

An Approach to Establish Correlation of Courses to POs & PSOs and Attainment of COs, POs & PSOs

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Abstract: Outcome based education (OBE) is student-centered instruction model that focuses on measuring student performance through outcomes. Outcomes include knowledge, skills and attitudes. An important component of OBE is the attainment of Course Outcomes (COs), Program Outcomes (POs) and Program Specific Outcomes (PSOs). Criterion 3 of Self-Assessment Report (SAR) emphasize on attainment of COs, POs and PSOs. The correlation between CO-PO describes the level at which a particular PO is addressed through a CO. The correlation is justified based on number of sessions mapping. Direct and Indirect assessment tools are applied for measuring attainment of COs, POs and PSOs. The paper presents a simple yet robust approach followed for establishing correlation between CO-PO/PSOs; and for measurement of attainment of COs, POs and PSOs as per the guidelines of SAR.

Keywords: Outcome Based Education, Course Outcomes, Program Outcomes, Program Specific Outcomes

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I. Introduction

Course Outcomes are the resultant knowledge skills the student acquires at the end of a course. **Program Outcomes** as stated by NBA represent the knowledge, skills and attitudes the students should have at the end of a four year engineering program. **Program Specific Outcomes (PSOs)** are statements that describe what graduates of a specific engineering program should be able to do. COs and PSOs need to be formulated by the respective programs. COs are defined for each course. Each CO may lead to attainment of one or more POs or PSOs. The various courses offered, as per the design of curriculum for the program, are expected to address all the POs to a significant extent. The PSOs are expected to be addressed by the curriculum directly or through specialized instructional methods and practices, particular to the department or program in the institution. The process of attainment of COs, POs and PSOs starts from writing course outcomes for each course of the four year program followed by establishing a correlation between the COs and POs/PSOs as per the templates^[1] and guidelines^[2] of SAR.

II. Correlation of Course to POs & PSOs

Course outcomes are stated for every course using the action verbs of learning levels of Blooms Taxonomy^[3]. A course addresses a set of POs/ PSOs. To establish the correlation between CO - POs&PSOs, number of sessions devoted for POs &PSOs through each course outcome in the class room instruction is identified. The correlation level of 1, 2 or 3 defined as 1: slight (low) 2: Moderate (medium) 3: substantial (high) :- no correlation is decided based on %ge of class room sessions.

- If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
- If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
- If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
- If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed

Course outcome to POs & PSOs correlation level is obtained using the equation 1.

CO – POs &PSOs level: $\frac{\text{Total number of sessions devoted to a particular PO for a given CO}}{\text{Total number of periods devoted for a given CO}} \% \text{ ----} 1$

For example: in a course if 15 sessions are utilized to address PO1 through CO1 out of 20 sessions then the %ge of class room sessions devoted to PO1 through CO1 is 75% and hence it is mapped to Level 3.

Course to POs & PSOs correlation level is obtained using the equation 2.

$$\text{Course – PO/PSO level: } \frac{\text{Total number of sessions devoted to a particular PO across all COs}}{\text{Total number of periods devoted for the Course}} \% \text{ ---- 2}$$

For example: in a course if 35 sessions out of 55 are devoted for PO1 then the %ge of class room sessions devoted to PO1 through the course is 64% and hence it is mapped to level 3. Those with insignificant and nil correlation are represented by ‘-’. The above procedure is followed for obtaining the CO-POs & PSOs matrices and Course –POs & PSOs correlation for all courses. A sample is shown in Table 2.1.

Table 2.1: Course – POs & PSOs matrix

Course-POs & PSOs MATRIX CAY : 2016-17																
S N O	Cou rse Cod e	Course Name	P	P	P	P	P	P	P	P	P	P	P	P	P	
			O	O	O	O	O	O	O	O	O	O	O	O	O	O
			1	2	3	4	5	6	7	8	9	0	1	2	1	
1	CS 101	Engineering Mathematics I	3	2	1	-	-	-	-	1	-	2	-	1	2	-
2	CS 102	Engineering Physics I	3	1	-	1	-	-	-	1	-	1	-	3	-	-
-																
2	CS 201	Mathematics III	3	2	-	1	-	-	-	1	-	2	-	1	1	-
2	CS 202	Data Structures using C++	1	2	2	1	-	1	1	1	-	1	-	1	2	1
-																
4	CS 301	Database Management Systems	1	3	3	1	1	-	-	-	-	-	-	1	3	-
4	CS 302	Operating Systems	3	2	2	2	-	-	-	-	-	-	-	2	2	-
-																
7	CS 413	Seminar	-	3	-	-	1	-	-	1	2	1	-	2	-	-
7	CS 414	Project	3	3	3	2	2	2	1	2	1	1	1	1	3	2

