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1. **Write Course Outcomes (COs) for each course of the program**
   o Write about 5-6 COs for each course using the action verbs of learning levels,
   o It should be narrower and measurable statements.
   o CO statements should describe what the students are expected to know and able to do at the end of each course, which are related to the skills, knowledge and behavior that students will acquire through the course.
   o Departmental Course Committees to finalize COs (Not individual faculty members)
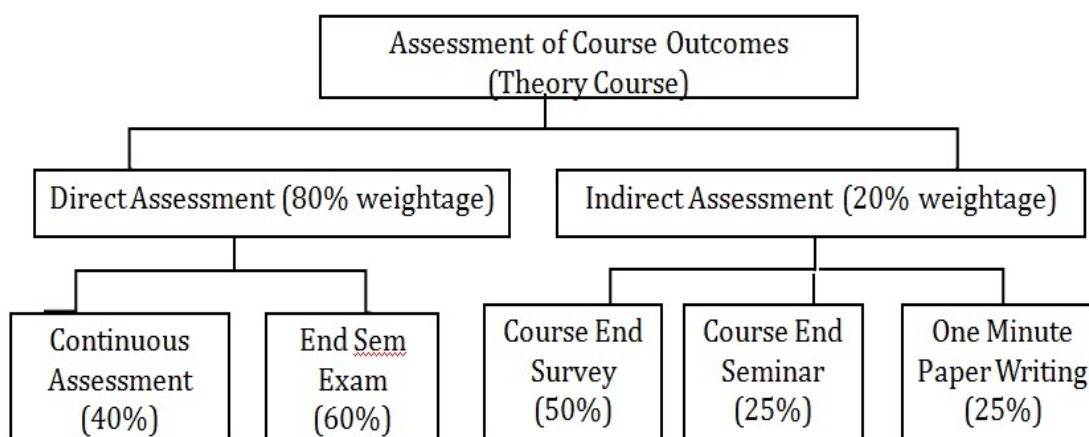
2. **Mapping of CO's with PO's**
   o After CO statements are developed by the course in-charge, CO's should map with any possible PO's based on the relationship exist between them.
   o All PO's are not necessarily mapped with any one CO and it may be left blank.
   o All the courses together must cover all the POs (and PSOs). For a course we map the COs to POs through the CO-PO matrix and to PSOs through the CO-PSO matrix.
   o The CO-PO mapping has been done with correlation levels of 3, 2, 1 and '-'. The notation of 3, 2 and 1 denotes substantially (high), moderately (medium) and slightly (low). The meaning of '-' is no correlation between CO and PO.
   • The Process for mapping the values for CO-PO Matrix is given in the Table below. It gives information about the action verbs used in the POs and the nature of POs, stating whether the POs are technical or non-technical, with an understanding of the intention of each PO and the Bloom's level to which each of these action verbs in the POs correlates to.

Table No 1 Process for mapping the values for CO-PO Matrix

Type	POs	PO action Verbs	POs Blooms Levels	COs Bloom's Level(s)
Technical Skills	PO1	Apply	L3	• Theory Courses: L1 & L4
	PO2	Identify	L2	• Laboratory courses: L1 to L5
		Formulate	L6	• Mini Project and Major Project: L1 to L6
		Review	L2	**Thumb Rule for assigning mapping value**
	PO3	Design	L3,L6	• If L1 Action Verbs of a CO Correlates with any of PO then assign mapping strength as '1'
		Develop	L3,L6	
	PO4	Analyze	L4	
		Interpret	L2,L3	
		Design	L6	• If L2 to L3 Action Verbs of a CO Correlates with any of PO then assign mapping level as '2'
	PO5	Create	L6	
		Select	L1,L2, L6	
		Apply	L3	• If L4 to L5 Action Verbs of a CO Correlates with any of PO then assign mapping level as '3'
	PO6	Apply	L3	
		Assess	L5	
Transferable Skills	PO7-12			

3. **Assessment Process for CO Attainment (Theory Courses):**
   o Course Outcome is evaluated based on the performance of students in internal assessments, end semester examination of a course, course end seminar, one minute paper writing and feedback on course outcome.
   o Course end seminar, one minute paper writing and feedback on course outcome are the indirect measurement tools and internal assessments, end semester examination of a course are the direct method for CO assessment.
   o In direct assessment method, internal assessment (mid-term examinations, weekly quizzes and assignments are used for theory courses, rubrics based evaluation is used for seminar and projects courses) contributes 40% to the total CO attainment. End term assessment contributes 60% to the total attainment of a CO as shown in the flowchart below.

