How to Calculate Attainment of CO and PO

Prof (Dr.) J.N.Jha

Principal, MIT Muzaffarpur

Email: jagadanand@gmail.com

Engineering Programs

- Graduates of Engineering Programs in India are required

- ➢ To attain the Program Outcomes (POs) identified by the National Board of Accreditation (NBA)

- ➢ To attain Program Specific Outcomes (PSOs) identified by the University or the Department offering the Program.

- POs and PSOs are to attained

- ➢ through courses, projects, co-curricular and extra-curricular activities (in which performance of the students is evaluated).

Courses

- Courses are broadly classified

  ➢ Core courses and Electives.

- Core courses are Classified

  ➢ Engineering/Engineering Science, and Basic Sciences / Humanities / Social Sciences /Management

- POs and PSOs are to be attained

  ➢ through core courses, project and activities

  (in which all students Participate- Elective will not be considered).

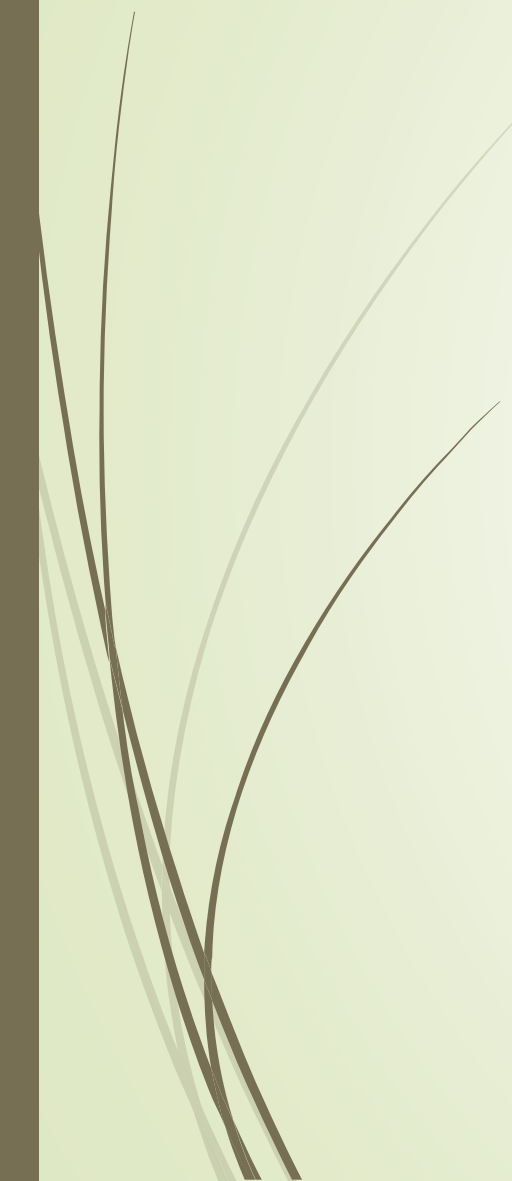- Courses constitute the dominant part of any engineering program.

Students learn well

➡️ Course Outcome

➢ when they are clear about what they should be able to do at the end of a course (Course Outcomes)

➢ Assessment is in alignment with what they are expected to do (Assessment in alignment with Course Outcomes)

➢ Instructional activities are designed and conducted to facilitate them to acquire and demonstrate what they are expected to do

(Alignment among Instruction, Assessment and Course Outcomes)

What are Course Outcomes?

- **Course Outcomes (COs): What the student should be able to do at the end of a course**

- **It is an effective ability, including attributes, skills and knowledge to successfully carry out the identified activity**

- **Most important aspect of a CO: Should be observable and measurable**

Structure of a CO statement

- **Action:** Represents a cognitive/ affective/ psychomotor activity the learner should perform. An action is indicated by an action verb, occasionally two, representing the concerned cognitive process(es).

- Cognitive Process (Action Verb): Remember, Understand, Apply, Analyze, Evaluate, Create

- **Knowledge**: Represents the specific knowledge from any one or more of the eight knowledge categories

- Factual, Conceptual, Procedural, Metacognitive, Fundamental Design Principles, Criteria & Specifications, Practical Constraints, Design instrumentalities

- **Condition**: Represents the process the learner is expected to follow or the condition under which to perform the action (This is an optional element of CO)

- **Criteria:** Represent the parameters that characterize the acceptability levels of performing the action (This is an optional element of CO)

Two Action Verbs

- Some times it becomes equally important for a student to perform two cognitive processes/sub-processes on given knowledge elements.

