**TALE - 2 Course Design and Instruction of Engineering Courses**

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**Lecture - 01**
**Engineering Programs, NBA Accreditation and Engineering Courses**

Greetings and welcome to Module 2 of TALE. Many of you or most of you would have a participated in the Module 1 of TALE. This is Module 2 which is in continuation of Module 1. TALE is a course that facilitates the teachers in the context of the NBA Accreditation, good characteristics of engineer and to plan and conduct their courses.

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TALE - Module 2 - Unit 1: We are going to look at Engineering Programs, NBA accreditation and engineering courses. As engineering teachers all of you are familiar with it, but we will try to spend some time in looking at it in a particular sequence because some of the terminologies are recent and different faculty members may use these terms to mean different things.

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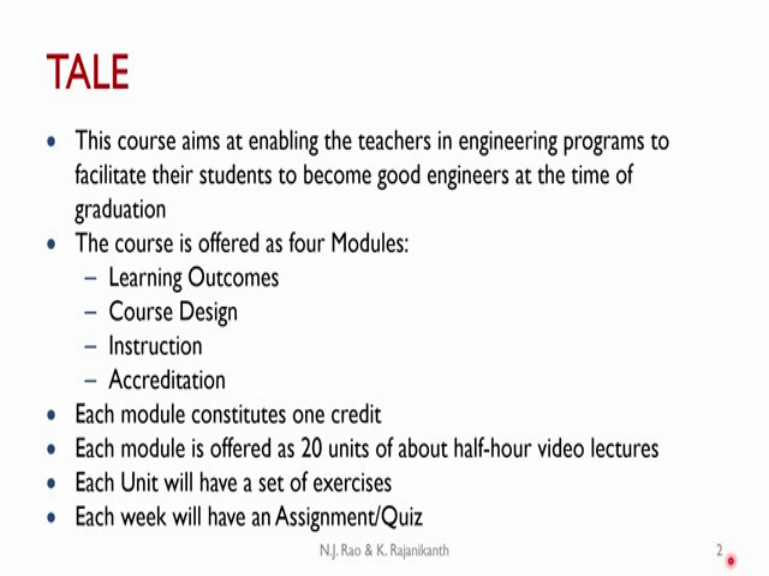


What does TALE do? TALE; with all the four modules; aims at enabling the teachers in engineering programs to facilitate their students to become good engineers at the time of graduation. So, it is a "second order input" kind of thing. The course enables the teachers, who in turn can facilitate their students to become good engineers.

The course is offered as four modules. One is looking at learning outcomes; the second one is course design; third one is instruction and fourth module is accreditation. As per the NPTEL format, each module constitutes one credit. Each module is also offered as 20 units of about half hour video lectures. Each unit will have a set of exercises, and each week will have an assignment or a quiz. Of course, in the end all of you will be writing an examination which should lead to the award of a grade and certificate.

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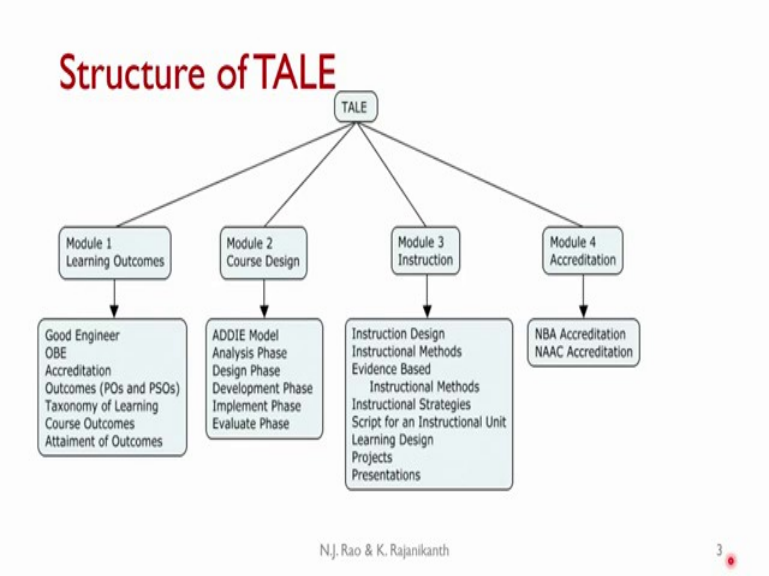


Let us look at the structure of a TALE which we have presented in Module 1. The same structure is repeated here. TALE has four modules as we mentioned. Module 1 is related to learning outcomes and that is otherwise called outcome based education. We will see what exactly we reviewed in that we will presently see. Module 2 is related to course design. That is what every teacher will have to do with their course; and if I design my course well, maybe my students will learn better. This course design is presented in the framework of ADDIE which we will elaborate in later units of Module 2.

