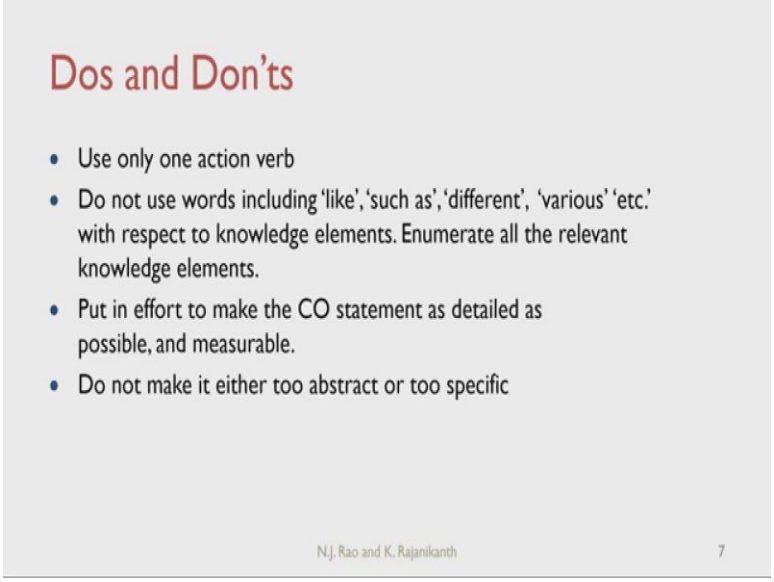

Some of the general guidelines dos and don'ts while writing the course outcomes. Use only one action verb. The cognitive process is captured in action verb and typically, a course outcome will have only one action verb. We saw that occasionally the course outcome might consist of 2 cognitive processes or sub-processes in which case the outcome statement may have 2 action verbs.

But predominantly the outcomes will have only one action verb. Do not use word including like, such as, different, various, etc words with respect to knowledge elements. The problem with these words would be that the scope the depth of the content would remain wide open. That would make it very difficult for the student the faculty and the examination paper setters to agree as to the depth of the content.

It is much better to enumerate all relevant knowledge elements. In any given CO the number of knowledge elements is unlikely to be more than about 5, 6 may be in the worst case about 7, 8. But it worth enumerating all these relevant knowledge elements instead of using open ended words like various, different, etc words.

Put in effort to make this reverse statement as detail as possible and measurable. Do not make it either too abstract or too specific, if it is too abstract it would be very difficult to make sense out of the outcome to design instruction to match that course outcome, to design assessment for that

outcome. And, if it too specific it is unlikely that we will be able to have too many questions regarding that specific outcome.

Then what is the right level at which the outcome should be written? Again there is algorithmic answer, teacher based on here experience of that course the contents, the way the course is to be delivered based on all these factors the teacher has to decide what should be the level of abstraction at which a given outcome should be written.

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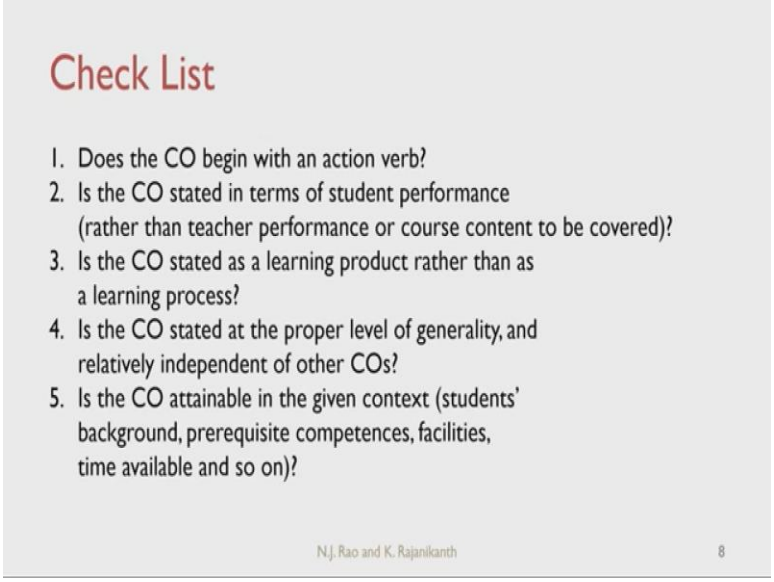

Some check list which one could use whiles writing the COs to see if they are of reasonably good quality. Does the CO begin with an action verb? So, when a CO statement is presented you first check whether it begins with an action verb. We know that the structure of the CO statement is at the end of the course the students will be able to, that will be followed by the actual CO statement.