3.1 Assessment Process for CO Attainment : Direct method
   o Every mid-exam question, every quiz question and every assignment is mapped to a specific CO.
   o For practical courses, seminars and projects, rubrics should be mapped with every CO of that course.
   o Thereafter, a CO wise cut-off value is taken based on the average marks scored by the students for that CO or a threshold mark such as 60% of the maximum marks allocated to that CO.
   o The number of students with their marks in a CO under consideration, above the cutoff value is considered for the CO attainment.
   o The documentation of the CO attainment level of the respective semester courses is presented in BoS meeting.

3.1.1 Sample calculation for CO1
   o **In Mid semester exam**, if 10 students attempted for maximum 5 marks and out of which 7 students scored more than equal to threshold (i.e. 60% of 5 marks = 3 marks). Then % of students scoring >= internal threshold will be (7/10) * 100 = 70% .

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- **For quiz and assignment part**, % of students scoring >= threshold in the above parts will be considered in same manner. Let i.e. 67.5% for quiz and 100% for assignment.
- **Similarly, for end semester examination, as each question is mapped with the CO, the number % of students scoring >= threshold can be obtained. Let for CO1,** if 10 students attempted for maximum 10 marks and out of which7 students scored more than equal to threshold (i.e. 60% of 10marks = 6 marks & above). Then % of students scoring >= internal threshold will be (7/10) * 100 = 70%.

$$\% \textit{ CO Attainment} = \frac{\textit{Number of students scored more than or equal to 60\% of Marks in CO}_x}{\textit{Total Number of students}} \times 100$$

Where x={1 to N}, N= number of course outcomes

3.1.2 Setting weightage for CO assessment (Direct method):

- 20% weightage is given to CO attainment based on mid semester examination
- 10% weightage is given to CO attainment based on online quiz.
- 10% weightage is given to CO attainment based on assignments
- 60% weightage is given to CO attainment based on end semester examination

- Based on the attainment level and the weightage assigned to the assessment tools, the % direct attainment of CO1 by all four parts is
  =.2*70%+.1*67.5%+.1*100%+.6*70%
  =72.75%

  Similarly, the attainment using direct assessment tools is computed for all other CO's.

3.1.3 Level of Attainment

- The % attainment is converted to level of attainments. The rubrics considered here are given below:
  - **Attainment Level 1: 50% of students score more than 60% marks out of the maximum relevant marks.**
  - **Attainment Level 2: 60% of students score more than 60% marks out of the maximum relevant marks.**
  - **Attainment Level 3: 70% of students score more than 60% marks out of the maximum relevant marks**
- So that attainment 72.75% is considered as attainment of level 3.

3.2 Assessment Process for CO Attainment (Theory Course) : Indirect Method

- Course end seminar and one minute paper writing is conducted as per the schedule mentioned prior in Time Table and the Institute Calendar.
- The evaluation team with class coordinator follow rubrics, which is set by the department for evaluation of course end seminar and marks are given to the students which are used for computation of CO attainments
- Also, the course exit survey (CO Feedback) is taken from all students on each CO.
- The course end seminar and one minute paper writing are given a weightage of 25% each and course end survey is given a weightage of 50%.

3.3 Overall CO Attainment:

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- The Final CO attainment is calculated by combining the direct attainment and indirect attainment in a ratio of 80: 20 i.e
- **Overall Attainment of CO=80% Direct Attainment+20% Indirect Attainment.**
- Let the attainment of CO1 with indirect measurement tool is 2.6 and with direct measurement tool is 3.0. then
- **Overall Attainment of CO1=80% *3+20% *2.6=2.92**

3.4 If the average attainment of a particular course for two consecutive years is the maximum attainment value (i.e. level 3), then for that particular course the current rubrics for attainment must be changed to analyze continuous improvement.