- Only in such cases, two action verbs are used in a CO statement-Don't combine two COs into one

Example

- <u>Draw</u> *Bode plots* for the given dynamic system and <u>determine</u> the gain and phase margins

- Drawing and determining are equally important and both processes are related to the same knowledge elements of Bode plots

Sample 1- CO statement

- **Calculate major and minor losses associated with fluid flow in piping networks**

- **Action: Calculate (Apply)**

- **Knowledge: major and minor losses associated with fluid flow in piping networks (Conceptual and Procedural)**

- **Condition: None**

- **Criteria: None**

Sample 2- CO statement

- Determine the dynamic unbalanced conditions of a given mechanical system of rigid bodies subjected to force and acceleration

- **Action**: Determine (Apply)

- **Knowledge**: Dynamic unbalanced conditions (Conceptual and Procedural)

- **Condition**: given mechanical system of rigid bodies subjected to force and acceleration

- **Criterion**: None

Sample 3- CO statement

- Understand the effect of all the parameters in voltage controlled oscillators through simulation using TINATI.

- **Action**: Understand

- **Knowledge**: effect of all the parameters in voltage controlled oscillators (Conceptual)

- **Condition**: using simulation using TINATI

- **Criterion**: None

Sample 4- CO statement

- Determine the root of the given equation, accurate to second decimal place, using Newton-Raphson method

- **Action**: Determine (Apply)

- **Knowledge**: root of the given equation (Conceptual and Procedural)

- **Condition**: using Newton-Raphson method

- **Criterion**: accurate to second decimal place

Number of COs for a Course

- Too small a number of COs do not capture the course in sufficient detail and may not serve instruction design that well.

- Too many COs make all the processes related to assessment design and computation of attainment of COs messy and demanding.

- A 3:0:0, 3:1:0 and 3:0:1 courses should have about 6 course outcomes.

- The number of COs of courses carrying different number of credits can be suitably adjusted

Dos and Don'ts

- Use only one action verb

- Do not use words including 'like', 'such as', 'different', 'various' 'etc.' with respect to knowledge elements. Enumerate all the relevant knowledge elements.

- Put in effort to make the CO statement as detailed as possible, and measurable.

- Do not make it either too abstract or too specific

Check List

- Does the CO begin with an action verb?

- Is the CO stated in terms of student performance (rather than teacher performance or course content to be covered)?

- 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?

- Is the CO attainable in the given context (students' background, prerequisite competences, facilities, time available and so on)?

Acceptability of COs

- Students will execute mini projects

➢ Instructional activities are designed to facilitate the attainment of COs by learners, but themselves are not COs

- Have the concepts of compensators and controllers (P, PD, PI, PID)

➢ COs are competencies / behaviors that can be demonstrated; not descriptions of internal changes in the students (though these are necessary)

- Optimal Generator scheduling for thermal power plants by using software package in the lab

➢ No action verb; no way of assessing; no way of determining attainment level; syllabus part is rewritten.

Acceptability of Cos... Cont.

- Will get knowledge of protection schemes for Generator, Transformer and Induction Motor

- COs are competencies / behaviors that can be demonstrated; not descriptions of internal changes in the students (though these are necessary)

- Apply problem solving techniques to find solutions to problems.

- Too general; no clear way of assessing!

- Study variety of advanced abstract data type (ADT) and data structures and their

  Implementations

- Activity that the student engages in during the Course; not what he / she becomes capable of demonstrating at the end of the course; the word "variety" is not to be used.

- Know the stress strain relation for a body subjected to loading within elastic limit.

- Internal change; Not an action that can be demonstrated

Acceptability of Cos... Cont.

- Students will be able to learn the structure, properties and applications of modern metallic materials, smart materials non-metallic materials and advanced structural ceramics.

- An outcome? How to assess?

- Students will be aware of base band signal concepts and different equalizers.

- Internal change; Not an action that can be demonstrated

- Get complete knowledge regarding adaptive systems

- Not an action that can be demonstrated; Internal change; Too ambitious to be realistic?

Tagging of Course Outcomes

- Tag Course Outcomes
- ➤ POs,
- ➤ PSOs,
- ➤ Cognitive Levels,
- ➤ Knowledge Categories addressed,
- ➤ Number of classroom/ laboratory/ field sessions associated with the COs

Tagging of Course Outcomes...Cont.

- Tagging COs with Classroom Sessions-Different COs may have different number of classroom sessions

- Tagging COs with Cognitive Levels-CO statement starts with an action verb from one of the cognitive levels

- (R-Remember, U-Understand, Ap- Apply, An-Analyse, E-Evaluate and C-Create)

- Tagging COs with Knowledge Categories-CO statement includes one or more categories of knowledge

Tagging COs with PSOs/POs- Concern/Grey areas

- All the COs of a course typically address the same PSO(s).
- Majority of the courses (non-autonomous institutions): Don't address strongly any PO other than PO1
- *PO1: Engineering Knowledge*
- Possible that PO2, PO3, PO4, PO5 are addressed slightly by some courses.
- *PO2: Problem Analysis*
- *PO3: Design/Development of Solutions*
- *PO4: Conduct Investigations of Complex Problems*
- *PO5: Modern Tool Usage*
- Hardly any course addresses complex engineering problems