In Module 3, we will look at instruction, how should you plan your instruction, which means planning and sequencing learning experiences of the students. We will talk about the related theories and how it can be presented. Module 4 is accreditation. These days each engineering program (not required to), but most to them go for NBA accreditation, and also every engineering college or every institute offering engineering programs goes for NAAC accreditation. In the fourth module, we will look at the accreditation processes.

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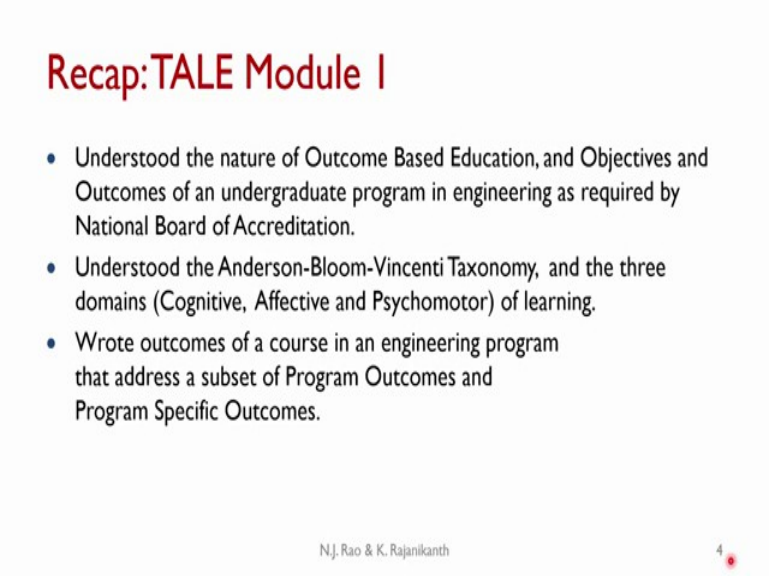


All the terminology, all the exercises of what has been done in TALE Module 1 are prerequisites to TALE Module 2. So, we are not going to repeat much of what has been addressed in TALE Module 1. In Module 1, we understood the nature of outcome based education, objectives and outcomes of an undergraduate program in engineering as required by National Board of Accreditation; because our framework is always the NBA accreditation framework or the guidelines provided by or a framework provided by AICTE and so on.

And we also understood the Anderson-Bloom-Vincenti taxonomy and three domains of learning namely cognitive, affective and psychomotor domains of learning. We understood the features of the three domains and particularly in the cognitive domain of the Anderson-Bloom-Vincenti taxonomy.

We also wrote outcomes of a course in engineering program that addresses a subset of program outcomes and program specific outcomes. So, at the end of Module 1, we not only wrote outcomes of a course, and how to write that as well as how to measure the attainment of these outcomes.

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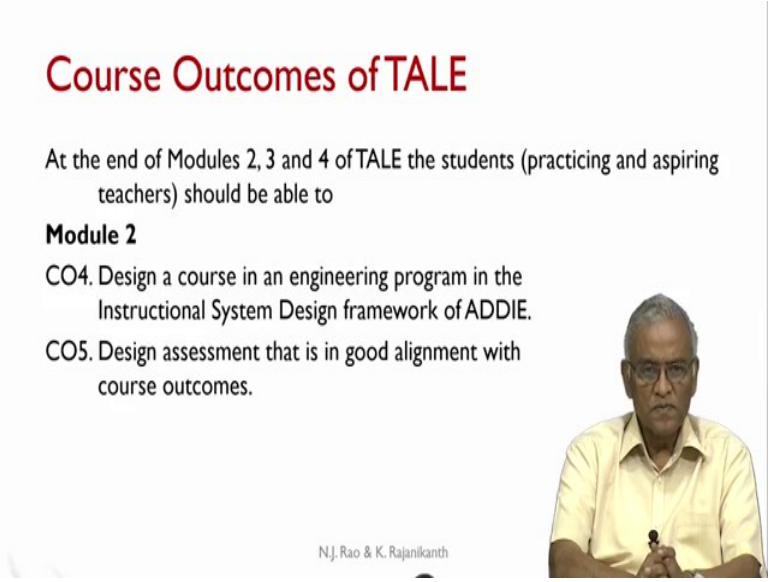