4. **Assessment Process for CO Attainment (Laboratory Courses):**
   - For practical subjects, there is continuous internal evaluation during the semester for 60 marks and 40 marks for end semester viva voce.
   - In internal evaluation, rubrics are used for each experiment and marks are given.
   - At the end of the semester, all average of the marks assigned to each rubric criteria are taken as the final marks.
   - Each rubric is mapped with the course outcomes of the laboratory course.
   - The attainment is computed using the average marks and the number of students scoring >= threshold can be obtained.
   - % of CO attainment is obtained as

     = [(number of students scoring >= threshold) /No of student attempted] *100
   - 80% weightage is given to the continuous evaluation and 20% is based on the viva for internal assessment.

5. **Assessment Process for CO Attainment (Major Project):**
   - Project batches are formed as per the instruction given by project coordinators.
   - Synopsis will be submitted to the project coordinators for scrutinizing. Project Batches are allotted to the internal guides based on the specialization and competency skills of the faculties.
   - Each internal guide will continuously monitor their students on a weekly basis to observe the progress of the work.
   - The project guide along with project coordinator conduct 2(two) project reviews as per the rubrics, which is set by the Department.
   - The rubrics are mapped to CO and PO.
   - The Internal Assessment marks are used for used for computation of CO attainment.
   - External Project Viva voce is conducted by the panel of examiners.
   - Based on the viva voce the marks are awarded to the students the attainment is computed,
   - The overall CO attainment =50% internal assessment+50% external viva voce

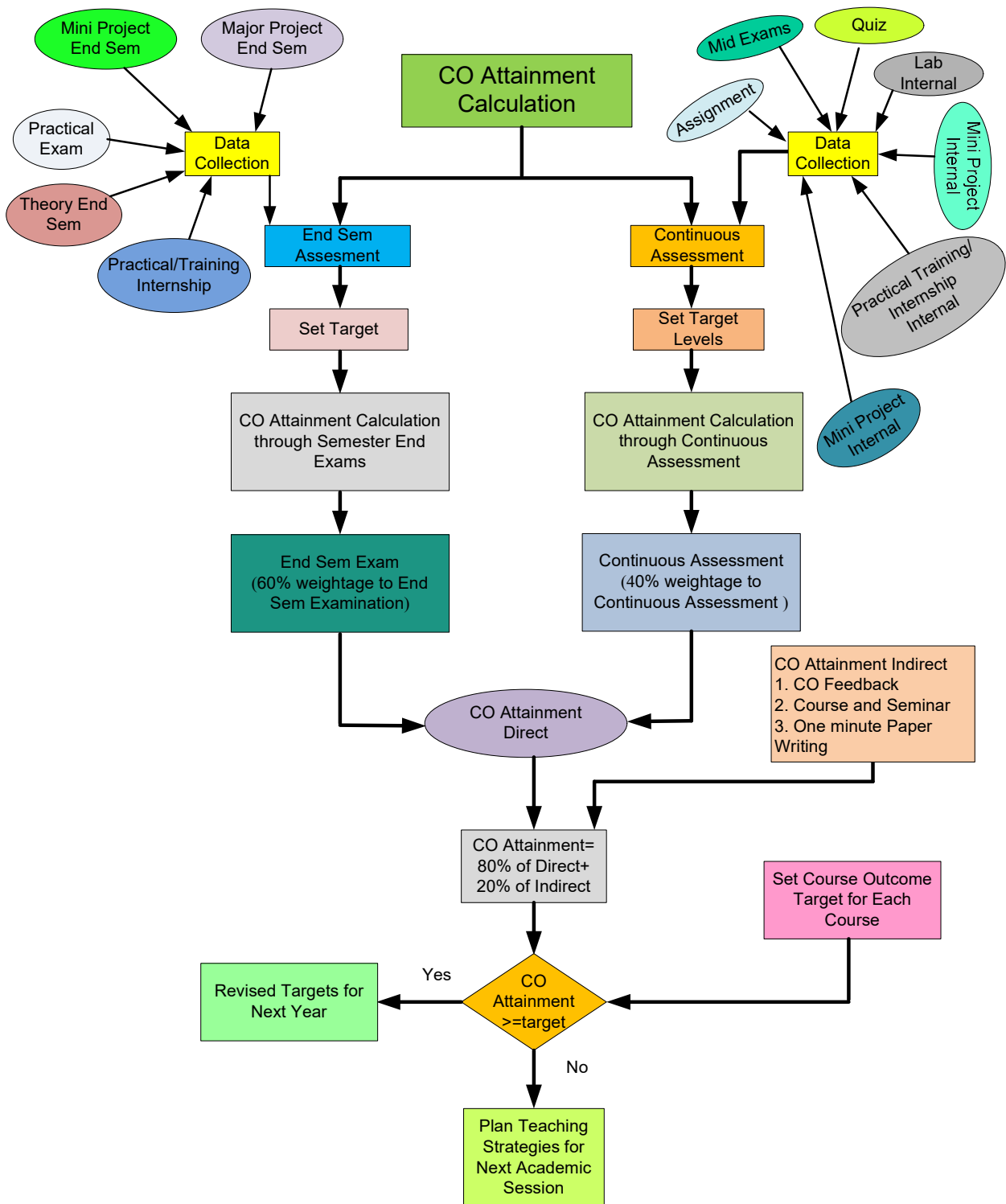   **The process of CO attainment is summarized as given in Figure 1 .**