III. Attainment of COs

Course Outcomes are the basic units of Outcome based evaluation system. **Assessment** refers to a wide variety of methods or tools used to evaluate, measure, and document the academic preparedness, learning progress, skill acquisition, or educational needs of students. Attainment of COs can be measured **directly** and **indirectly**. Direct attainment of COs can be determined from the performance of students by all the relevant assessment tools. Indirect attainment of COs is obtained from the course exit surveys. Computation of indirect attainment of COs may turn out to be complex; the percentage weightage to indirect attainment is kept at a low percentage to 20%. Fig 3.1 represents the assessment tools used for attainment of COs

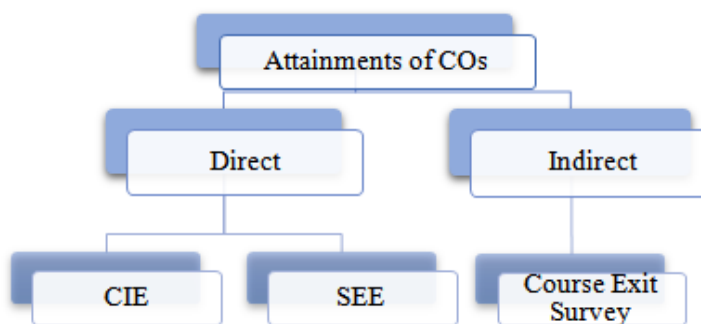


Fig 3.1: Assessment tools for attainment of COs

3.1 Assessment process used for evaluation of attainment of COs

Assessment of course outcomes is based upon the performance in each course through

- (a) Course Internal Evaluation (CIE)
- (b) Semester End Examination conducted by the University (SEE)

Marks division:

- a) The division of marks prescribed by University (Osmania University), and weightages in arriving at the attainment of CO are given in Table 3.1. The attainment level is determined as given in Table 3.2 as per the % of students scoring more than 50% for theory courses and 60% for other than theory courses in CIE or SEE.

Table 3.1: Weightage of Marks for CIE: SEE

Type of Course	Internal Marks (CIE)	External Marks (SEE)	Total marks	Net CO attainment level as per weight age
Theory	25	75	100	0.25*CIE Level + 0.75* SEE Level
Laboratory	25	50		0.25 *CIE Level + 0.75*SEE Level(50 marks scaled to 75)
Seminars & Mini Projects	25	-	25	CIE Level
Project	50	Grade	-	0.25* CIE Level + 0.75 *SEE Level (CIE- 50 marks scaled to 25)(Grade converted to 100 marks and scaled to 75)

Table 3.2: Range – Level Table

% of students scoring	Level	
<40%	0	Low
40% to 44%	1	Low
45% to 49%	1.25	Low
50% to 54%	1.5	Low
55% to 59%	1.75	Low
60% to 64%	2	Moderate
65% to 69%	2.25	Moderate
70% to 74%	2.5	Moderate
75% to 79%	2.75	Moderate
> = 80%	3	High

b)As per the new Choice Based Credit System (CBCS), introduced by the affiliating University, from the academic year 2016-17, starting with I year students admitted in 2016-17, a grading system is in place, in which the University awards a grade depending on the total of Internal and External exams. As per CBCS scheme, internal evaluation weightage is 30% and External is 70%.

This change affects only the assessments made for I year of 2016-17. In the case of I year of 2016-17, the effective CO attainment is based upon External Exam alone. The CO attainment based on internal evaluation is also analyzed for feedback and improvement.

The assessment tool used for each category of course is depicted in Fig 3.2.

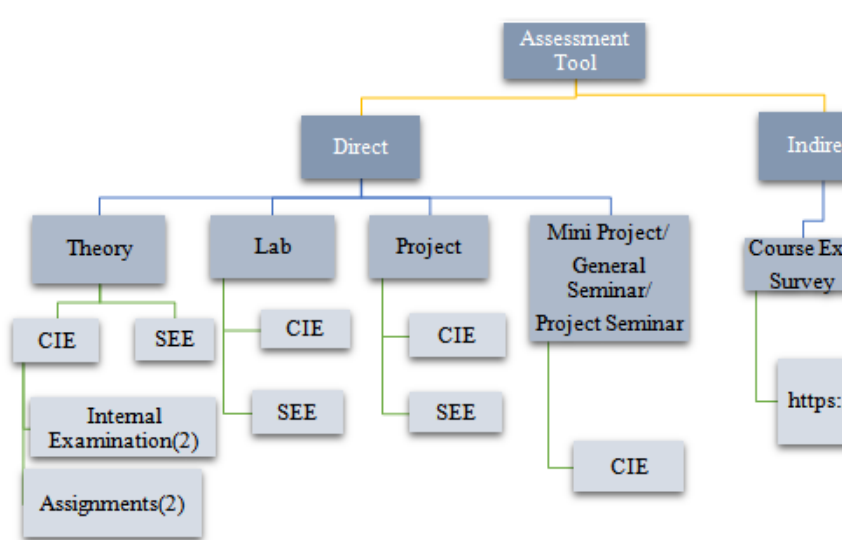


Fig 3.2: Assessment tools for different category of courses for attainment of COs

3.1.1 Assessment of COs for Theory courses

Attainment of CO in internal evaluation is decided by two internal examinations and two assignments.

