

# Integrating OBE-Based Attainment Systems with Accreditation Metrics: A Practical Perspective for Diploma Colleges (MSBTE)

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**Abstract**— Attainment measures how well students achieve the intended learning outcomes of a course or program. This paper presents a structured approach for assessing Course Outcome (CO) and Program Outcome (PO) attainment in Polytechnic colleges, following MSBTE guidelines. The assessment framework integrates direct (80%) and indirect (20%) evaluation methods. Direct assessments, including examinations, practical evaluations, and CO mapping, provide measurable performance insights, while indirect assessments, such as stakeholder feedback from employers, industry professionals, and alumni, offer qualitative perspectives. Evaluating attainment is crucial for enhancing academic quality, identifying learning gaps, and aligning teaching methodologies with industry expectations. A data-driven assessment process enables institutions to continuously refine their curriculum, optimize instructional strategies, and create a student-centered learning environment. Ultimately, a well-defined attainment framework ensures that graduates develop the necessary skills and competencies to succeed in their careers while meeting accreditation standards.

**Index Terms**—Course Outcomes, Program Outcomes, MSBTE, Polytechnic, Attainment

## I. INTRODUCTION

Attainment in education refers to the extent to which students achieve the intended learning outcomes of a course or program. In the context of Outcome-Based Education (OBE), attainment ensures that students develop the necessary skills and competencies to meet academic and industry expectations. Polytechnic institutions, following MSBTE guidelines, employ a structured methodology to assess Course Outcome (CO) and Program Outcome (PO) attainment. This process integrates both direct assessments (80%), including examinations, practical evaluations, and CO mapping, and indirect assessments (20%), such as feedback from employers, industry professionals, and alumni. The goal is to create a standardized framework that aligns academic programs with accreditation standards while improving student performance and engagement.

A well-structured attainment process is essential for continuous improvement in education. It helps institutions identify learning gaps, refine curriculum design, and enhance teaching strategies based on performance data. By adopting a data-driven approach, educators can implement targeted interventions to improve student outcomes and better align education with industry needs. This ensures that graduates are well-equipped with the required knowledge and skills, enhancing their employability and professional success. Ultimately, a comprehensive attainment framework not only strengthens the teaching-learning process but also supports the long-term quality and credibility of technical education programs.

## II. METHODOLOGY

Wherever Times is specified, Times Roman or Times New Roman may be used. If neither is available on your word processor, please use the font closest in appearance to Times. Avoid using bit-mapped fonts. True Type 1 or Open Type fonts are required. Please embed all fonts, in particular symbol fonts, as well, for math, etc.

**Setting Targets for Attainment:** Defining attainment targets is crucial for assessing student progress and ensuring continuous academic growth. The process starts with analyzing previous performance data, primarily using the Theory Score Index (TSI) to establish baseline achievement levels. By reviewing average TSI values, institutions can identify trends in student learning and set realistic goals. Attainment levels are typically divided into three categories: Low (0.0 – 1.5), Medium (1.5 – 2.5), and High (2.5 – 3.0), which help in evaluating student proficiency and setting expected learning outcomes. To support steady improvement, incremental targets are assigned for different academic years. For example, first-year students may have a goal of 40% attainment, which gradually increases to 50-60% in later years. Faculty members and academic committees review these targets to ensure they align with accreditation standards and institutional objectives. Regular monitoring and refinement, based on student feedback, industry requirements, and employer expectations, help in optimizing the learning process. This structured approach ensures a data-driven academic system that fosters student engagement and enhances overall educational quality.

### 1. Method for CO Attainment Assessment

#### A. Direct Attainment Tools (80%):

MSBTE evaluates student performance through multiple direct assessment methods:

**End Semester Examination (ESE) contributes 60% to direct attainment.**

Theory subjects are assessed through written examinations that may include subjective and objective questions. The answer sheets are evaluated by external faculty members to ensure unbiased assessment.

Practical subjects require students to undertake practical or oral examinations at the semester's end. These assessments are conducted by either internal faculty or external examiners appointed by MSBTE.

**Progressive/Internal Assessment contributes 40% to direct attainment.**

Theory subjects are evaluated using class tests and micro-projects, which follow MSBTE's structured guidelines. Students undertake two tests per semester—one at mid-term and another at the end.

