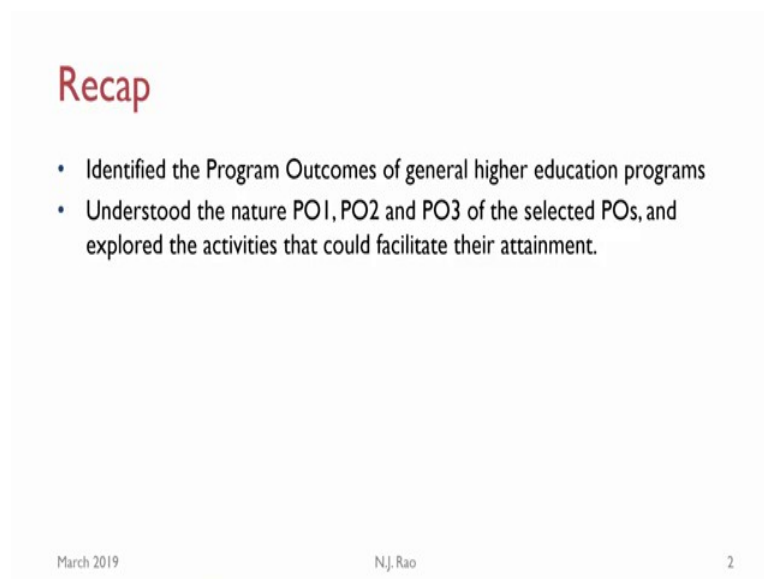


**Teaching and Learning in General programs (TALG)**  
**Prof. N.J. Rao**  
**Department of Electronics Systems Engineering**  
**Indian Institute of Science, Bengaluru**

**Lecture – 07**  
**Program Outcomes and Program Specific Outcomes**

Greetings and welcome to unit 7 of module 1 of TALG and this is going to be related to the Program Outcomes. Partly, we have dealt with that in unit 6.

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**Recap**

- Identified the Program Outcomes of general higher education programs
- Understood the nature PO1, PO2 and PO3 of the selected POs, and explored the activities that could facilitate their attainment.

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In unit 6 we have identified the program outcomes of general higher education programs. What you need to remind yourself is program outcomes of general programs are not going to be identified by accrediting agency. It is a university or the autonomous institution will have to identify. And also out all the twelve suggested possible outcomes we propose that initially, institution should aim at achieving or attaining seven program outcomes because the experience in designing a curricular in a top down manner from program outcomes and program specific outcomes is relatively new. So, the goals can be kept moderate and we confine ourselves to some seven and we made a proposal of those seven outcomes.

And in the process we understood the nature of PO1, PO2 and PO3 of the selected seven and explored what kind of activities could be incorporated in different courses that could facilitate their attainment.

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**MIU7: Outcomes**

- MIU7-1: Understand the nature PO4, PO5, PO6 and PO7 of the selected POs, and
- MIU7-2: Identify some possible activities that could lead to their attainment.
- MIU7-3: Write PSOs of a selected program.

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And, now, coming to unit 7, the goal is to understand the nature of PO4, PO5, PO6 and PO7 and identify some possible activities that could lead to their attainment and importantly write PSOs: program specific outcomes of a selected program. This is what the goals for this particular unit.

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**PO4: Individual and Team Work**

Function effectively as an individual, and as a member or leader in diverse teams, and in wide variety of settings.

- All activities in any organization are group activities. The group has to work as an effective team to meet the goals of the organization.
- An individual, after becoming a member of a team and identifying of his/her role, should be able to work effectively to achieve the team's objectives in spite of personal differences with other team members.