At the end of Module 2, 3 and 4 of TALE, the students who are mostly practicing and aspiring teachers should be able to design a course in an engineering program in the instructional design framework of ADDIE. We will be elaborating in the Module 2 about the framework of ADDIE, and also design assessment that is in good alignment with course outcomes.

In the Module 2, we will be looking at ADDIE. It has five phases - Analysis, Design, Development, Implement and Evaluate. We will be looking at how to perform activities in all the five phases of ADDIE and we expect the participants of TALE Module 2, to be able to design assessment that is in good alignment with course outcomes. These are the outcomes of Module 2.

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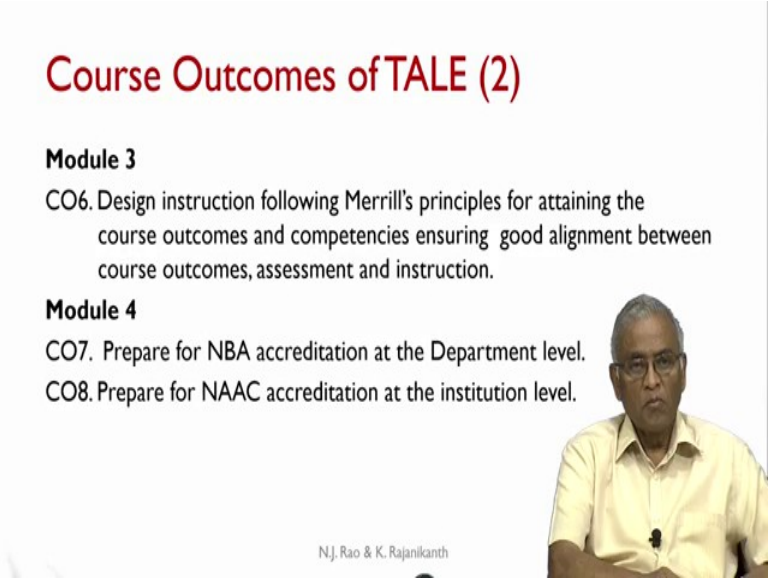


Module 3: Design instruction following Merrill's principles for attaining the course outcomes and competencies ensuring good alignment between course outcomes, assessment and instruction. Module 4: Prepare for NBA accreditation at the department level and also prepare for NAAC accreditation at the institution level.

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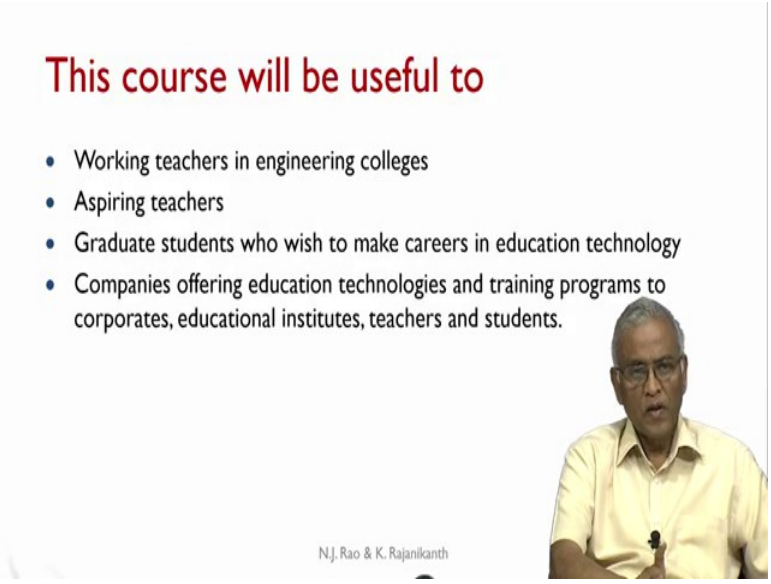