Tagging COs with POs- Concern/Grey areas

- Some specific courses address PO7, PO8, PO9, PO10 and PO11
- *PO7: Environment and Sustainability*
- *PO8: Ethics*
- *PO9: Individual and Teamwork*
- *PO10: Communication*
- *PO11: Project Management and Finance*
- Projects can potentially address many Pos, (Rubrics-used to evaluate)
- Department can arrange for some activities outside the curriculum to address some POs
- *PO6: The Engineer and Society*
- *PO12: Life-Long Learning*

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions
CO1	Understand the fundamentals of fluid mechanics and fluids	PO1, PSO1	U	C,	6
CO2	Determine the basic equation to find the force on submerged surfaces	PO1, PSO1	Ap	C, P	9
CO3	Calculate the center of buoyancy of floating body, and the, velocity and acceleration of a fluid	PO1, PSO1	Ap	C,	12
CO4	Calculate flow parameters using fluid flow meters and using dimension analysis to predict flow phenomena, viscous effects using Hagen Poiseille's equation	PO1, PSO1	Ap	C, P	12
CO5	Calculate functional losses through pipes and to calculate the drag and life, displacement, momentum and energy thickness	PO1, PSO1	Ap	C, P	12
	Total hour of Instruction Fluid Mechanics - Credits: 4:0:0 Cognitive Level (CL), Knowledge Categories (KC),				54

Attainment of Course Outcomes- CO Attainment and Quality Loop
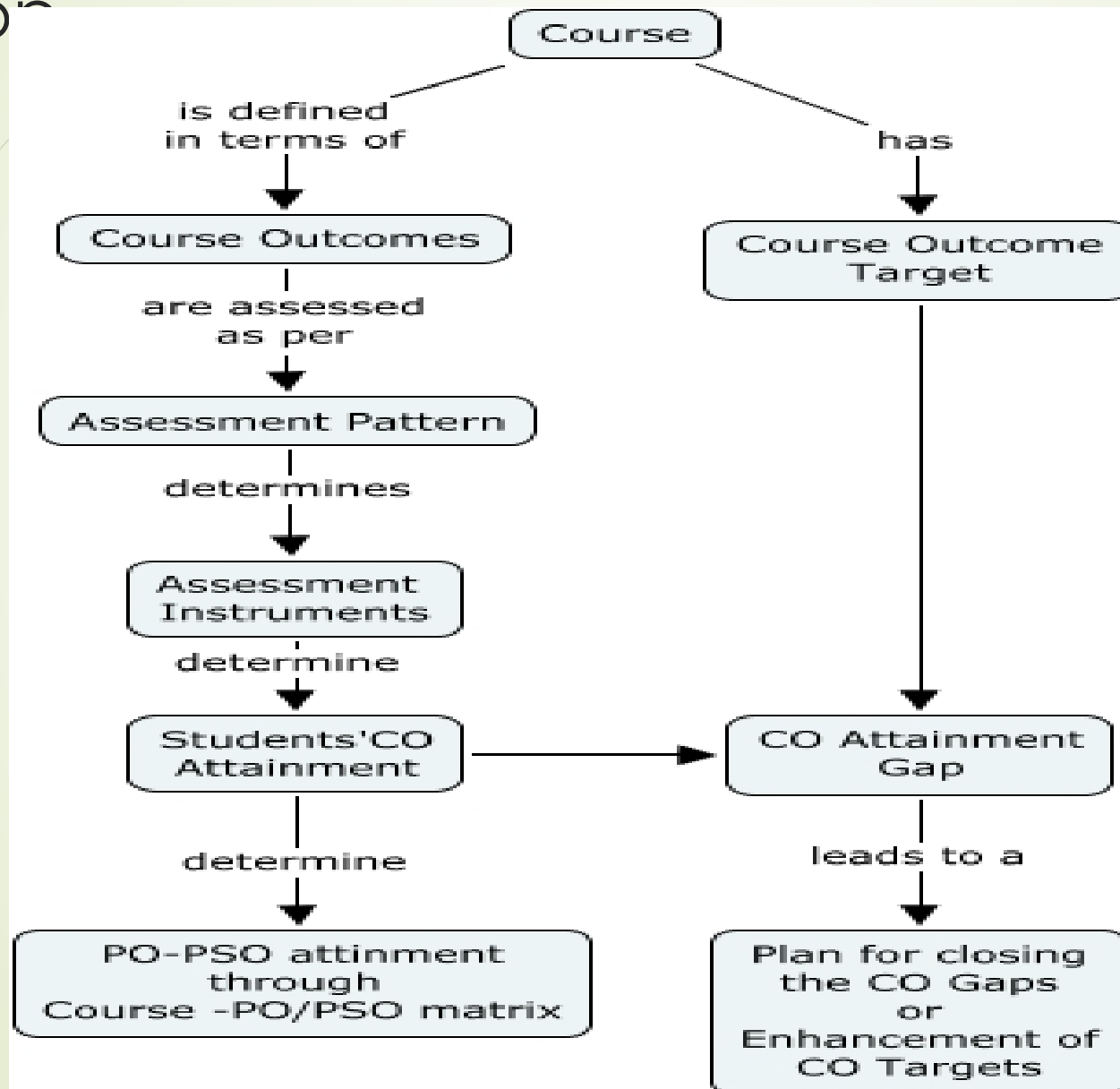
Setting CO Attainment Targets