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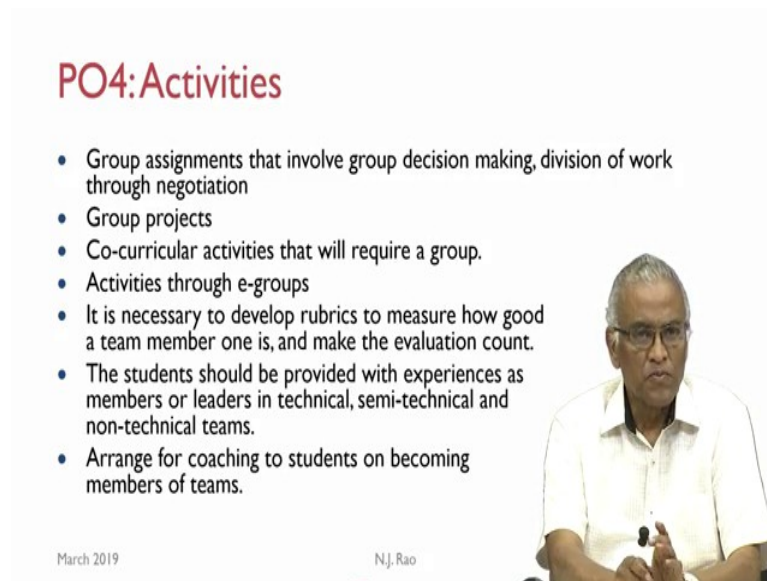
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Now, starting with PO4, it is related to individual and teamwork. The outcome statement is 'function effectively as an individual and as a member or leader in diverse teams and in a wide variety of settings'. All activities in any organization or group activities

whether it is office work or as I said one is working as a receptionist in an organization, whatever it is, whatever the activities that you do, it is always a group activity. And the group has to work as an effective team to meet the goals of the organization. That is the reason why everyone should train himself or herself both as an individual and as a team member.

And an individual after becoming a member of a team and identifying his or her role should be able to work effectively to achieve the team's objectives in spite of personal differences with other team members. This always happens when you change your job, the team into which you are going is very different from the team you are used to and anyone to be effective should have to learn to work with a different set of people with whom you may have several personal differences.

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**PO4: Activities**

- Group assignments that involve group decision making, division of work through negotiation
- Group projects
- Co-curricular activities that will require a group.
- Activities through e-groups
- It is necessary to develop rubrics to measure how good a team member one is, and make the evaluation count.
- The students should be provided with experiences as members or leaders in technical, semi-technical and non-technical teams.
- Arrange for coaching to students on becoming members of teams.

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And, what are the possible activities that you can organize in a program to attain this outcome? One can give group assignments that involve group decision making, division of work through negotiation that is one or just simply give a group project without stating anything. Co-curricular activities that will require a group.. Any co-curricular activity will generally involve a group of people to work and the group maybe e-group also. You are not directly face to face interacting, you have an e-group and but by merely asking a number of people to form a group alone will not do.

It is necessary to develop rubrics to measure how good a team member one is and to make the evaluation count. If the performance does not matter and it does not affect anything at all in your course or in your program then people do not pay attention to that. So, you should develop a rubric, you should be able to evaluate the students performance and you should give weightage to that in terms of the final grade of the student.

The students should be provided with experiences as members or leaders in technical, semi-technical and non-technical teams. So, these are possible activities: Arrange for coaching to students on becoming members of teams. Generally most of the institutions will have a BA program in a social sciences or psychology. So, that teachers from these departments can offer a short coaching program to all students of all programs. So, if some kind of coaching is given students are likely to perform better as team members.

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## PO5: Ethics

Understand multiple value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

- Application of ethical principles requires moral autonomy.
- Moral autonomy means conduct and principles of action are owned, decisions and actions are based on critical reflection and not a passive adoption of some "code", and moral beliefs and attitudes are integrated into the core of one's personality and lead to committed action.
- Students should understand the nature of ethical problems they face in a range of professions they are likely get into.
- PO5 can be addressed through a dedicated course on professional ethics and/or case studies with focus on ethical issues and their resolutions.

Now, the more difficult thing PO5 is related to ethics, understand multiple value systems including your own, understand the moral dimensions of your decisions and accept responsibility for them. Anyone would say you must have your ethics. So, one easiest way to get rid of this is to design a course either called professional ethics or ethics and treat it as any other subject and give it and that is easiest way to really address this PO. But, to address this PO is really somewhat difficult. First thing is most importantly any application of ethical principles requires what is called moral autonomy that is at

individual level; you must be responsible for your decisions. To acquire that particular characteristic is not going to be very easy.

Moral autonomy means conduct and principles of action are owned; that means, how I behave and what principles of action I have to own myself and decisions and actions are based on critical reflection and not passive adoption of some code. Sometimes we also whether we like it or not we have to follow the code even if you do not believe in. Like most importantly the traffic rules. If you do not put fines/heavy fines nobody will follow the traffic rule. It is very difficult for people to have that kind of internal discipline and moral beliefs and attitudes are integrated into the core of one's personality and lead to committed action. So, moral autonomy really means that.