A. Internal Tests

Two internal tests are conducted per semester each of 20 marks. As per University norms, the question paper consists of Part A consisting of 3 questions each of 2 marks and Part B consisting of 3 questions each of 7 marks, giving a choice of answering 2 of 3 questions. Thus the question paper is set for 27 marks while evaluated for only 20 marks in view of the choice.

- i. In Internal examination I, each question is linked to a particular CO and allotted marks are indicated.
- ii. Total marks allotted for each CO addressed is noted.
- iii. A table is prepared indicating the marks scored by each student of the class against each question and also against each CO addressed by the test.
- iv. A similar table is prepared for internal examination II.

B. Assignments:

Two assignments are given to students in each semester. Each assignment is for 5 marks. The questions are so tailored that all COs are addressed between the two assignments. The assignments may include short or long answer questions.

- i. Questions given for Assignment I are each marked against a corresponding CO and marks are allotted for the CO.
- ii. A table is prepared indicating the marks scored by all students of the class against each CO addressed by the assignment.
- iii. A similar table is prepared for Assignment II.

C. Consolidation of marks scored in tests and assignments:

- i. The four tables prepared for the two internal examinations and assignments are merged into a single table. In this table, for each student, the total marks scored in examinations and assignments, against each of the COs is calculated as shown in sample table 3.3.

Table 3.3: Attainment of CO through CIE

	CO Addressed	MID – I			MID – II				Assignment – I			Assignment – II				CO marks reduced for total internal marks of 25						
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	
	CO Marks	13	8	6	3	12.5	3.5	8	2	1	2	2	1	1	1	7.5	6	7.2	2.2	0.5	8.5	
S I N O .	Roll No.																					
1	2451-14-733-061	0	0	0	0	0	0	0	2	1	2	2	1	1	1	1	0.5	1	0.5	0.5	1.5	
2	2451-14-733-062	25	3	5	3	3	0	3	1	1	1	1	0.5	0.5	1	1.6	25	3.5	2	0.2	0.2	2.6
3	2451-14-733-063	65	5	5	3	10.5	0	3	2	1	2	2	1	1	1	4.2	5	4.5	6.2	0.5	0.5	6.2
...																						
6	2451-14-733-324	3	2	1	2	1.5	0.5	5	2	1	5	1.5	1	1	1	2.5	2.5	1.5	0.7	0.5	3.5	
																5.8	4.6	5.6	1.7	0.3	6.6	
																6	9	6	6	9	4	
																2.9	2.3	2.8	0.8	0.2	3.3	
																3	4	3	8	0	2	
																No. of students >= 50 % of Max marks						
																49	53	46	18	67	57	
																CIE - % Attainment --- % of students >= 50 % of Max marks						
																73.13	79.10	68.66	26.87	100.00	85.07	

						CIE - Attainment level	2.5	2.7 5	2.2 5	0	3	3
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D. Assessment of Course Outcomes:

- i. For each CO, 50% (theory) / 60% (other than theory) value of the maximum marks allotted is determined.
- ii. For each CO, the number of students who scored more than 50% (theory) / 60% (other than theory) of the maximum marks for the CO is found.
- iii. Ratio of students who scored more than 50% to the total number of students in the section is expressed as %, and treated as % attainment for each CO.
- iv. Above percentages are converted to a corresponding level of attainment as per Table 3.2 for each CO.
- v. When a class has more than one section, average of the sections represents the percentage attainment, and converted into CO attainment level.

Semester End University Examination Evaluation (SEE)

- i. Semester end final examination for 75 marks is conducted by the university.
- ii. Final marks obtained by each student in the semester end examination is made available by University. Attainment is taken as uniform for all COs of the course.
- iii. Percentage of students who score more than 50% (theory) / 60% (other than theory) of the SEE is used to decide the CO level. For more than one section, the CO level is taken as the average of the CO levels in SEE of all sections.

Targets are set based on the targets attained in the previous academic year. Targets for CIE are set for each course outcome. After the analysis if targets are not met an action plan is incorporated to meet the target in the overall CO attainment. Targets for SEE are set the same for every course outcome. After the analysis if targets are not met an action plan is suggested which needs to be followed to improve performance of a particular course in the subsequent academic year. Targets – in terms of attainment level are set using the formula; $0.25 * CIE + 0.75 * SEE$ in the overall CO attainment. After the analysis if targets are not met an action plan is suggested which need to be followed to improve performance of the particular course in the subsequent academic year. It is necessary to set higher target for next year, if the set target is attained (for CIE and SEE separately). If current targets are not met for some COs, consecutive target is unchanged.