So, the actual CO statement begins with an action verb. So, this check list says first check whether the CO begins with an action verb, if it does not begins with an action verb then immediately we know that the CO has some problem. Is the CO stated in terms of student performance rather than teacher performance are course content to be covered? CO is what the student is able to do at the end of the course.

It should not reflect what the intends to do, it is not about the teachers performance nor it should indicate what is the course content that is dealt with, CO is not course content, CO is what

student able to do at the end of the course. So the CO must be stated in terms of student performance. Is the CO stated as a learning product rather than a learning process? Quite often learning activities are design by the teachers to help students acquire the course outcomes.

The learning activities themselves are not the outcomes, the learning activities are designed to facilitate the students acquire the learning outcomes. So, the course outcome is the result of engaging in the learning activity. It is the learning product rather than the learning process. So, is the CO stated as a learning product rather than as a learning process? Is the CO stated at the proper level of generality and relatively independent of other COs.

The level of generality we discuss this issue in the previous slide also, it must be appropriate to the content and the intended outcome. And one CO should be relatively independent of other COs, there should not be overlap between different COs. Then the fifth check list item would be, is the CO attainable in the given context? We know that every course is delivered in a specific context.

The context would include students background, prerequisite competences, facilities, time available and so on. The course is delivered in such a specific context it is also called as the instructional context. When we write the COs we must take into account the specificity of the instructional context. Writing a CO that is too ambitious may make it very difficult to attain the CO in the given instructional context.

So, we must check whether the CO is realistic, attainable in the given context. Again the individual faculty member is the best judge of whether the CO is attainable in the given context, but she should take into account the context while writing the CO. Do not make the CO too ambitious.

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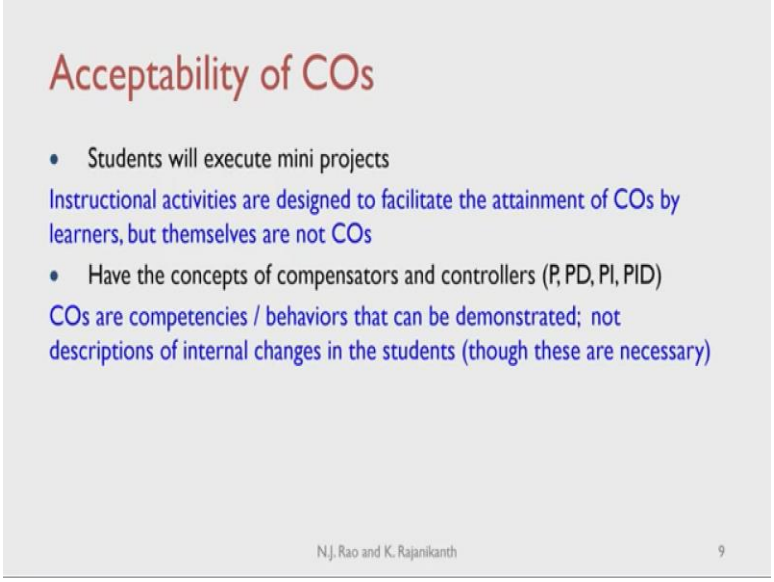

Now let us look at some CO statements, these have being picked up from different faculty members contributions, reflect on the given CO, for example, this is one CO, students will execute mini projects. Reflect on the CO, is it in an acceptable form? Do we say this is an outcome statement of good quality? Does it meet the structure that we proposed? If you put this CO statement against the checklist, do all the criteria get satisfied? What would be your opinion about the quality of this outcome statement?

Reflects for few seconds about the outcome then we will come and turn the outcome as presented in this statement. Okay, executing a mini project is an instructional activity. Instructional activities are designed to facilitate the attainment of COs. The instructor designs these activities and students go through these activities and these activities are designed to facilitate the attainment of COs by the learners. But, the activities themselves are not the COs.

So the activity of executing a mini project by itself is not a CO. What is the expected competency of the learner when he or she executes a mini project? That intended competency is the outcome statement. Let us look at another CO, have the concepts of compensators and controllers including proportional, proportional derivative, proportional integral, proportional integral and derivative controller reflect about this CO?