When you consider somebody does not have moral autonomy the only way to handle that issue is by fines or some kind of punishment. Students should understand the nature of ethical problems they face in a range of professions they are likely to get into. PO5 can be addressed through a dedicated course on professional ethics and/or case studies with focus on ethical issues and their resolutions. This can be made very interesting, but it cannot be merely translated into a kind of a single textbook. So, the teacher who teaches either this course or incorporates these case studies into other courses will have to do special work to really present the ethical dilemmas that would come in that particular case study.

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## PO5:Activities

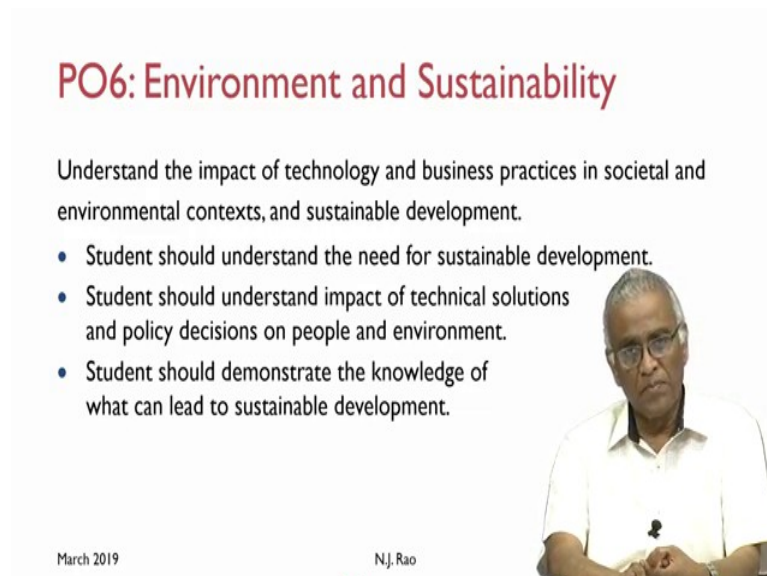
- Identify the deviations of a solution from the accepted professional practices.
- Identify the impact of a solution on different groups of persons.
- Recognize the ethical dilemma in the case studies presented.
- Propose actions that minimize damage and synthesize solutions rather than judge the players in ethically complex situations presented as case studies.

So, some of these activities that you can address are: identify the deviations of a solution from the accepted professional practice. You take a case where the solution deviated from the accepted professional practice and then you discuss. Whether the deviation is justifiable or punishable or whether there is any ethical issue involved, how the ethical issues are deviated, one needs to be sensitized to that.

Identify the impact of the solution on different groups of persons. Especially any major project that you will have, it will have different impact and different groups depending on where it is located, what economic groups are affected and so on and on. Recognise the ethical dilemma in the case studies presented. Propose actions that minimise damage and synthesise solutions. For example, this one is somewhat difficult. Propose actions that minimise damage and synthesis solutions rather than judge the players in ethically complex situations presented as case studies.

Instead judging the players in a situation, can we try to synthesise solution that satisfies major or at least minimise damage? This is where compromises are required and I am sure that all of us are familiar with this kind of compromises that are constantly are addressed in a variety of politically oriented cases.

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**PO6: Environment and Sustainability**

Understand the impact of technology and business practices in societal and environmental contexts, and sustainable development.

- Student should understand the need for sustainable development.
- Student should understand impact of technical solutions and policy decisions on people and environment.
- Student should demonstrate the knowledge of what can lead to sustainable development.

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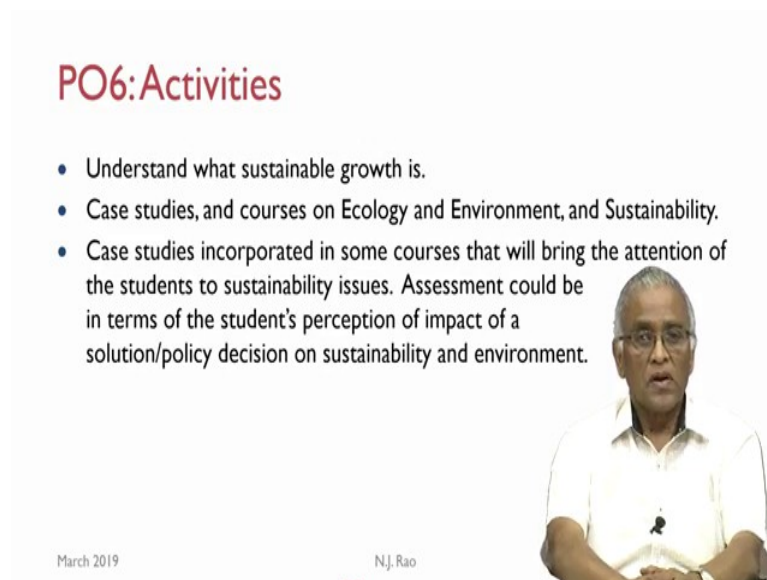
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Now, environment and sustainability, once again this is an issue that everyone today is familiar with. First of all there is environmental damage through all our human activities