This course will be useful to working teachers in engineering colleges, aspiring teachers, graduate students who wish to make careers in education technology, and companies offering education technologies and training programs to corporates, educational

institutes, teachers and students. These days there are a number of companies that are coming up in India who are trying to design and conduct programs for the corporates as well as for the educational institutes.

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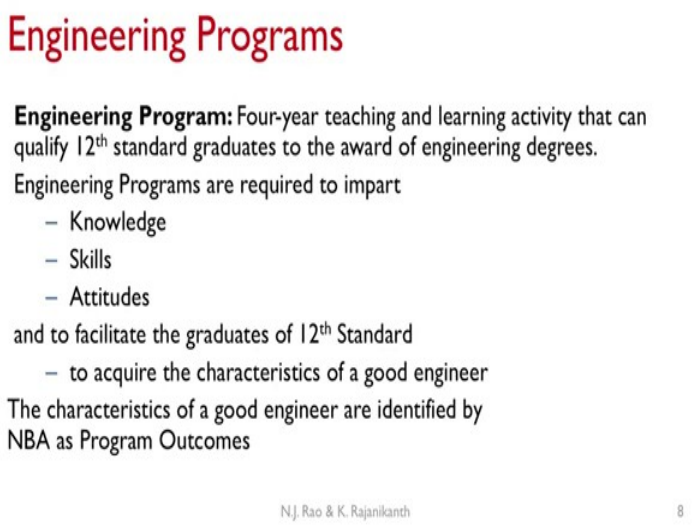


We need to be clear about a few terms. We will try to pin down certain words for which people usually use other words. Let us see what engineering programs are? Engineering program is a four-year teaching and learning activity that can qualify 12th standard graduates to the award of engineering degrees. When you say a program, it always leads to a formal degree in the present-day context.

Engineering programs are required to impart, (this we have mentioned already in Module 1), impart knowledge skills and attitudes, and to facilitate the graduates of 12th standard to acquire the characteristics of a good engineer. Who defines the characteristics of a good engineer? They are identified by National Board of Accreditation; they use the word ‘program outcomes’, that means, the program outcomes represent the characteristics of a good engineer as understood today. This may keep changing slightly from time to time. It is not as if you write the program outcomes once and they are permanent. As the technology changes the role of engineers change, the nature of program outcomes also will have to change with time.

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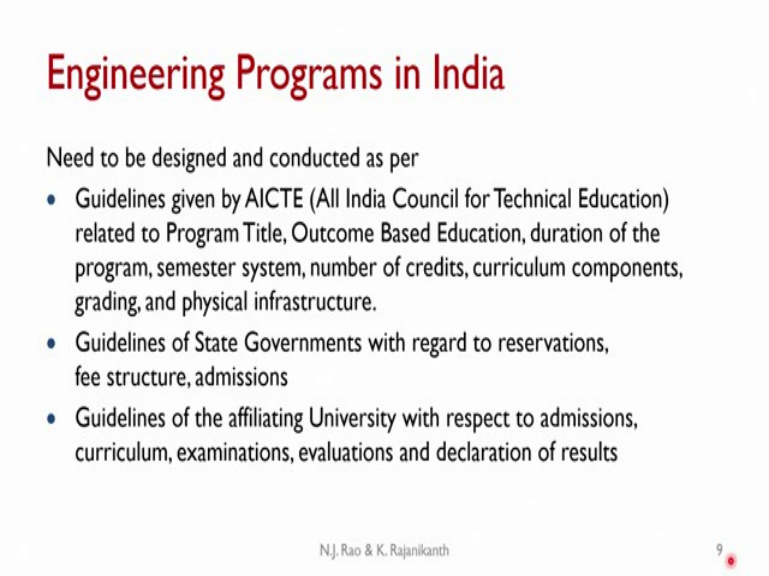


Engineering programs in India (this is what every teacher needs to be very clear), need to be designed and conducted as per guidelines given by AICTE; AICTE is All India Council for Technical Education. What are the guidelines they give here? They are related to the program title, that means what title you can use to your program- B.Tech in Computer Science or B. Tech in Computer Science and Engineering, so whichever degree that we offer the title will have to be generally accepted by AICTE. Of course, AICTE also from time to time will keep modifying the list of program titles.