- Same target (all the COs of a course) "class average marks > 60 marks"
- Targets set in terms of performance levels of different groups of students. (does not provide any specific clues to plans for improvement of quality of learning)

Targets (% of students getting)			
(< 50)	(>50 and < 65)	(>65 and < 80)	(≥ 80)
10	40	40	10

CO	Targets (% of students getting)			
	(< 50)	(>50 and < 65)	(>65 and < 80)	(≥ 80)
CO1	10	40	40	10
CO2	20	30	40	10
CO3	20	30	40	10
CO4	10	40	40	10
CO5	20	20	50	10
CO6	20	20	50	10

- Targets are set for each CO of a course separately

- Does not directly indicate the distribution of performance among the students

- Advantage of finding out the difficulty of specific Cos

- Improvements also can be planned CO-wise

CO	Target (Class Average %)
CO1	70
CO2	80
CO3	75
CO4	65
CO5	70
CO6	80

- Targets are quantized into certain levels, 3 being the most common number of levels.
- Level 3: Class Average > 70%

  Level 2: 50% < Class Average ≤ 70%

  Level 1: Class Average ≤ 50%
- Aim is to attain Level 3

Attainment of COs

- Attainment of COs can be measured **directly** and **indirectly**

- Direct attainment of COs can be determined from the performances of students in all the relevant assessment instruments.

- The exit survey form should permit receiving feedback from students on all the COs.

- Computation of indirect attainment of COs is based on the perceptions of students! Hence, the percentage weightage to indirect attainment can be kept at a low value, say 10%.

Direct CO Attainment

- Direct attainment of COs is determined from the performances of students in Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).

- The proportional weightages of CIE: SEE will be as per the academic regulations in force

- Proportions of 20:80, 25:75, 30:70, 40:60, 50:50 are all possible!

- Direct attainment of a specific COs is determined from the performances of students to all the assessment items related to that particular CO.

- Also, we need data about performance of students, assessment item-wise

Direct CO attainment from CIE and SEE

- Continuous Internal Evaluation (CIE) is conducted and evaluated by the Department itself in both Tier 1 and Tier 2 institutes.

- When questions are tagged with relevant COs, the department has access to performances of students with respect to each CO.

- Hence, computing the direct attainment of COs from CIE is straight forward for both Tier 1 and Tier 2 institutes.

- Semester End Examination (SEE) is conducted by the University for Tier 2 institutes

- No means of computing the direct attainment of individual COs from SEE!

- Only possible solution, though not satisfactory, is to treat the average marks in SEE as the common attainment of all COs!!!

Analog Circuits and Systems - Credits: 3:0:1

	Course Outcome	POs/PSOs	CL	KC	Class Sessions	Lab Sessions (Hrs)
CO1	Understand the characteristics of linear one-port and two-port signal processing networks	PO1, PO10, PSO1	U	F, C	3	0
CO2	Model one-port devices including R, L, C and diodes, two-port networks, and active devices including amplifiers, Op Amps, comparators, multipliers, BJTs and FETs	PO1, PO10, PSO1	U	C	9	4
CO3	Understand how negative and positive feedback influence the behaviour of analog circuits	PO1, PSO1	U	C	4	4
CO4	Design VCVS, CCVS, VCCS, CCCS, and DC and SMPS voltage regulators	PO3, PO4, PO5, PSO1	Ap	C, P, C&S, PC	10	4
CO5	Design analog filters	PO3, PO4, PO5, PSO1	Ap	C, P, C&S, PC	8	8
CO6	Design waveform generators, phase followers and frequency followers	PO3, PO4, PO5, PSO1	Ap	C, P, C&S, PC	6	8
Total Hours of instruction					**40**	**28**

Class Average in CIE (Tier 1 College)

CO	A1 5 Cl Ave	A2 5 Cl Ave	T1 15 Cl Ave	T2 15 Cl Ave	CIE Class Average %age
CO1	0	0	3.3/5	0	3.3/5= 66
CO2	1.5/2	0	4.1/5	0	5.6/7 = 80
CO3	0.7/1	0.75/1	3.8/5	2.3/3	7.55/10= 75.5
CO4	1.7/2	1.3/2	0	3.1/5	6.1/9= 67.8
CO5	0	1.7/2	0	2.8/4	4.5/6= 75
CO6	0	0	0	2.1/3	2.1/3= 70

Assessment Plan for CIE - Tier 2 College (Sample Assessment Plan for CIE)

Total Marks for CIE: 25
 (A1: Assignment 1; T1: Test 1; T2: Test 2)

CO	A1 5	T1 10	T2 10
CO1	0	4	1
CO2	2	3	1
CO3	1	3	3
CO4	2	0	2
CO5	0	0	2
CO6	0	0	1

Class Average in CIE (Tier 2 College)