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Figure 1 CO Attainment Calculation Process

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6. **PO Attainment**

The process adopted for PO & PSO attainment is as shown in the flowchart below**.**
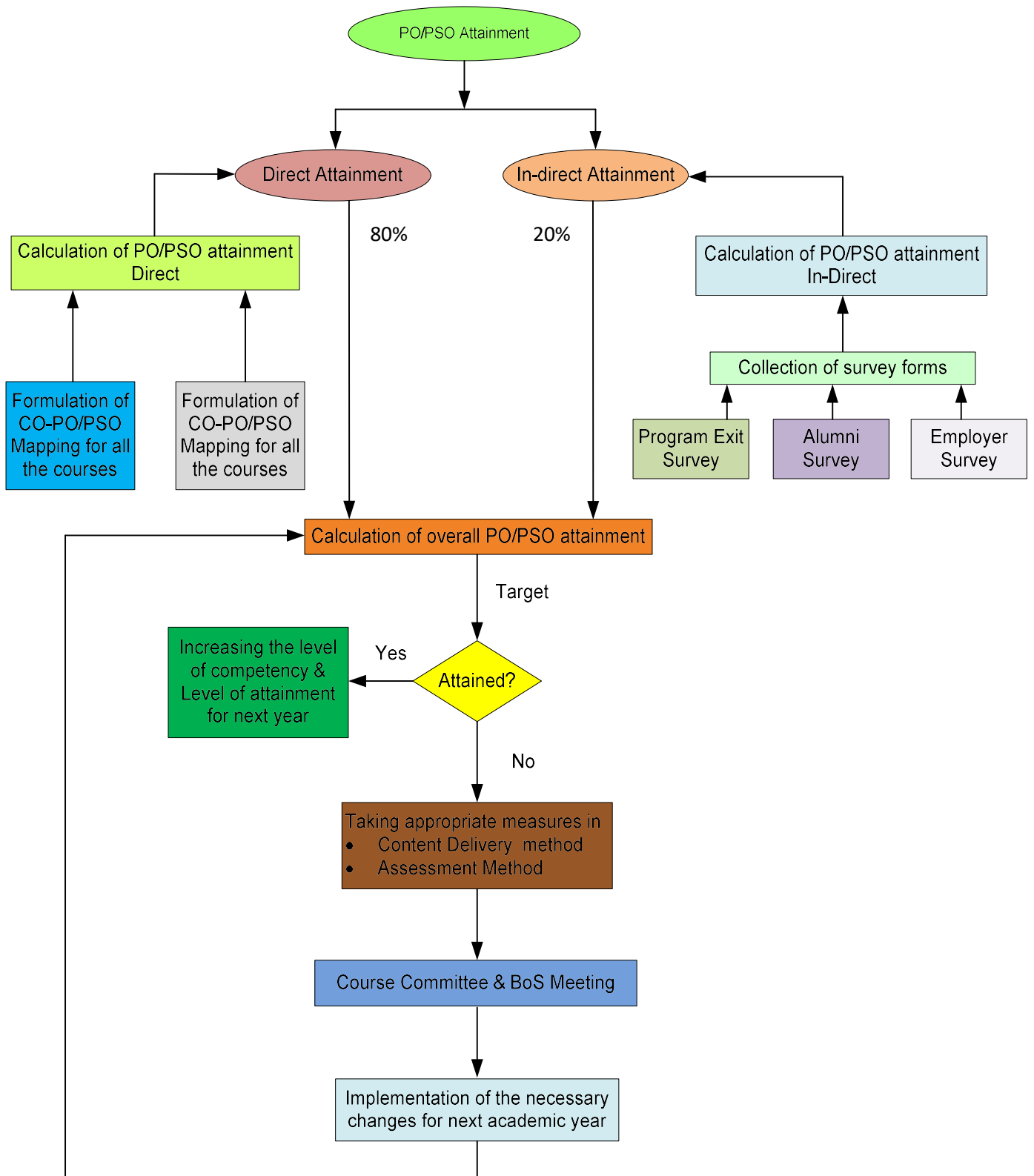
Figure 2. Process of PO/PSO Attainment