The guidelines are given with respect to outcome based education, duration of the program, the semester system, the number of credits for which the program has to be designed, curriculum components, grading and physical infrastructure. These are the guidelines that AICTE provides. Unless you follow that, AICTE will not permit you to conduct and award or qualify your students for the award of engineering degrees.

In addition to these, guidelines of State Governments; they are with regard to reservations, fee structure and admissions. There may be many more, but these are the main guidelines that the State Government gives. Most of the colleges in India are affiliated to some university. It is a university that awards the degrees not the college, except in a few cases where they are private Universities or which are established by Government (either State or Central).

Affiliating university will have guidelines and some constraints with respect to admissions, curriculum, examinations, evaluations and declaration of results. Engineering programs will have to be designed and conducted under the guidelines given by AICTE, State Government and the affiliating university, which every teacher knows, but they have to understand in the corresponding framework.

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Though it is not compulsory to get NBA accreditation for the program, but majority (you can say ninety five percent) of the programs would want to go for NBA accreditation. If you take that as one of the requirements. NBA talks about vision and mission of the institute, that means the institute has to write a vision and mission. It does not say what that vision and mission should be, but they have to write vision and mission of the institute, vision and mission of the department, program educational objectives, program outcomes, program specific outcomes, course outcomes and how do you attain the COs, POs and PSOs, and generally closing the quality loop and ensuring that you are trying to improve continuously.

So, these are all the aspects of NBA accreditation as for as designing and conducting a course. Other than vision and mission, the rest of the things were addressed in Module 1, at least the terminology, what they are, how they are related etc.

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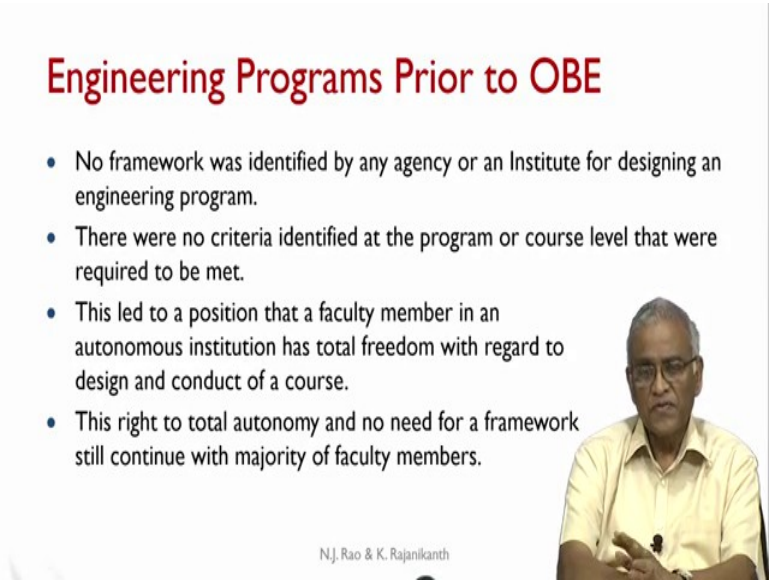


Engineering programs, if you want to understand prior to the introduction of OBE that is prior to 2015. While informally there was some understanding, but no formal framework was identified by any agency or an institute for designing an engineering program. For example, if you look at a document given by any institution offering engineering programs, there is no framework document saying that what are the objectives of the program, what are the program outcomes or at least an equivalent word for that was written. The framework was either informal are unstated.

Now we are required to state everything on a piece of paper. So, there will be clarity about the framework in which a program and a course is designed and offered. There were no criteria identified at the program or course level that were required to be met, This led to a position that faculty member in an autonomous institution has total freedom with regard to design and conduct of a course. One is not answerable to anything. I just pick a course, design my syllabus and offer it the way I consider the best, either from the subject perspective or goals that I have in mind, even the goals are not particularly stated.