CO	A1 5 Cl Ave	T1 10 Cl Ave	T2 10 Cl Ave	CIE Class Average (Rounded) %age
CO1	0	2.3/4	0.6/1	2.9/5= 58
CO2	1.5/2	2.1/3	0.8/1	4.4/6 = 73
CO3	0.7/1	2.3/3	2.3/3	5.3/7= 76
CO4	1.7/2	0	1.2/2	2.9/4= 73
CO5	0	0	1.1/2	1.1/2= 55
CO6	0	0	0.7/1	0.7/1= 70

Computation of CO Direct Attainment - Tier 2 College

Attainment of COi in a course Cxxx =

0.25x Attainment of COi as percentage in CIE + 0.75x Class Average Marks Percentage in SEE

CO	CIE Cl. Ave (%age)	SEE Cl. Ave (%age) (Same value is assumed for all COs)	Direct CO Attainment 0.25 CIE Cl. Ave + 0.75 SEE Cl. Ave (%age)
CO1	58	63	61.75
CO2	73	63	65.50
CO3	76	63	66.25
CO4	73	63	65.50
CO5	55	63	61.00
CO6	70	63	64.75

Total CO Attainment - Tier 2 College

Computation of Attainment of COs in Cxxx =

0.9 x Direct CO Attainment+ 0.1 x Indirect CO Attainment

CO	Direct CO Attainment %ge	Indirect CO Attainment (Obtained from Exit Survey) %ge	Total CO Attainment (Rounded) %ge
CO1	61.75	78	63
CO2	65.50	85	67
CO3	66.25	76	67
CO4	65.50	89	68
CO5	61.00	78	63
CO6	64.75	85	67

CO Attainment Gap - Tier 2 College

CO	CO Target %ge	Total CO Attainment %ge	CO Attainment Gap (Target – Attainment) %ge
CO1	60	63	-3
CO2	75	67	8
CO3	70	67	3
CO4	70	68	2
CO5	80	63	17
CO6	70	67	3

Gap > 0: Target not attained. Improvements must be planned to increase attainment next time.

Analog Circuits and Systems - Credits: 3:0:1

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions	Lab Sessions (Hrs)
CO1	Understand the characteristics of linear one-port and two-port signal processing networks	PO1, PO10, PSO1	U	F, C	3	0
CO2	Model one-port devices including R, L, C and diodes, two-port networks, and active devices including amplifiers, Op Amps, comparators, multipliers, BJTs and FETs	PO1, PO10, PSO1	U	C	9	4
CO3	Understand how negative and positive feedback influence the behaviour of analog circuits	PO1, PSO1	U	C	4	4
CO4	Design VCVS, CCVS, VCCS, CCCS, and DC and SMPS voltage regulators	PO3, PO4, PO5, PSO1	Ap	C, P, C&S, PC	10	4
CO5	Design analog filters	PO3, PO4, PO5, PSO1	Ap	C, P, C&S, PC	8	8
CO6	Design waveform generators, phase followers and frequency followers	PO3, PO4, PO5, PSO1	Ap	C, P, C&S, PC	6	8
Total Hours of instruction					40	28

Closure of the Quality Loop-Tier 2 College

CO	Target %ge	CO Attainment gap (%ge)	Action proposed to bridge the gap	Modification of target where achieved
CO1	60	-3		Increase the target to 65%
CO2	75	8	Explain in detail the need for macro modelling, and the models of BJTs and FETs. Present the parameters of presently available commercial devices	
CO3	70	3	Present more simulations of frequency dependence of transient behaviour of feedback systems	
CO4	70	2	Work out 5 more examples of amplifier and regulator design	
CO5	80	17	Demonstrate the effects of parameter variations using mathematical models and Graph	
CO6	70	3	Include 3 more open ended experiments in waveform generation and FLLs	

Action Plans for Improving the CO Attainments

- Action plans need to be as specific as possible.
- Indicate if any additional resources (Physical resources, Learning resources) are required to implement the improvement plans.
- Indicate if any changes in the Lesson Plan are required.
- Avoid vague statements like "Motivate the students", "Work harder".
- If possible, have the action plans reviewed by peers.

Increasing CO Attainment Targets

- CO attainment targets, quantized into levels, are increased by increasing the targets associated with the levels.

Example:

	Original Targets	Increased Targets
Level 3	Class Average > 70%	Class Average > 75%
Level 2	50% < Class Average ≤ 70%	60% < Class Average ≤ 75%
Level 1	Class Average ≤ 50%	Class Average ≤ 60%

Conclusions

No unique way of:

- Setting the targets for the attainments of COs
- Computing the attainments of COs
- Increasing the attainment targets

POs and PSOs

POs and PSOs are/can be addressed through:

- Core courses
- Projects (Major and Mini)
- Seminars / Presentations
- Internships
- Co-curricular and Extra-curricular Activities
- For any activity to be considered for computing the attainment of POs/PSOs, all students of a program are required to participate in that activity.
- For activities to be included for computing attainment, the related student performances should be measurable.
- Electives play an important role in providing depth and contribute to the attainment of POs/PSOs. However, they are not considered for computing the attainments of POs/PSOs as all students may not be crediting them.