and on top of that the style of life that we are building is not sustainable over a longer period of time.

So, the PO6 says understand the impact of technology and business practices in societal and environmental contexts and sustainable development. Now, student should understand the need for sustainable development. Whether you want to give it as a course or a series of lectures that each college can decide. Student should understand the impact of technical solutions and policy decisions on people and environment. This can be given through as case studies or part of a course. Students should demonstrate the knowledge what can lead to sustainable development.

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**PO6: Activities**

- Understand what sustainable growth is.
- Case studies, and courses on Ecology and Environment, and Sustainability.
- Case studies incorporated in some courses that will bring the attention of the students to sustainability issues. Assessment could be in terms of the student's perception of impact of a solution/policy decision on sustainability and environment.

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And now what are the activities that are possible for this? Understand what sustainable growth is. Case studies and courses on ecology and environment and sustainability such formal courses do exist. So, one can incorporate courses like that. In fact, UGC requires a two credit course on ecology and environment to make compulsory, but that does not automatically lead to the sustainability issue. You can also have a course on sustainability or a set of case studies.

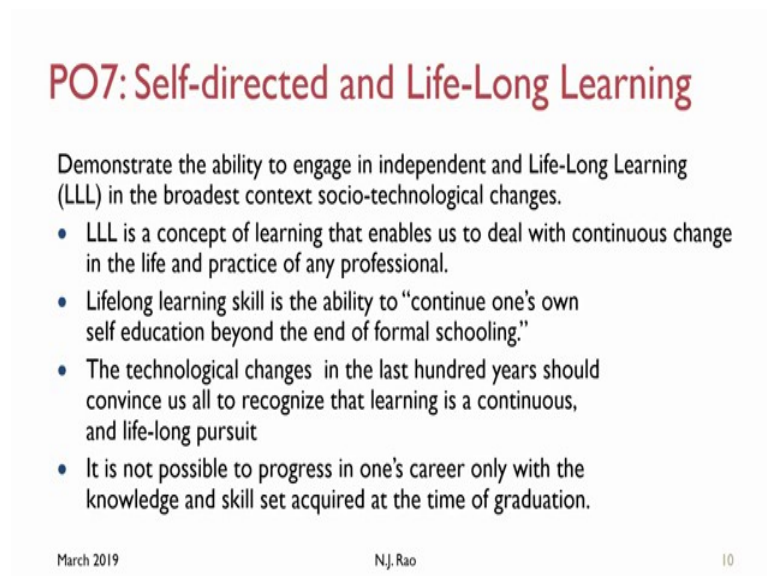
So, case studies incorporated in some courses that will bring the attention of the students to sustainability issue. So, if you are incorporating a case study in a course the assessment could be in terms of student's perception of impact of a solution or policy decision on sustainability and environment. So, the way the course is designed and



conducted and also the student performance is evaluated will have an impact on to what extent PO6 is attained.

Merely giving a series of lectures on sustainability or environment do not automatically mean that you have attained PO6. Have you assessed the students and have you evaluated the performance of the students? Did you count that in the final grade of the student? Until all these three activities are done, mere lecturing or presenting case studies it does not lead to attainment of these POs.

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**PO7: Self-directed and Life-Long Learning**

Demonstrate the ability to engage in independent and Life-Long Learning (LLL) in the broadest context socio-technological changes.

- LLL is a concept of learning that enables us to deal with continuous change in the life and practice of any professional.
- Lifelong learning skill is the ability to “continue one’s own self education beyond the end of formal schooling.”
- The technological changes in the last hundred years should convince us all to recognize that learning is a continuous, and life-long pursuit
- It is not possible to progress in one’s career only with the knowledge and skill set acquired at the time of graduation.