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- o PO/PSO assessment is done by giving 80% weightage to direct assessment and 20% weightage to indirect assessment.
- o Direct assessment is based on CO attainment. At the end of the each programme, the PO/PSO assessment is done from the CO attainment of all curriculum components.
- o Similarly, the values of PSO attainment are also determined

6.1 Direct Method

- o The course outcomes are translated to POs.
- o The each PO attainment of corresponding to a particular course is determined from the attainment values obtained for each course outcome related to that PO and the CO-PO mapping values.
- o Initially, the attainment of each course outcome is determined using internal as well as external assessment.
- o Question papers include, short answers, short essay and long essay type.
- o In addition, MCQs examinations (quizzes) are conducted on each unit test. Assignments are given for each CO and on some extension of syllabus.
- o In case of laboratory examination, experiment, viva voce, reports, etc., are the components.
- o While setting a question paper, each question is framed based on the POs in order to attain them to a large extent.

6.2 Indirect method

- o The indirect method done through surveys and interviews; it asks the stakeholders to reflect their views on student's learning.
- o The institute assesses opinions or thoughts about graduate's knowledge or skills by different stakeholders.
- o Program exit survey and employer survey are given a weightage of 25% each and alumni survey is given a weightage of 50%.

7. For weakly supported POs find the gaps, write additional COs, improve content delivery, modify curriculum, change evaluation methods etc.

8. The sample calculation of PO attainment is given below:

Course outcome

CO-PO Mapping

Course outcome		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	2.76	3	3	3	-	-	-	-	1	1	1	2	-	2	-
CO2	2.2	3	3	-	2	-	2	2	2	1	1	2	1	-	-
CO3	2.8	3	3	-	-	-	-	-	1	1	1	-	-	-	-
CO4	2.72	3	-	3	3	2	-	-	1	1	1	-	-	-	-
CO5	2.16	3	3	-	3	2	-	-	1	1	1	1	1	-	2
CO6	2.2	3	-	3	3	2	-	-	1	2	1	1	-	-	-

Sample Calculation:

Attainment of PO1

$$=(3\times2.76+3\times2.2+3\times2.8+3\times2.72+3\times2.16+3\times2.2)/(3+3+3+3+3+3)$$
$$=2.47$$

Attainment of PO5

$$=(2\times2.72+2\times2.16+2\times2.2)/(2+2+2)$$
$$=2.36$$