Overall CO attainment

- i. The average CO level in CIE and the average CO level in SEE are combined as $0.25 * CIE \text{ Level} + 0.75 * SEE \text{ Level}$. A sample is shown in table 3.4.
- ii. The average value of the CO levels for the course are then used for mapping the PO attainments, using the array of target PO values for the course.
- iii. The direct CO attainment and indirect CO attainment collected through course exit survey designed as a web app - mvsr.epizy.com are combined as $0.8 * \text{Direct Level} + 0.2 * \text{Indirect}$. A sample is shown in table 3.5.

Table 3.4: Attainment of CO through CIE and SEE

	CO1	CO2	CO3	CO4	CO5	CO6	
CIE % Attainment	73.13	79.10	68.66	26.87	100	85.07	
CIE Attainment Level	2.5	2.75	2.25	0	3	3	
SEE % Attainment	70.15	70.15	70.15	70.15	70.15	70.15	
SEE Attainment Level	2.5	2.5	2.5	2.5	2.5	2.5	
CIE +SEE Attainment % -- $0.25 * CIE + 0.75 * SEE$	70.90	72.39	69.78	59.33	77.61	73.88	avg level
CIE +SEE Attainment level -- $0.25 * CIE + 0.75 * SEE$	2.5	2.56	2.44	1.88	2.63	2.63	2.44

Table 3.5: Attainment of CO through Direct and Indirect assessment

MVSR, Department of CSE Attainment of COs through Direct and Indirect assessment						
Academic year: 2016-17		Course Code: CS303		Course Name: Automata Languages and Computation		
Year : III		Semester: I		Section: I, II & III		
Attainment Level						
Level Attained	CO1	CO2	CO3	CO4	CO5	CO6
Target Level	2.60	2.55	2.60	2.60	2.55	2.60
Direct	2.56	2.54	2.48	1.96	2.63	2.56
Indirect	2.8	2.7	2.9	2.6	2.6	2.8
Overall $0.8 * \text{direct} + 0.2 * \text{indirect}$	2.61	2.57	2.56	2.09	2.62	2.61
Status of Attainment (M: Met ; NM – Not Met)	M	M	M	NM	M	M

3.1.2 Assessment of COs for courses other than Theory

The other types of courses in the program are Laboratory, Mini project, Project seminar, General seminar and Project.

a) Laboratory:

The internal evaluation is based on session wise performance of experiment and viva voce, record and internal examination and viva voce. CO level for CIE attainment is decided upon the percentage of students who score more than 60% of the maximum internal marks, i.e., 15 out of 25. Marks are distributed proportionately for each course outcome. SEE Lab exam is conducted by the University at the institution level and the evaluation is done by an external examiner appointed by the University. SEE Lab exam is evaluated for 50 marks. Marks are scaled to 75 to maintain CIE: SEE ratio of 25:75. SEE % of students who score over 60% of the maximum marks, i.e. 45 out of 75 marks, is used to decide the CO attainment level and is uniform for all COs.

The overall CO attainment is considered with the weightages as per allotted marks as:

CO level = $0.25 * \text{CIE level} + 0.75 * \text{SEE level}$.

The average value of the CO levels for the course are then used for mapping the PO attainments, using the array of target PO values for the course.

b) Mini Project:

For mini project in III yr- I semester and II semester the assessment is based only on internal evaluation. The marks obtained are used to decide the % of students who scored more than 60%, i.e. 15 out of 25, and the corresponding CO attainment level.

c) General seminar and Project seminar:

For seminars, the assessment is based only on internal evaluation. The marks obtained in seminar are used to decide the % of students who scored more than 60%, ie 15 out of 25, and the corresponding CO attainment level.

d) Final year Project:

The internal marks for project (50) are the total of marks allotted in Project review, final presentation, and by project guide. The external evaluation is done by an external examiner appointed by the University by award of Grade (Excellent/Very Good/Good / Satisfactory /Poor), which are converted into 100 marks.

Internal marks are scaled to 25 and external marks are scaled to 75 to maintain CIE: SEE ratio of 25:75. CO attainment levels in both internal and external evaluation are decided upon % of students who scored more than 60% of the maximum, for CIE and SEE.

The overall level is obtained as

CO level = $0.25 * \text{CIE level} + 0.75 * \text{SEE Level}$.

The average value of the CO levels for the course are then used for mapping the PO attainments, using the array of target PO values for the course.

Attainments of all courses from first year to fourth year are tabulated for the set target levels to record the attainment. If targets are met higher targets are set for the subsequent years. The process adapted for measuring direct attainment of CO and PO& PSO is depicted in Fig 3.3.