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And finally, PO7 is related to self directed and lifelong learning. Demonstrate the ability to engage in independent and lifelong learning is the broadest context of socio-technical changes. Now, we call it triple L that is life-long learning, is a concept of learning that enables us to deal with continuous change in the life and practice of any profession. Because, we now accept what you are at the time of graduation not going to be the same that it is a 5 years from now. You are working in a different environment and different kind of activity. The nature of profession itself will keep changing.

So, life-long learning is the ability to continue one’s own self education beyond the end of formal schooling. If you look at present days advertisements is there on the radio or on the TV as you can see that there are many institutions keep advertising that if you want to move up in your profession you can come on that credit such in such a course, get



certified in that. So, to that extent unless you are willing to continuously learn one may not be able to progress in one's own profession.

The technological changes; obviously, in the last hundred years should convince all of us that learning is a continuous and life-long pursuit, there is no choice. It is not possible to progress in ones' career only with the knowledge and skill set acquired at the time of graduation.

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**PO7:Activities**

- Determine the knowledge, skills and attitudes needed at the beginning of a project (writing a report and/or developing a product/process)
- Develop strategies to acquire the required knowledge and skills.
- Acquire the required knowledge and skills outside classroom.
- Participate in professional development, professional society activities, and co curricular and extra curricular activities

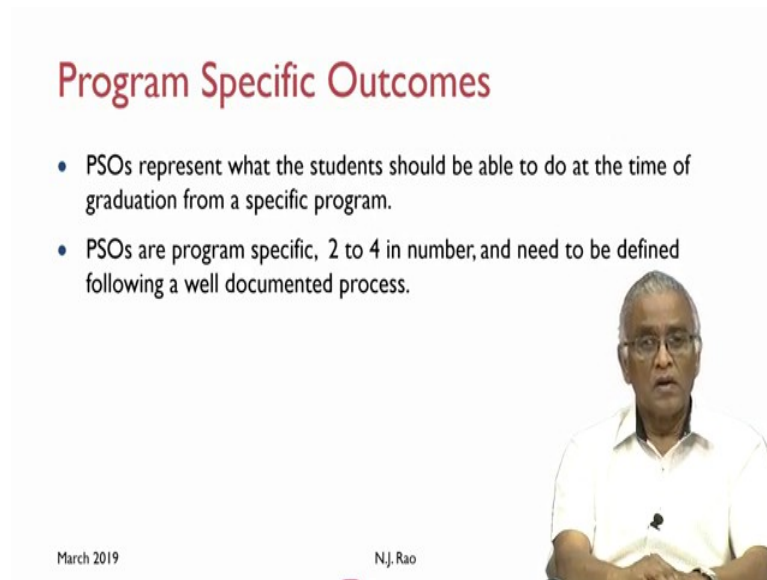
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And what are the activities that you can do to promote this ability? Determine the knowledge, skills and attitudes needed at the beginning of a project. For example, one can present hypothetical project and ask the students to write a report and before you write the report what is the knowledge, skills and attitudes there are needed to execute the project can be first determined by the students.

Develop strategies to acquire the required knowledge and skills. Because this kind of self learning, you are not sitting in a classroom and attending lectures. How do you? You must develop your own strategy to acquire the required knowledge and skills. Acquire the required knowledge and skills outside the classroom, not inside the classroom. Participate in professional development, professional society activities and co-curricular and extracurricular activities. By participating in this, you are continuously learning on your own.

So, during the 3 years if you participate in various activities, it should be possible for a student to realise the importance of continuous learning, continuous updating of one's own knowledge and skills and also how to go about getting that kind of knowledge and skills.

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**Program Specific Outcomes**

- PSOs represent what the students should be able to do at the time of graduation from a specific program.
- PSOs are program specific, 2 to 4 in number, and need to be defined following a well documented process.

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So, we looked at the seven program outcomes. It is not easy to integrate, but one should make an effort that is where the curriculum design and implementation will have to spend significant amount of time to kind of demonstrate that we are truly attaining those seven program outcomes.

Now, come to program specific outcomes. PSOs represent what the student should be able to do at the time of graduation from a specific program. If you are doing BSc in Zoology, at the end of 3 year program in zoology what kind of outcomes you should attain which are specific to Zoology. Because your design of the program will depend on what kind of knowledge and skill set you want your graduates to have. Because, Zoology if you take it is such a vast discipline. You are selecting something from that. So, you are trying to communicate what you are selecting through this PSO statement.