COs are competencies, behaviors that can be demonstrated. Not descriptions of internal changes in the students, though these are necessary. Students must learn these concepts, so students must

have these concepts but that is not the way the outcome statement is written. The outcome statement must start with an action verb, which indicates what the student is supposed to do, what this student is supposed to perform, at the end of the learning activity.

Thus this statement does not show what is it that the student is expected to do after having the concepts of the compensators and controllers. This is not the way an outcome statement is to be written. It must be a competency behavior that can be demonstrated. So it must start with an action verb.

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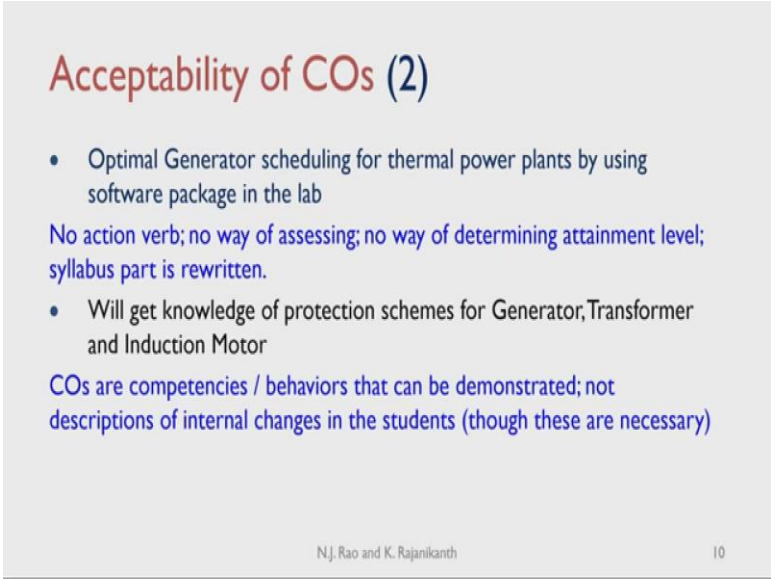

Let us look at another CO, optimal generator scheduling for the thermal power plants by using software package in the lab. This does not have any action verb, it does not convey what this student is expected to do at the end of that learning unit. There is no way of assessing this students performance because it does not indicate what this student is expected to do. There is no way of determining the attainment level of this CO.

In fact if 1 looks at this statement with some care, it almost appears as if a part of the syllabus has been re-written. It almost looks as if a statement from the syllabus is picked up and it is pasted into an outcome statement. This cannot be an outcome statement at all. The outcome statement must show what the student is expected to do. There is no action verb in this statement so it does not even qualify as an outcome statement at all.

Leave alone an outcome statement of good quality. It is not an outcome statement at all. Let us look at this CO. We will get knowledge of protection schemes for generator, transformer and induction motor. This statement has the same problem as the previous statement. An outcome statement is a competency or behavior that can be demonstrated not discrepancy of internal changes in the students though these are necessary.

The student will get knowledge of protection schemes but that does not indicate clearly what the students is expected to do. Thus an outcome statement must state what the student is expected to do or perform. It should not describe the changes that take place in his mind or her mind. So COs are competencies behaviors that can be demonstrated, not descriptions of internal changes in the students.

Internal changes are necessary, students must really get the knowledge of the protection schemes. So, a change must occur in his brain or her brain that is absolutely necessary. But, that is not an outcome statement. What the student is able to do because of getting that knowledge that is an outcome statement.

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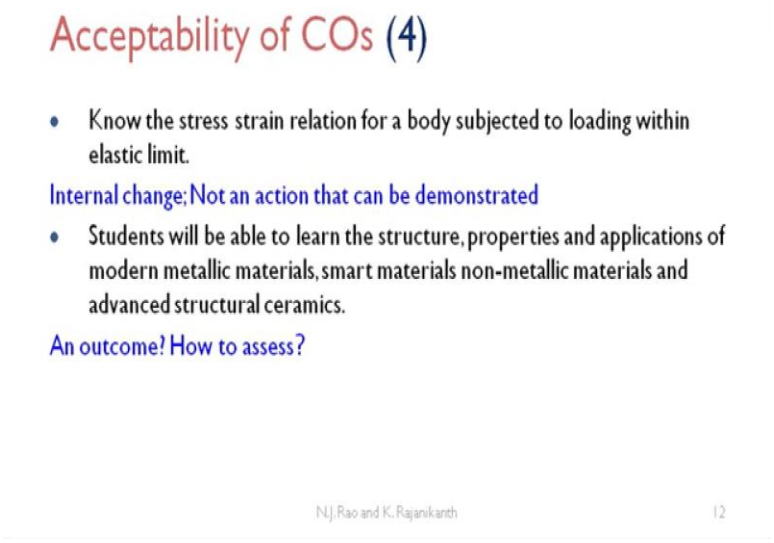