PO/PSO Attainment and quality loop
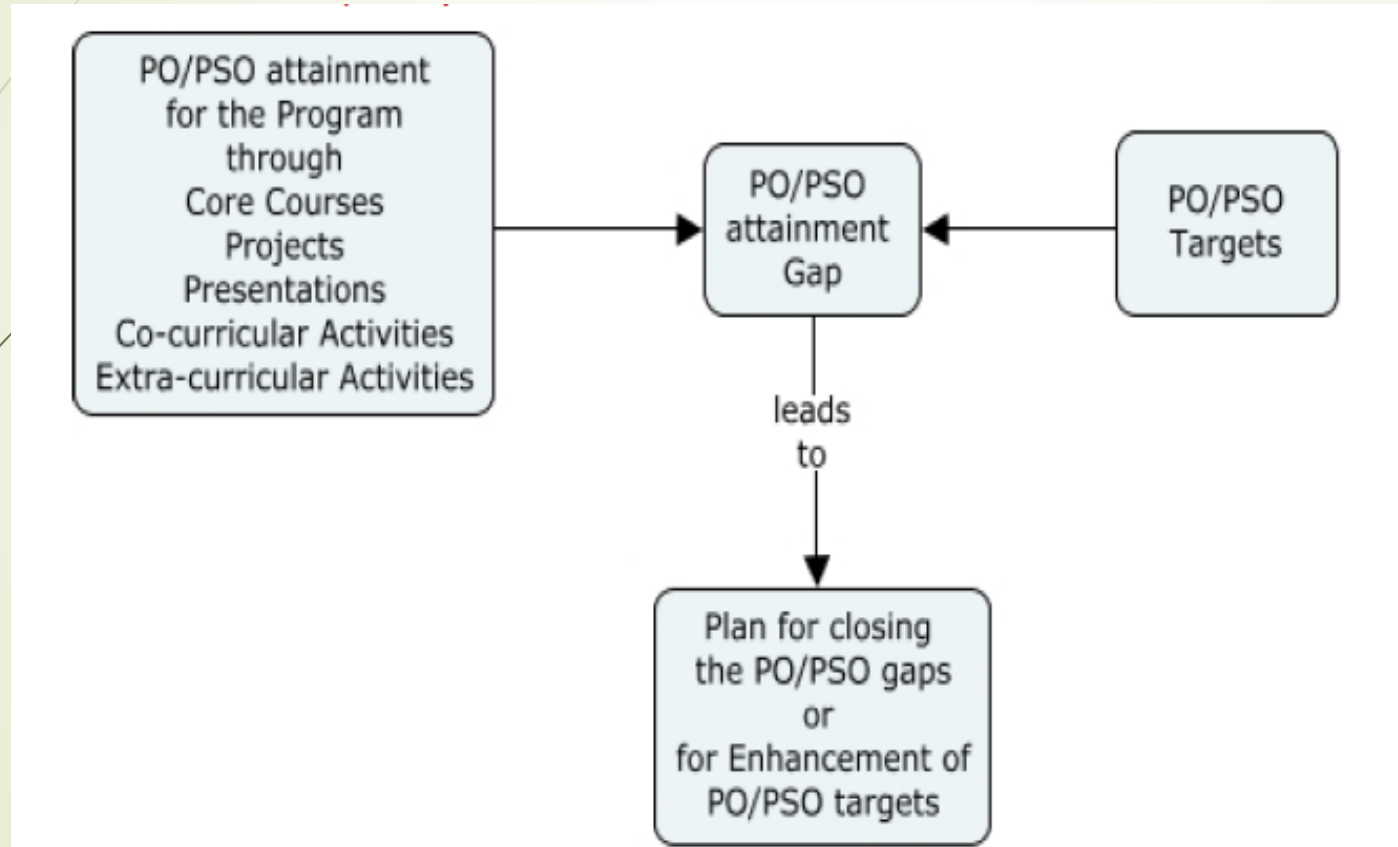
Strength of CO-PO/PSO Mapping

- Attainment of a PO/PSO depends both on the attainment levels of associated COs and the strengths to which it is mapped

- It is necessary to determine the level (mapping strength) at which a particular PO/PSO is addressed by the course.

- Strength of mapping is defined at three levels: Low (1), Medium (2) and Strong (3).

- Several methods can be worked to determine the strength of a PO/PSO, but implementing them across a few hundred courses can become a burden.

A simple method is to relate the level of mapping to a PO with the number of hours devoted to the COs which address that PO.

- If $\geq$40 % of classroom sessions/tutorials/lab hours address a particular PO, it is considered that the PO is addressed at Level 3.

- If 25% to 40% of classroom sessions/tutorials/lab hours address a particular PO, it is considered that the PO is addressed at Level 2.

- If 5% to 25% of classroom sessions/tutorials/lab hours address a particular PO, it is considered that the PO is addressed at Level 1.