They are program specific and we do not write too many of them. They should be 2 to 4 in number and need to be defined following a well documented process. This is not the job of one individual or one head of the department, but it should be done by a group of people or a committee that is specifically constituted for it.


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## Structure of PSO Statements

- The PSO statement should start with one or more action verbs.
- The action verbs should be followed by clearly identified knowledge elements belonging discipline(s) of the program of concern, and if required by the conditions under which the actions have to be performed.

Some examples of action verbs

- Formulate, specify, conceive, design, plan, architect, build, implement, test, operate
- Select
- Analyse, determine, estimate, calculate



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Now, all outcome statements will have to start with some action verbs. Here, as far as PSOs are concerned you can have one or more action verbs. Several action verbs can be used and some examples we have given below like formulate, specify, conceive, design, plan, architect, build, implement, test, operate, select and so on and on. You do not have to be restricted to the indicated action verbs; you can also coin some action verbs that truly represent what you have in mind for your program. And the action verbs should be followed by clearly identified knowledge elements belonging to the disciplines of the program.


Sometimes a program have more than one discipline as a core, sometimes it will have only one discipline- of the program of concern and if required by the conditions under which the actions have to be performed. So, you not only talk about the knowledge elements from a particular discipline, you also talk about the conditions under which the actions have to be performed.

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**PSOs: BSc Zoology (Sample)**

- PSO1. Understand the nature and basic concepts of Cell Biology, Biochemistry, Taxonomy and Ecology.
- PSO2. Analyse the relationships among animals, plants and microbes
- PSO3. Perform procedures as per laboratory standards in the areas of Biochemistry, Bioinformatics, Taxonomy, Economic Zoology and Ecology
- PSO4. Understand the applications of biological sciences in Apiculture, Aquaculture, Agriculture and Medicine

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Now, the only way to demonstrate is by giving you some examples. Now, PSOs of BSc Zoology - this is sample. It is not the saying that all BSc Zoology programs have to be given this way. These are about two or three faculty members as a group have retained in one particular case/ instance. You may agree or you may disagree with what is presented here.

Understand the nature and basic concepts of Cell Biology, Biochemistry, Taxonomy and Ecology. Analyse the relationships among animals, plants and microbes. Perform procedures as per the laboratory standards in the areas of Biochemistry, Bioinformatics, Taxonomy, Economic Zoology and Ecology. Understand the applications of biological sciences in Apiculture, Aquaculture, Agriculture and Medicine. You should not be writing more than four. It is preferable to capture as much detail that is when you write the sentence you can make the sentence longer adding various adjectives as well as specific knowledge elements to make it rich, but a PSO is only one sentence, each PSO is one sentence and you can write a maximum of four.


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**PSOs: BA History (Sample)**

- PSO1. Understand historical facts about the formation of societies and cultures of the World with emphasis on India.
- PSO2. Distinguish between primary and secondary sources and understand historical interpretations.
- PSO3. Analyze contemporary social and political issues in historical perspectives.
- PSO4. Write well organized historical arguments in the form of essays or reports

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Now, BA in History: Understand historical facts about the formation of societies and cultures of the world with emphasis on India. Distinguish between primary and secondary sources and understand historical interpretations. Analyse contemporary, social and political issues in historical perspectives. Write well organized historical arguments in the form of essays or reports.

This is a set of PSO for BA in History. Again, it is for the teachers or the concerned experts in this area to decide whether this is a kind of BA in History or a program in at undergraduate level in history that you want to do or you want to add more specific details into these statements.