Procedure for evaluation of CO - PO & PSO attainments:

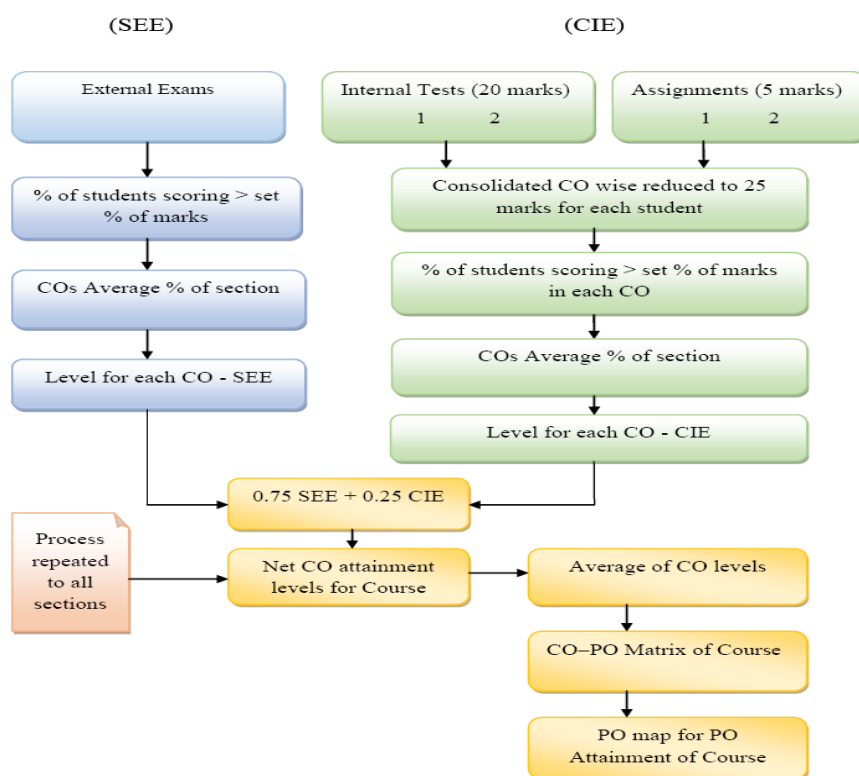


Fig 3.3 : Process adopted for measuring direct attainment of CO – PO & PSO

IV. Attainment of POs and PSOs

June 2015 SAR format includes POs^[1] that are common to all programs. However, NBA suggests program to include 2 to 4 POs specific to an engineering program referred as “Program Specific Outcomes”. It is required to compute attainment levels of PSOs in addition to computing attainment of POs. Attainment of POs & PSOs can be measured **directly** and **indirectly**. Direct attainment of POs & PSOs can be determined from the performance of students by all the relevant assessment tools. Indirect attainment of POs & PSOs is obtained from the Surveys and Rubrics in combination of certain ratios. Computation of indirect attainment of COs may turn out to be complex; the percentage weightage to indirect attainment is kept at a low percentage.

4.1 Assessment process used for measuring the attainment of POs and PSOs

Direct attainment of POs & PSOs can be determined from the performance of students by all the relevant assessment tools (CIE & SEE).

4.1.1 Direct Assessment

Direct assessment of POs for a course is obtained by mapping the average value of Course Outcome attainment with the mapping of the target or expected POs for the particular course. For example, the CO value arrived at from CIE and SEE for the course CS 303 is 2.44 – for a particular section

The target POs for CS303 are given below

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CS 303	3	3	2	1	-	-	-	-	-	-	-	2	2	-

The target value for PO1 is 3. Then the attainment value is 2.44*3/3 = 2.44. Other POs are mapped similarly. The complete PO attainment for the course code CS303 is shown in table given below.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Target PO level	3	3	2	1	-	-	-	-	-	-	-	2	2	-

PO Level Attained	2.44	2.44	1.63	1	0	0	0	0	0	0	0	1.63	1.63	0
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Note: PO level >0.5 and <1 is rounded off to 1.

The PO & PSO attainment values so obtained are their direct components for the course. The direct components for all the courses are obtained similarly and tabulated. The average for PO&PSO gives the values attained directly.

4.1.2 Indirect Assessment

The indirect components of PO contribution are obtained from surveys, rubrics and through the additional co-curricular activities.

(i) Surveys: Surveys of (a) Graduate exit (b) Course Exit (c) Alumni (d) Professional bodies (e) Employer (f) Expert member are considered for measuring attainment for PO/PSO.

Parent survey and Alumni Parent survey is also collected but is not considered for measuring attainment of PO/PSO.

(ii) Rubrics: A rubric is a tool that helps to make subjective measurements as objective, clear and consistent as much as possible, by defining criteria on which performance is judged. Rubrics are used to determine the attainment of POs that are either not adequately addressed in the curriculum, or when it is found that COs of many subjects do not address these aspects, or related COs cannot be justifiably quantified. Rubrics are framed for PO6 to PO12; PSO1 and PSO2. Rubrics for projects are designed that address all POs.