This right to total autonomy, and no need for a framework still continue with majority of the faculty members. That is the reason why having got used to operating with no framework, many faculty members may feel a little constrained to providing any framework. We will presently see that aspect.

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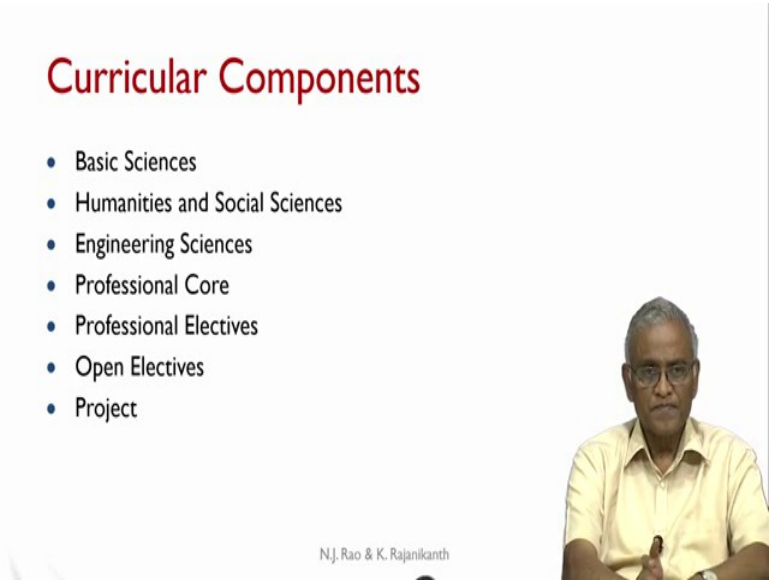


Courses are classified into these categories. The curricular components include basic sciences - how many courses, what courses depend on a given program- that is not stated by NBA or AICTE. But there is a basic science component. Basic sciences normally constitute physics, chemistry, mathematics, biology such things. Humanities and Social Sciences will include language and management and any other social science subject. Engineering sciences, professional core, professional electives, open electives and a project; these are broadly curricular components.

So, whenever somebody designs a curriculum, first thing that one does is the credits of the entire program are distributed under these curricular components, how many credits of the total program are allocated to basic sciences. There will be some courses in the curriculum, one may find it difficult to put under one of these categories, but too many categories cannot be created. Sometimes, we have difficulty in deciding whether a particular course should come under. ‘engineering science’ or ‘basic science’ or should it be shifted to core and so on. Such issues will always be there. But there are seven official categories that are identified, and all courses will have to be put under one of these seven categories.

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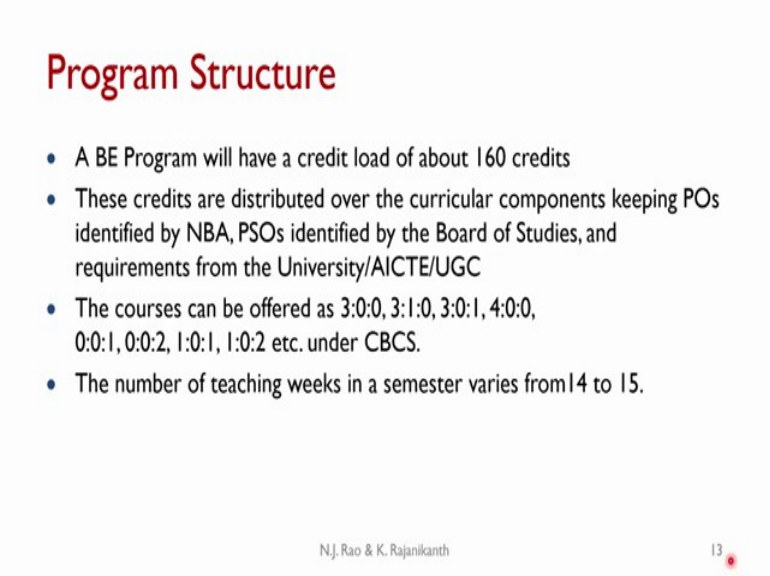


At least now we can say as for as AICTE is concerned, a BE program will have a credit load of about 160 credits, that means, it could be 160 plus or minus a few. Though till now there are large number of programs which are operating even are up to 260 credits on paper, though their credit definition will keep changing, but the majority of the programs in India are operating anywhere up to 200 credits, and in the recent past they coming back to around 160. Many of the programs have come back to 160 plus or minus 5, to 160 plus 10. They are trying to come within that.