Let us look at one more outcome statement. Apply problem solving techniques to find solutions to problems. Superficially, it looks like it satisfies all the elements of the checklist, but the problem with this statement is that it is too general. There is no clear way of assessing whether

the student has acquired this ability or not. Apply problem solving techniques is a very-very general statement and it does not specify what are the competencies that we should be assessing.

So it is very difficult to assess and determine the level of attainment when the CO is written at this level of generality. It also says find solutions to problems. It does not indicate what kind problems, what kind of scope is implied by this CO statement, these are all vague. So this is a very-very general CO statement and thus is not acceptable as CO of good quality. Study variety of advanced abstract data types and data structures and their implementations. Please reflect about this outcome statement.

This is an activity that the student engages in during the course. Study, study is the activity that the student engages in during the course. It is not what he or she becomes capable of demonstrating at the end of the course. During the course student studies a varieties of abstract data types and data structures and their implementations. So, it is an activity that the student engages in during the course.

Whereas an outcome is a statement of what this student is able to do at the end of the course. So this is not really a learning product, rather this is a learning process. An outcome statement must be a learning product. At the end of the course what is it that the student can do? That will be an outcome statement. Further the statement uses variety of which is not be used. Specify what are the abstract data types that the students have to earn and implement and demonstrate their understanding.

There may be 3 or 4 types or 5, 6 types, state what they are, enumerate all of them, whatever be the data types that the instructor is intending to cover. It could be a queue, a stack, a tree whatever abstract data types the instructor plans to essentially cover in the given instructional unit must be stated her. So this statement has 2 problems, the word variety is not acceptable and this is an activity that the student engages in during the course and not an outcome statement.

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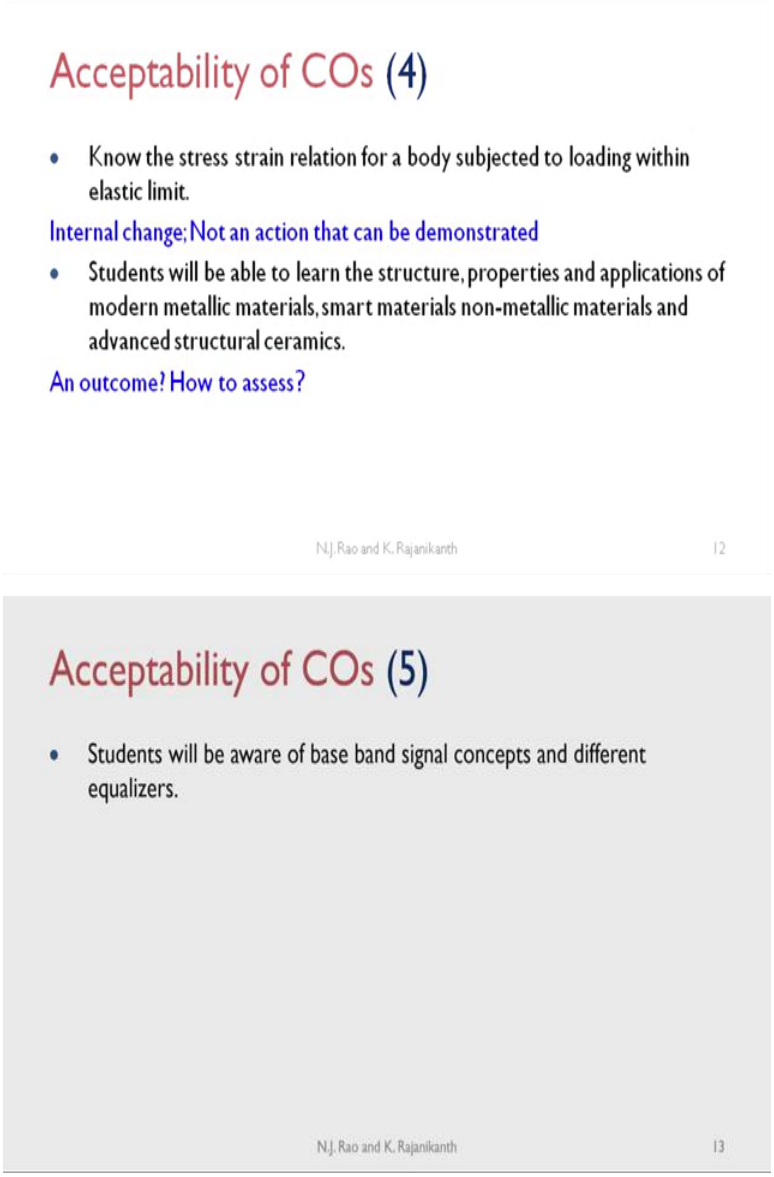