Practical subjects are assessed continuously, considering students' practical skills and their ability to apply knowledge in real-world scenarios.

- B. **Indirect Attainment Tools (20%):** A Course End Survey is conducted to collect student feedback at the end of each semester. At least 60% of students enrolled in the course must participate in the survey, which evaluates their learning experiences using a four-level scale: Poor, Good, Very Good, and Excellent.

## 2. Thresholds for Attainment Measurement:

To establish CO attainment levels, benchmarks are set during academic meetings attended by the Principal, HOD, and Academic Coordinator. The following thresholds are applied:

For theory-based end-semester exams, students must secure at least 45% marks to contribute to attainment.

For practical-based end-semester exams, students must achieve a minimum of 50% marks for attainment consideration.

For progressive theory assessments (class tests and micro-projects), students must obtain at least 55% marks.

For progressive practical assessments, a minimum score of 75% marks is required to be counted towards attainment.

## 3. CO Attainment Levels:

CO attainment is classified into three levels based on student performance:

- **Level 1:** Achieved if at least **60% of students** score at or above the set average marks.
- **Level 2:** Attained when at least **70% of students** reach the set average marks.
- **Level 3:** Reached if **80% or more students** secure marks at or above the set average.

## 4. Criteria for Direct Attainment Calculation:

The following rubrics are used to assess direct attainment:

- For internal theory assessments (class tests and micro-projects): If 60% of students score more than 50% marks, attainment is considered met.
- For internal practical assessments: Attainment is achieved when 60% of students score at least 75% marks.
- For external theory exams: Attainment is counted if 60% of students score more than 45% marks.
- For external practical exams: Attainment is reached when 60% of students secure more than 55% marks.
- For higher attainment levels, the percentage of students meeting these criteria increases to 70% for Level 2 and 80% or more for Level 3.

## 5. Method for PO Attainment Assessment:

The Program Outcome (PO) attainment process employs a structured methodology that incorporates both direct and indirect assessment tools. This systematic approach ensures a thorough evaluation of how well the program meets its intended academic and professional learning objectives. The methodology involves the following steps:

## 6. Selection of Assessment Tools:

The PO attainment framework consists of two primary assessment tools:

- Direct Attainment (80%) – Measured through student performance in examinations and internal assessments.
- Indirect Attainment (20%) – Determined using feedback from external stakeholders, including employers, alumni, and industry professionals.

## 7. Calculation of Direct Attainment (80%):

The direct attainment score is derived from the following methods:

- **Internal Assessment:** Conducted through continuous evaluations, such as class tests, assignments, and micro-projects. Student performance is assessed and mapped to Course Outcomes (COs) to determine their achievement levels.
- **End Semester Examination:** The End Semester Examination (ESE) consists of both theory and practical/oral exams. The Theory Examination (ESE-TH) is externally assessed to evaluate students' conceptual understanding. The Practical/Oral Examination (ESE-PR) assesses technical skills and practical application of knowledge.
- **CO-PO-PSO Mapping & Normalization:** Each CO is mapped to Program Outcomes (POs) and Program-Specific Outcomes (PSOs) to measure its contribution to the overall program. The CO attainment score is multiplied by the CO-PO-PSO mapping coefficient to standardize results. The outcome is normalized by dividing by the highest possible attainment value, ensuring consistency. The direct attainment score contributes 80% to the final PO attainment score.

## 8. Calculation of Indirect Attainment (20%):

The indirect attainment score is derived from stakeholder feedback and evaluation.

- **Stakeholder Feedback Collection:** Feedback is obtained from employers, industry professionals, and alumni regarding the program's effectiveness. Respondents evaluate the program using a 4-point scale: Poor (4 marks), Good (6 marks), Very Good (8 marks), Excellent (10 marks)
- **Feedback Score Analysis:** The number of responses in each category is recorded and analyzed. A weighted score is determined by multiplying the frequency of each rating with its respective value. The final score is normalized by comparing it to the highest possible score, assuming all responses were "Excellent." The indirect attainment score contributes 20% to the overall PO attainment score.