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**PSOs: BA Economics (Sample)**

- PSO1. Understand the basic concepts in Economics
- PSO2. Understand the characteristics of Indian and World economy
- PSO3. Analyze macro-economic policies in India
- PSO4. Determine economic variables GDP, inflation, BOP, Poverty using statistical and econometric tools

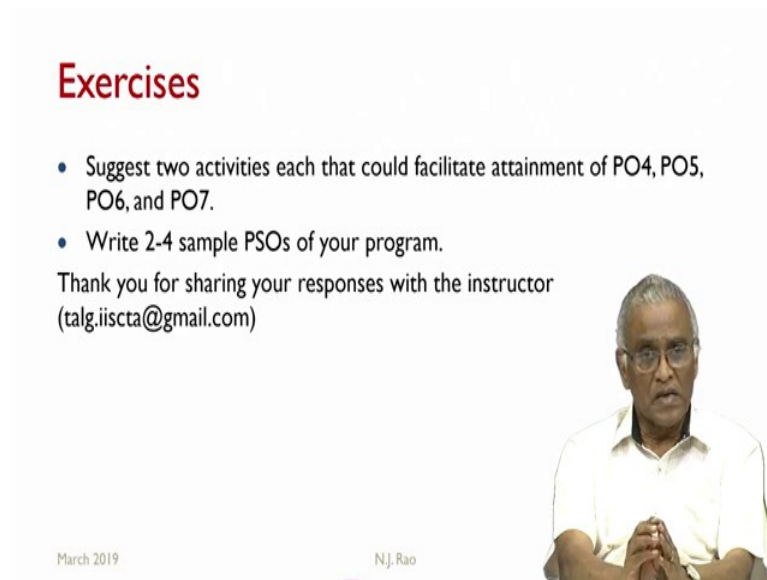
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Another example for BA in Economics: Understand the basic concepts in Economics. Understand the characteristics of Indian and world economy. Analyse macroeconomic policies in India. Determine economic variables GDP, inflation, BOP, poverty using statistical and econometric tools. These are the four that were shown for representing BA in economics.

These are examples only. We will not be able to show examples of all programs and once again we will be adding a resource document to the course to give a much larger number of samples of PSOs of undergraduate programs. You can consult them based on that one can write for one's own program the PSOs statements.

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**Exercises**

- Suggest two activities each that could facilitate attainment of PO4, PO5, PO6, and PO7.
- Write 2-4 sample PSOs of your program.

Thank you for sharing your responses with the instructor  
(talg.iiscta@gmail.com)

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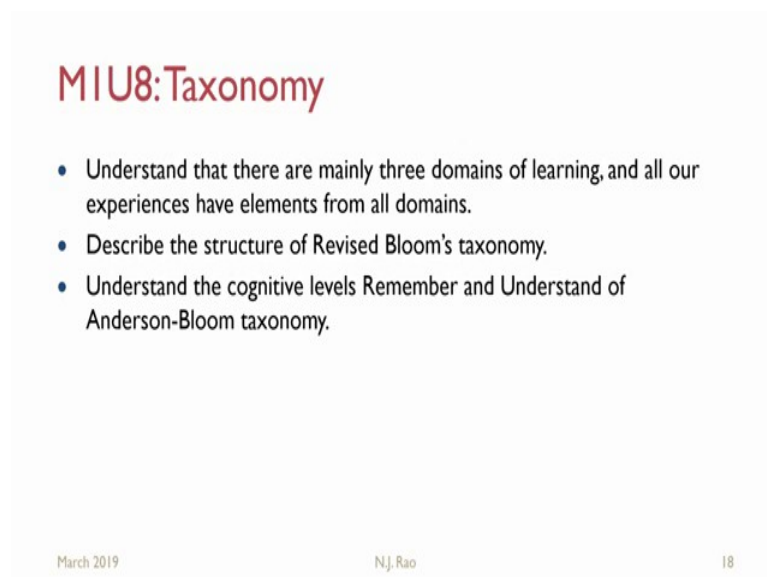
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The exercises that we would like you to do is suggest two activities each that could facilitate attainment of PO4, PO5, PO6 and PO7.

Write 2 to 4 sample PSOs of your own program.

This is as an individual not for the college. As an individual can I write because I know my undergraduate program can I write? and if you can share your responses with the instructor we will be thankful for.

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**MIU8: Taxonomy**

- Understand that there are mainly three domains of learning, and all our experiences have elements from all domains.
- Describe the structure of Revised Bloom's taxonomy.
- Understand the cognitive levels Remember and Understand of Anderson-Bloom taxonomy.

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And in the following unit on taxonomy, we attempt to understand that there are mainly three domains of learning and all our experiences have elements from all domains. And we describe the structure of revised blooms taxonomy and understand the cognitive levels: Remember and Understand of Anderson-Bloom taxonomy. As you can see in sentences like this same word comes twice, one is used in a very specific sense the other is possibly used in a more commonsensical way.

So, that will be the unit 8 and thank you for listening.