- If < 5% of classroom sessions /tutorials/lab hours address a particular PO, it is considered that the PO is not addressed.

Analog Circuits and Systems - Credits: 3:0:1

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions	Lab Sessions (Hrs)
CO1	Understand the characteristics of linear one-port and two-port signal processing networks	PO1, PO10, PSO1	U	F, C	3	0
CO2	Model one-port devices including R, L, C and diodes, two-port networks, and active devices including amplifiers, Op Amps, comparators, multipliers, BJTs and FETs	PO1, PO10, PSO1	U	C	9	4
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CO5	Design analog filters	PO3, PO4, PO5, PSO1	Ap	C, P, C&S, PC	8	8
CO6	Design waveform generators, phase followers and frequency followers	PO3, PO4, PO5, PSO1	Ap	C, P, C&S, PC	6	8
Total Hours of instruction					40	28

POs/PSOs addressed by COs

PO/PSO	COs	Total Number of Sessions
PO1	CO1, CO3	3 + 8 = 11
PO2	CO2	13
PO3	CO4, CO5, CO6	14 + 16 + 14 = 44
PO4	CO4, CO5, CO6	14 + 16 + 14 = 44
PO5	CO4, CO5, CO6	14 + 16 + 14 = 44
PO10	CO1, CO2	3 + 13 = 16
PSO1	CO1, CO2, CO3, CO4, CO5, CO6	3 + 13 + 8 + 14 + 16 + 14 = 68

Course – PO/PSO Mapping Strength

Number of Sessions Devoted	PO/PSO	Mapping strength
11 of 68 (16%)	PO1	1
13 of 68 (19%)	PO2	1
44 of 68 (65%)	PO3	3
44 of 68 (65%)	PO4	3
44 of 68 (65%)	PO5	3
16 of 68 (24%)	PO10	1
68 of 68 (100%)	PSO1	3

Course-POs/PSO Mapping

Course C302	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Mapping Strength	1	1	3	3	3	0	0	0	0	1	0	0	3	0

Example (Showing only non-zero mapping entries):

CO	PO1	PO2	PO3	PO4	PO5	PO 10	PSO1
CO1	1					1	2
CO2		2				1	3
CO3	3						3
CO4			3	3	2		3
CO5			2	2	3		2
CO6			2	2	3		3
Average	2	2	2.3	2.3	2.7	1	2.7
Mapping Strength	2	2	2.3	2.3	2.7	1	2.7

Mapping Strengths of PO6, PO7, PO8, PO9, PO11, PO12, and PSO2 are equal to 0 in this course

We will use the first method for the present.

PO/PSO Attainment

- Attainment of PO/PSO = (Average of attainments of relevant COs) x Scale Factor
- Scale Factor = (Actual Mapping Strength / Maximum Possible Mapping Strength)

  = Actual Mapping Strength / 3

CO- attainment of TierII Institute

(Example from the earlier Module 1 Unit 19)

CO	Total CO Attainment (Rounded) %ge
CO1	63
CO2	67
CO3	67
CO4	68
CO5	63
CO6	67

Cont...

POs/PSOs Attainment

PO	COs	Mapping Strength	PO/PSO Attainment (Rounded) Percentage
PO1	CO1, CO3	1	$(1/3)\,[(63 + 67)/2] = 22$
PO2	CO2	1	$(1/3)\,(67) = 22$
PO3	CO4, CO5, CO6	3	$(3/3)\,[(68 + 63 + 67)/3] = 66$
PO4	CO4, CO5, CO6	3	$(3/3)\,[(68 + 63 + 67)/3] = 66$
PO5	CO4, CO5, CO6	3	$(3/3)\,[(68 + 63 + 67)/3] = 66$
PO10	CO1, CO2	1	$(1/3)\,[(63 + 67)/2] = 22$
PSO1	All the 6 COs	3	$(3/3)[(63 + 67 + 67 + 68 + 63 + 67)/6]=66$

Cont...

Mapping Strength and Attainment of PO/PSO

Course C302	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Mapping Strength	1	1	3	3	3	0	0	0	0	1	0	0	3	0
Attainment	22	22	66	66	66	0	0	0	0	22	0	0	66	0

Cont…

Direct Attainments of POs and PSOs

- Attainments of PO and PSO are normalized to 1.

- Attainments are calculated for all core activities including courses, Seminars, Project(s).

- Performance in any co-curricular and extra-curricular activity which is evaluated as per declared rubrics is also treated as a course.

- Then, the average attainments of POs and PSOs are computed.

  (Note: The present version of the software used for uploading SAR, uses the number of non-zero entries in a column to compute the average automatically. Future versions may change this procedure.)

Cont...