(iii) Contribution due to Co-curricular Activities: Co-curricular activities are mainly aimed at making up for the curricular gaps observed as per the target PO values of all courses that is obtained in table 3.1.3 of SAR. The activities address aspects covered beyond the curriculum to update the students on the latest technology trends, innovative teaching methodologies adapted for improving teaching learning process and curricular and co-curricular activity participations of the students. Contributions due to these activities are taken to represent 25% of the PO attainments towards fulfilling the PO gap.

In the case of PO1 to PO5, the courses over the 4 years of the program contribute significantly, and hence 80% weightage is given to direct attainment for these POs, 5% for indirect attainment through rubrics and 15% for indirect attainment through surveys. As PO6, PO7, PO8, PO9, PO10, PO11 and PO12; PSO1 and PSO2; are not well addressed directly in the curriculum, direct assessment weightage is limited to 50%. Surveys are given a weightage of 20% and Rubrics are given a weightage of 30%. The rubrics aim to assess PO/PSOs by performance of the students in seminars, projects and other co-curricular activities.

Table 4.1 gives the distribution of weightages directly from courses, and those indirectly obtained from rubrics and surveys.

Table 4.1: Distribution of weightage% of Courses, Rubrics and Surveys in the indirect attainment of PO/PSOs.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Courses	80	80	80	80	80	50	50	50	50	50	50	50	50	50
Rubrics	5	5	5	5	5	30	30	30	30	30	30	30	30	30
Surveys	15	15	15	15	15	20	20	20	20	20	20	20	20	20

Contributions due to various activities are also added to the PO values obtained.

4.1.2a Assessment from Rubrics

The proportion of weightages of rubrics for PO1 to PO12; PSO1 and PSO2 for different components through which PO/PSO is assessed is shown in Table 4.2. Average value of attainment of POs from each component with respect to its weightage is obtained. Net contribution to PO is obtained as PO average of all components.

Project addresses all PO/PSOs. Rubric numbering chosen for Projects / Mini Projects are prefixed by P. For example P-R2- represents project rubric used for assessing PO3. For other components general notation of R with a number is used. For example R1- represents rubric used for assessing PO9 – Team Work. Rubric notation used for Projects / Mini Projects is shown in Table 4.2a and the Rubric notation used for evaluating PO6 to PO12; PSO1 and PSO2 is shown in Table 4.2b.

Table 4.2: Distribution of Weightages of Rubrics

Rubrics																
PO /PSO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO10 oral	PO10 written	PO11	PO12	PSO1	PSO2
PO /PSO	Engg. Knowl	Prob. Anay	Design sol	comp. prob	Tool. usage	Engg. Soc	Enviv. Sus	Ethics	Team Work	Com m.	Com m.	Mngt &Fin	L.LL	Prog.	Codin g	SW/ Depl.
Rubrics from	P-R1	P-R1	P-R2	P-R3,P-R4	P-R3,P-R4	P-R1	P-R1	P-R5	P-R6	P-R7	P-R7	P-R8	P-R9	P-R3,P-R4	P-R4	
Rubrics from						R6	R7	R4	R1	R3-O	R3-W	R5	R2	R8	R9	
Projects	3	3	3	3	3	10	5	10	10	10	10	10	13	6	10	
Mini projects-I	1	1	1	1	1	5	3	4	3	2	2	5	2	4	5	
Mini projects-II	1	1	1	1	1	5	3	4	3	2	2	5	2	4	5	
Project seminar	-	-	-	-	-	2	3	3	3	4	4	2	2	-	-	
General seminar	-	-	-	-	-	2	3	3	2	4	4	2	2	-	-	
Industrial visit	-	-	-	-	-	2	3	2	-	-	-	-	2	2	6	
Student activity	-	-	-	-	-	2	5	2	2	2	2	3	2	3	2	
Professional Society Activity	-	-	-	-	-	2	5	2	2	1	1	3	2	3	2	
Lab courses	-	-	-	-	-	-	-	-	5	5	-	-	3	8	-	
Theory courses	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	
weightage	5	5	5	5	5	30	30	30	30	30	30	30	30	30	30	

Table 4.2a: Rubrics Notation for Projects / Mini Projects

Rubrics Applied for Project/ Mini Projects	
Rubric No.	Description
P-R1	Rubric for PO1, PO2,PO6 and PO7
P-R2	Rubric for PO3
P-R3	Rubric for PO4,PO5 and PSO1
P-R4	Rubric for PO4,PO5; PSO1 and PSO2
P-R5	Rubric for PO8
P-R6	Rubric for PO9
P-R7	Rubric for PO10
P-R8	Rubric for PO11
P-R9	Rubric for PO12