These credits, whatever number that you choose are distributed over the curricular components, keeping the POs identified by NBA, PSOs identified by the Board of Studies, and the requirements of the University, AICTE and UGC. These are constraints that you have. For example, UGC says you have to have a course on ecology or environment. Sometimes a university may say every student will have to go through one course in local language, and sometimes a university may also constrain there should be a course specifically identified on professional ethics so on. To that extent, there are requirements that come from any of these agencies and we have talked about POs and PSOs, POs are identified by NBA, and PSOs are identified by the Board of Studies associated with the program.

Final selection of the courses will be done by Board of Studies, and they have to put the courses under these seven categories that we talked about. Courses can be offered as

3:0:0, or 3:1:0, 3:0:1 and so on. For example, a project can carry 0:0:12 or 0:0:8 whatever number is allotted for the project.

The courses earlier were characterized by marks like 100 marks, 150 marks and so on. Here they are characterized by the number of credits and the grade that a student gets. Under the CBCS scheme the student should have access to a wide range of courses (electives) from which he can choose.

Another aspect that you need to keep in mind is the number of teaching weeks; (mind you we are calling teaching weeks not working weeks), normally 90 working days is the norm of most of the semesters. We would not be teaching in all the 90 days we are conducting internal tests, there are some preparatory holidays, then you have final examination and so on. Taking all that into account the number of teaching weeks in a semester comes to 14 to 15. Why is this important? The content of the course that can be addressed satisfactorily by all students should be selected keeping this number in mind. If I increase the content indefinitely, because as a teacher I consider all that should be learned, but I will not be able to do a proper justice during the 14 to 15 weeks. It should be kept in mind that the number of weeks available for classroom interactions is 14 or 15, and the content will have to be accordingly adjusted.

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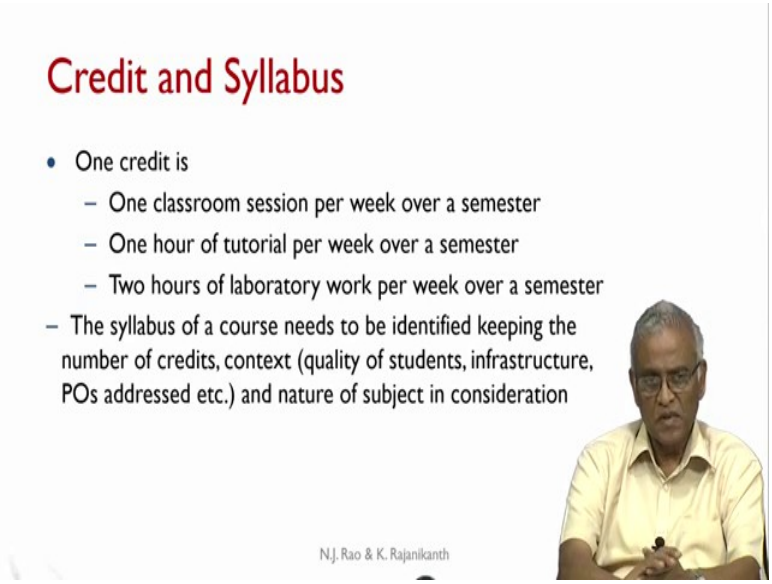


Credit and syllabus: one credit is one classroom session per week over a semester, one hour of tutorial per week over a semester or two hours of laboratory work per week over

a semester. And this will have to be strictly adhered to. This is right from UGC level, at AICTE level, these are all applicable. No institution/college should deviate from this definition of the credit. The syllabus of the course needs to be identified keeping the number of credits. Some courses are 2:0:0, or some courses are 3:1:0.