Course	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C101	0.22	0.33	0.85	0.25	0.15	0	0	0	0	0.13	0	0	0.76	0
... ...														
C302	0.22	0.22	0.66	0.66	0.66	0	0	0	0	0.22	0	0	0.66	0
... ...														
C806 (Project)	0.86	0.82	0.94	0.74	0.84	0.67	0.61	0.21	0.31	0.77	0.82	0.84	0.85	0.79
Average Direct Attainment	0.69	0.71	0.67	...	...	...	...	...	...	...	...	...	0.82	0.78

Cont...

Total Attainments of POs and PSOs

- Determine the Indirect Attainment based on all the relevant Surveys. (Graduate Exit Survey, Alumni Survey, Employer Survey)
- Combine the Direct Attainment with the Indirect Attainment using suitable weights. Typical values are 0.8 and 0.2.

Total Attainment of a PO / PSO = 0.8 * Direct Attainment + 0.2 * Indirect Attainment

Example

PO10:

Direct Attainment based on all relevant academic activities: 0.25

Indirect Attainment based on all relevant surveys: 0.35

Combining them, the total attainment of PO10, for this batch of students is:

$$(0.8 \times 0.25) + (0.2 \times 0.35) = 0.27$$

- Repeat this type of calculation for all POs and PSOs.

Cont…

Setting Targets for POs and PSOs

- Set the attainment targets with consideration.

- Among the POs, probably only PO1 is addressed well.

- Not many POs from PO6 to PO12 are addressed directly by most of the programs.

- There need not be any concern if the target for a PO is quite low, for example, 0.3.

- All PSOs are generally addressed well. Thus, the targets can be reasonably high. For example, realistic targets of 0.6 and above are feasible.

- Absolute targets are of less concern than continual improvement.

Cont…

Closing the Quality Loop at the Program Level

For each PO and PSO:

- Set the attainment target
- Determine the total attainment value
- Close the quality loop

  o   If Attainment < Target, then Plan improvement actions
  o   If Attainment ≥ Target, then increase the target realistically

- Wide choice exists for improvement plans (Semester, Course / Activity)

Example

PO10	
Combined Attainment	0.25
Target	0.35
Attainment Gap	0.10

Improvement Action Plan:

- Add an extra communications lab in the third semester as a value-added core course

- Introduce a seminar starting from third semester

- Add in the 4th Semester, a 5-day workshop on communication skills

Conclusions

- Determining the strength to which a PO/PSO is addressed, and computing the attainment are approximations at best!

- Even if a more precise computation of PO/PSO attainment is possible the effort involved may not be worth it.

- What is important is to follow one method across an Institute

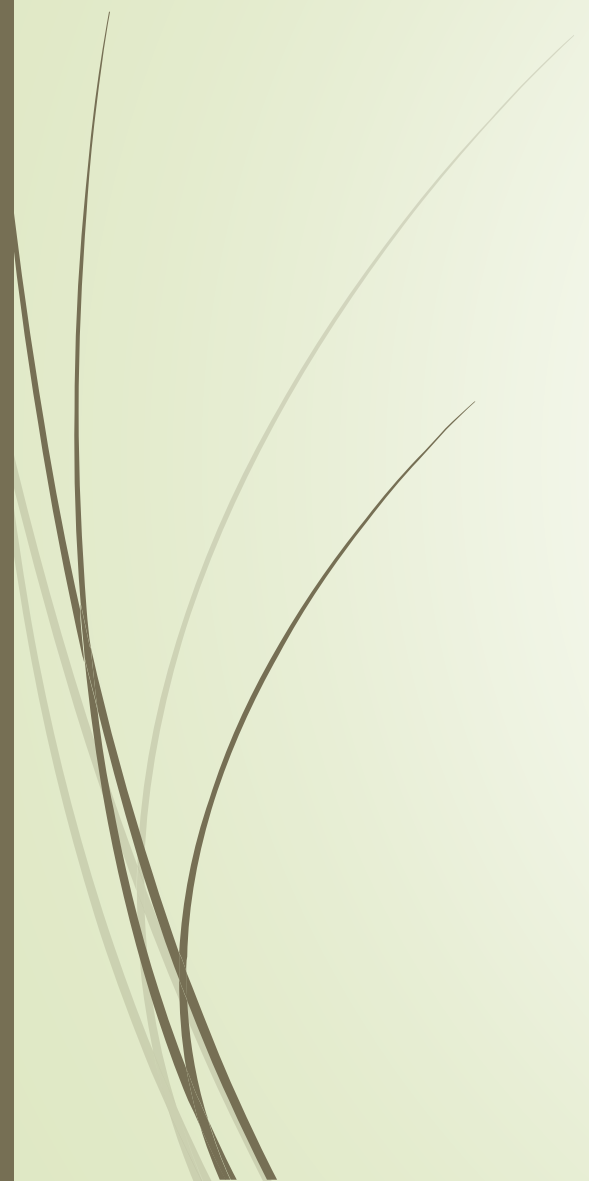- Strive for continual improvement in attainment, and demonstrate the improvements with evidence.

Any Question.....?

Acknowledgement

➡ **All the known or unknown sources used during making the presentation are duly acknowledged without the use of their data/information, the presentation would not have been so informative.**

Thank You