Let us look at one more statement, know the stress strain relation for a body subjected to loading within elastic limit. This is not an action that can be demonstrated, it is an internal change in the minds of the students. While internal change is essential that change itself does not become an outcome statement. An outcome statement must clearly state what the learner is expected to perform or do. This does not indicate that. There is no action that can be demonstrated. So, again this is an outcome of very poor quality.

Let us look at one more statement, students will be able to learn this structure, properties and applications of modern metallic materials, smart materials, non-metallic materials and advanced

structural ceramics. Is it an outcome statement? How to assess whether the outcome has been attained or not? The statement is saying students will be able to learn. That again is essentially an activity. It is not what the leaners will be able to do.

It states students will be able to learn the structure. Whereas an outcome statement should indicate, what the students will be able to do. Thus, this is again not an outcome statement that is acceptable.

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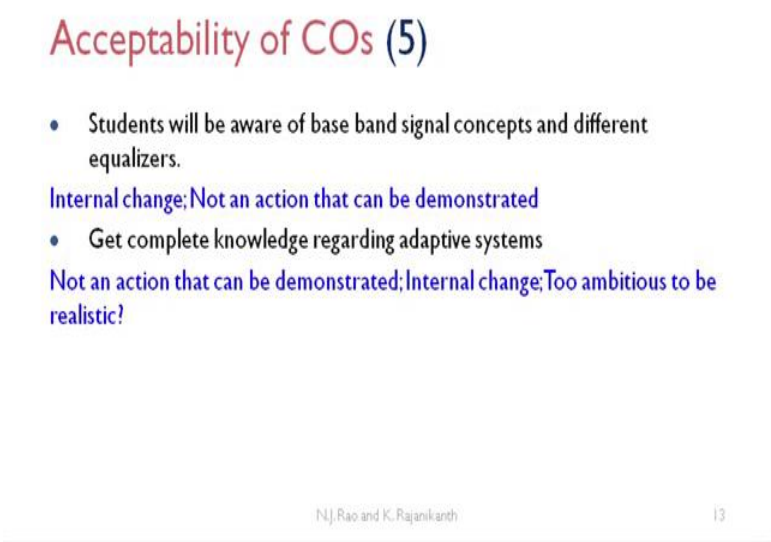

Students will be aware of base band signals concepts and different equalizers. Please think about this as an outcome statement. Again, this is not an action that can be demonstrated, it only states the expected change in the minds of the students. In other words, it indicates the expected internal change, it does not state what is the activity that the students will be able to show, do, demonstrate and thus it is again not a outcome statement of good quality.

It says, students will be aware of, an outcome statement must clearly specify what the students will be able to do. It must start with an action verb. Get compete knowledge regarding adaptive systems. Same problem not an action that can be demonstrated, it is an internal change, it does not indicate what the students are expected to do or perform. Moreover, it is too ambitious to be realistic.

Complete knowledge is a word that is very scary to use in any given context. Complete knowledge is something that is not realistic at all. Thus this statement also is statement of very

poor quality. There is no action verb, it does not indicate what the students are expected to do or perform and it is not realistic. Getting complete knowledge and then demonstrating that would be almost impossible.