Depending on the number of credits and context, context here will refer to quality of students, infrastructure, POs addressed, and nature of the subject in consideration. If the subject is highly mathematical, and very difficult concepts are involved, or very complex procedures are involved in the course; then obviously, the content will have to be accordingly adjusted not because the subject requires that. The syllabus of the course needs to be decided by these considerations.

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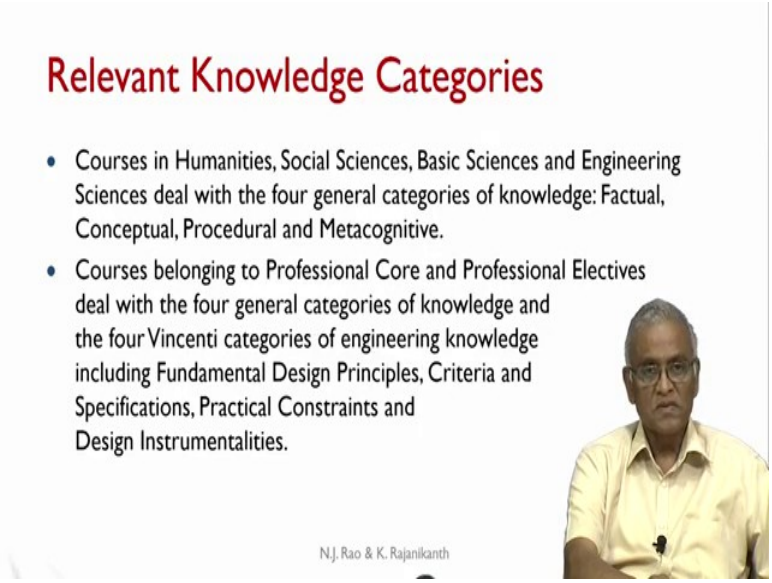


Broadly we need to divide the courses into two categories in a way based on the knowledge categories. For example, courses in Humanities, Social Sciences, Basic Sciences and Engineering Sciences, deal with the four general categories of knowledge namely factual, conceptual, procedural and metacognitive. Whereas, courses belonging to Professional course, Professional Electives deal with the four Vincenti categories of engineering knowledge including Fundamental Design Principles, Criteria and Specifications, Practical Constraints and Design Instrumentalities. When you come to open electives, the way open elective design can belong to the first category or to the engineering category- that is the choice of the course designer.

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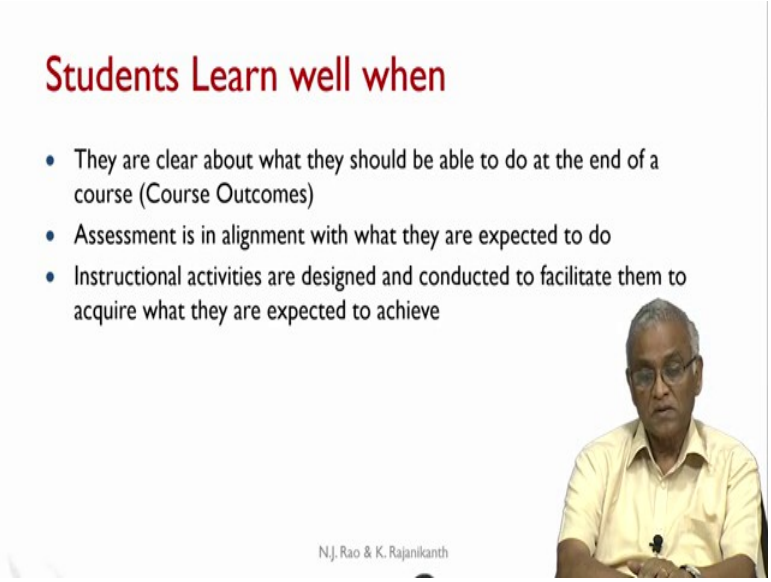


Students learn well when they are clear about what they should be able to do at the end of a course- these are written as course outcomes. Assessment is an alignment with what they are expected to do. And instructional activities are designed and conducted to facilitate them to acquire what they are expected to achieve. These are the principles of a in a good course.

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In unit 2 of this module we present the role of course design in facilitating good learning, which is the purpose of the course design.

Thank you very much for your attention.