Table 4.2b: Rubrics Notation for PO6 to PO12; PSO1 and PSO2

Rubrics Applied for PO6 to PO12 ; PSO1 and PSOs2	
Rubric No.	Description
R1	Rubric for PO9
R2	Rubric for PO12
R3	Rubric for PO10 R3-O for Oral R3-W for Written
R4	Rubric for PO8
R5	Rubric for PO11
R6	Rubric for PO6
R7	Rubric for PO7
R8	Rubric for PSO1
R9	Rubric for PSO2

Rubric Evaluation: Maximum score possible for a student (for 4 criteria) = 16
 Score obtained from rubric = (Total score obtained)/(Max score of all students) * 3 (max level)

Assume total rubric score obtained =741, and no. of students 62 then max score = 62*16 = 3 * 741/ (62*16) = 2.24

For multiple sections, the average is calculated.

Thus, the PO attainment contribution from rubrics is 0.747 (for 3 sections), out of a maximum value of 30% allotted to rubrics for the PO, ie 3 * 0.3 = 0.90.

4.1.2b Assessment from Surveys

Proportions of weightages of PO/PSO attainment through surveys are shown in the Table 4.3. Average values of attainment of POs from each survey with respect to its weightage are obtained. Net contribution to PO is obtained as PO averages of surveys. From PO1 to PO5 – Survey weightage is 15% and from PO6 to PO12; PSO1 and PSO2; the survey weightage is 20%.

Table 4.3: Distribution of Weightages of Surveys

Surveys														
PO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Graduate Exit Survey	3	3	3	3	3	5	5	5	5	5	5	5	5	5
Alumni Survey	3	3	3	3	3	5	5	5	5	5	5	5	5	5
Employer Survey	4	4	4	4	4	5	5	5	5	5	5	5	5	5
Course Exit Survey	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Professional body Survey	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Expert Member Survey	1	1	1	1	1	1	1	1	1	1	1	1	1	1
weightage	1/5	1/5	1/5	1/5	1/5	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0

Average value of attainment of POs from each survey is obtained as per the proportion in overall weightage of that PO. The averages from each survey obtained is tabulated to obtain the overall survey average for each PO/ PSO.

4.1.2c Assessment from Activities

The co-curricular and extra-curricular activities aim at making up the shortfall of the curriculum based PO from the maximum value of 3. Contributions of all the activities towards attainment of each PO are taken from all activities that address content beyond curriculum towards attainment of PO; student activities; the innovative teaching methodologies applied by faculty. Only 10% of the %covered through innovative teaching learning is taken into consideration. The % addressed from each activity from each Criterion is tabulated and the average is obtained for each PO that represents the gap in terms of % for a given PO. The contribution is taken as 25% of the x% of the gap.

For example – fulfillment of the gap estimated for PO9 for 2016-17 is 25.91%. The contribution is taken as 25% of 25.91% of the gap. The gap being 1.14 (3-1.86); the contribution due to activities is calculated as = 0.25 * (25.91 /100) * 1.14 = 0.07.

4.2 Overall PO Attainment Level

PO/PSO target levels are set as follows, for PO1 to PO5 – 80% of level 3 is chosen and for PO6 to PO12; PSO1 and PSO2 – 60% of level 3 is chosen for CAYm2 – 2014-15. If targets are met higher targets are set for subsequent academic year.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PO target level	2.4	2.4	2.4	2.4	2.4	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8

The overall attainment level for each PO is computed using following formula;
 PO Level = x% value from direct attainment + y% value from rubrics + z% value from surveys + contribution of co-curricular activities& extracurricular activities; where x, y and z represents the weightage of the respective PO/ PSO as shown in Table 4.1.

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The direct attainment value in the formula is obtained by taking the average of PO attainments of all courses using the procedure explained in 4.1.1 direct component.

For example:

Let the value of PO9, obtained from Direct Attainment = 0.8

Overall value or level of attainment of PO9

= 50% of Direct Attainment + 30 % value from Rubrics + 20% value from Surveys + contribution of co-curricular & extracurricular activities

= 0.8 + 0.49+ 0.41+0.07 = 1.77

The overall PO Attainment values are obtained similarly for all other POs/PSOs.

A sample PO/PSO attainment obtained for one year is shown in the Table 4.4.