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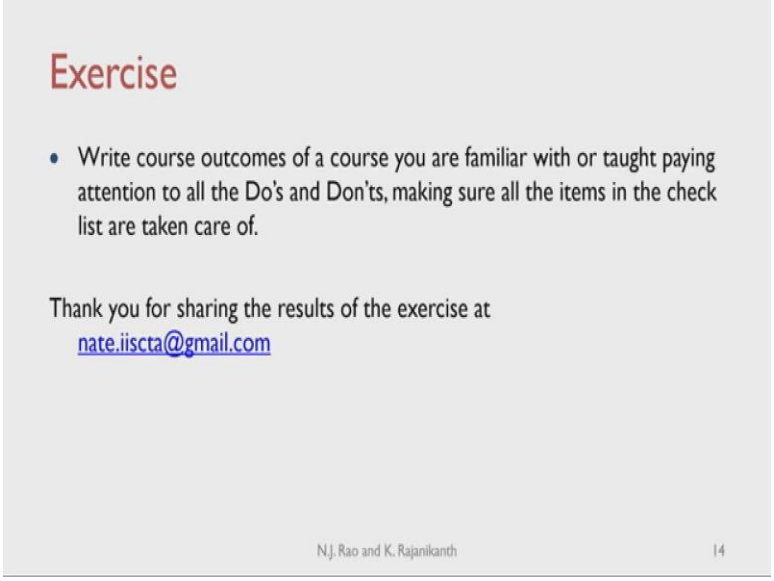

So, we have seen several outcome statements and we have seen what are the reasons why these statements cannot be considered as statements of good quality, one has to take considerable care in writing the outcome statements. In our probability, the statements have to go through 2-3 rounds of iterations, 2-3 faculty can sit together, discus, revise and then after some gap again look at the outcomes, see if they can be improved. So after 2-3 iterations it is likely that the outcome statements will be of good quality.

So one should not look at writing the outcome statements as a mere formality of producing a statement, one should write really outcome statements of good quality because the process does not stop with just writing the outcome statements. Having written the outcome statements we must design instruction to facilitate the students acquire those competencies. We must devoice assessment whereby we can know what is the extent to which those outcomes have been attain, then we have to close the quality loop at the level of the course.

There are several issues, which surround the quality of the outcome statement. So, we should be looking at writing the outcome statements as a serious activity and the outcome statements must

be of good quality, if the subsequent processes are to be carried out efficiently. So one should pay attention to the way the outcome statements are written.

Then exercise, write course outcomes of a course you are familiar with or taught paying attention to all the dos and donts, making sure all the items in the checklist are taken care of. Please also keep in mind the comments that we have made regarding the sample outcome statements that we projected. Thank you for sharing the result of the exercise at nat.iiscta@gmail.com.

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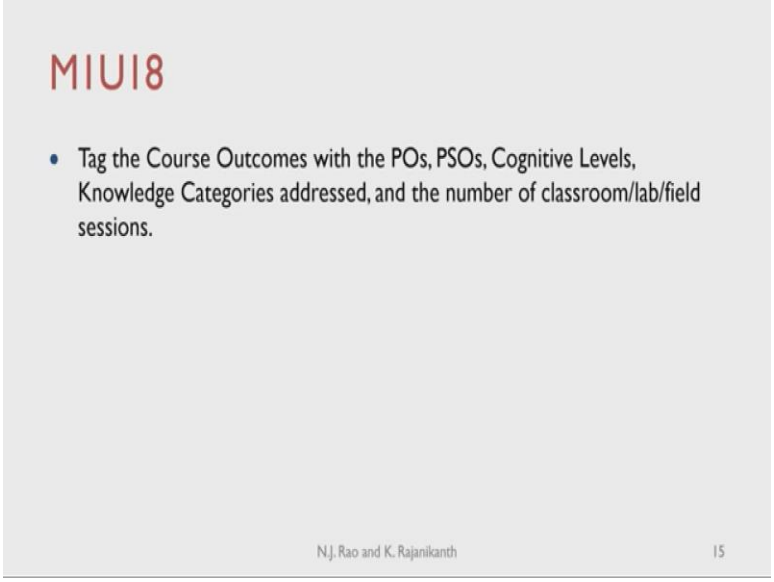

In the next unit we will look at tagging the course outcomes with the program outcomes, program specific outcomes, cognitive levels, knowledge categories addressed and the number of classroom, laboratory or field sessions. Thank you and we will meet in the next unit. Thank you.