Table 4.4 : Overall PO attainment for AY: 2014-15

M.V. S. R. Engineering College, Department of CSE															
Attainment of POs & PSOs															
CAYm2 : 2014-15															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
PO Target set for 2014-15	2.4	2.4	2.4	2.4	2.4	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	
PO- Level - Curriculum	2.35	2.25	2.25	1.63	2.16	1.54	1.36	1.28	1.88	1.84	1.30	1.68	2.34	1.65	
PO Gap	0.65	0.75	0.75	1.38	0.84	1.46	1.64	1.72	1.12	1.16	1.70	1.32	0.66	1.35	
% Gap Fulfilled	12.08	13.76	12.62	26.56	19.35	4.24	7.71	10.38	3.75	11.76	7.60	14.19	20.94	11.56	
PO Attn Direct 100%	1.93	1.88	1.90	1.36	1.83	1.18	0.99	1.05	1.70	1.56	1.04	1.42	2.01	1.31	
% contribution Direct	80	80	80	80	80	50	50	50	50	50	50	50	50	50	
PO Direct Attn	1.54	1.50	1.52	1.08	1.47	0.59	0.50	0.52	0.85	0.78	0.52	0.71	1.00	0.65	
PO Rubrics Attn	0.13	0.13	0.14	0.14	0.14	0.75	0.59	0.59	0.50	0.44	0.67	0.47	0.52	0.67	
PO Surveys Attn	0.42	0.41	0.41	0.38	0.37	0.38	0.36	0.38	0.39	0.38	0.37	0.40	0.40	0.38	
25% of PO activities Attn	0.02	0.03	0.02	0.09	0.04	0.02	0.03	0.04	0.01	0.03	0.03	0.05	0.03	0.04	
PO Attainment	2.10	2.06	2.10	1.70	2.02	1.74	1.48	1.54	1.74	1.64	1.60	1.63	1.95	1.74	
PO Target for 2015-16	2.4	2.4	2.4	2.4	2.4	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.95	1.8	

Summary of PO/PSO attained Levels for CAY -2016-17, CAYm1-2015-16and CAYm2-2014-15 is shown in table 4.5 and the same is depicted in graph shown in Fig 1.

Table 4.5: POs &PSOs Attained Levels CAY, CAYm1 and CAYm2

POs &PSOs Attained Levels for 3 Assessment Years														
A.Y	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CAYm2: 14-15	2.10	2.06	2.10	1.70	2.02	1.74	1.48	1.54	1.74	1.64	1.60	1.63	1.95	1.74
CAYm1: 15-16	2.13	2.08	2.17	1.71	2.03	1.78	1.54	1.67	1.75	1.75	1.64	1.70	1.96	1.79
CAY: 16-17	2.20	2.10	2.21	1.70	2.11	1.68	1.54	1.69	1.77	1.78	1.62	1.71	1.96	1.79

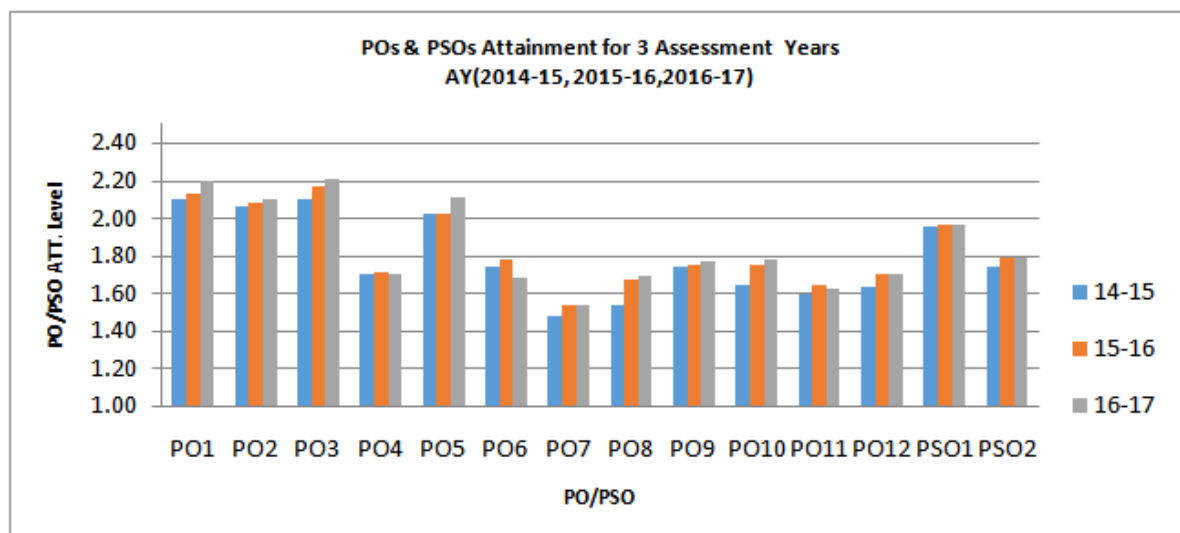


Fig 3.3.4: PO/PSO Attained Levels CAYm2, CAYm1 and CAY

V. Conclusion

In this paper a more realistic approach for establishing CO-POs &PSOs correlation and measurement or computation of the attainment of COs, POs and PSOs has been presented. The attainment values thus obtained can be compared with the set target levels and action plan can be suggested for those POs &PSOs where attained values are less than target value.

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