9. **Computation of Final PO Attainment Score:** The Program Outcome (PO) attainment score is calculated by assigning 80% weight to Direct Attainment, which includes student performance in assessments and exams, and 20% weight to Indirect Attainment, derived from stakeholder feedback such as input from employers and alumni. This method provides a

comprehensive evaluation of the program's effectiveness in achieving learning goals, meeting industry standards, and enhancing student competencies.

### III. SAMPLE CO ATTAINMENT OF END SEMESTER EXAM:

Sr. No.	Enrollment No	Name of Student	TH (ESE) (Out of 70)	PR (ESE) (Out of 50)
1	2005300218	Ahire Prerna Santosh	66	44
2	2005300219	Ahire Snehal Someshwar	52	30
3	2005300220	Bagar Jayesh Sanjay	52	34
4	2005300221	Bagar Jaymala Sanjay	59	30
5	2005300222	Bagul Kiran Varu	38	25
6	2005300223	Barve Mahima Nandkishor	52	38
7	2005300224	Barve Sahil Shantaram	63	30
8	2005300225	Bhadange Suyog Shrikrishna	47	25
9	2005300226	Bhavar Sanjivani Devidas	40	40
10	2005300227	Bhurkud Vicky Bandu	45	35
11	2005300228	Bhurkund Pushpa Bandu	28	30
12	2005300229	Bohara Taniya Dipak	31	44
13	2005300230	Borse Shubham Dilip	61	44
14	2005300231	Brahmane Eshvar Pandurang	42	43
15	2005300232	Chaudhari Ashok Sitaram	38	25
16	2005300233	Chaudhari Pankaj Ramdas	40	25
17	2005300234	Chaudhari Yogesh Gulab	42	25
18	2005300235	Chavan Omkar Sunil	68	38
19	2005300236	Deshmukh Chiranjivi Randhir	49	40
20	2005300237	Dive Rahul Vishnu	54	30
21	2005300238	Gangurde Kiran Santosh	54	40
22	2005300239	Gangurde Sanjay Jayaram	47	25
23	2005300240	Gangurde Siddhant Bhagwat	47	40
24	2005300241	Gaykawad Bhaudas Hiranman	45	25
25	2005300242	Gondhale Siddhesh Ashok	28	38
26	2005300243	Hadal Dhanashree Dashrath	35	37
27	2005300244	Jadhav Neha Sunil	28	40
28	2005300245	Kadam Omkar Nilesh	63	43
29	2005300246	Kasture Athrav Mangesh	59	40
30	2005300247	Khairnar Prathamesh Ravindra	49	44
31	2005300248	Kumawat Bhushan Vikas	54	40
32	2005300249	Mahure Anjali Deepak	59	39
33	2005300250	Pagare Pranali Vilas	28	42
34	2005300251	Pawar Ashutosh Ravindra	52	42
35	2005300252	Pawar Darshan Suresh	49	43
36	2005300253	Pawar Sneha Santosh	68	41
37	2005300254	Pawar Sumit Hari	54	25
38	2005300255	Pawar Vijay Jibhau	54	25
39	2005300256	Ramoshi Rahul Sanjay	40	28
40	2005300257	Saini Anju Badriprasad	24	38
41	2005300258	Saini Manju Badriprasad	38	38
42	2005300259	Sapte Prasad Bhagvan	35	28
43	2005300260	Sapte Swapnil Bhagwan	40	29
44	2005300261	Shirapure Sakshi Santosh	70	44
45	2005300262	Waghela Viral Prakashbhai	61	38
46	2005300263	Walzade Atharva Ambadas	24	38
47	2005300264	Shirsath Piyush Somnath	70	43
48	2005300265	Patil Shweta Mohan	54	30
49	2005300266	Chavan Karan Sharad	54	41
50	2005300267	Bahiram Ujjwala Ramalal	38	27
Average Marks			32	30
Number of Students who attempted			50	50
Number of Students getting marks more than average			43	37
% of student getting marks more than Average Marks			86	74
Attainment Level achieved			<b>3.00</b>	<b>2.11</b>

Fig. 1. Calculation of End Semester Exam CO Attainment

Course End Survey						
Sr No	At what level do you able to estimate the error in the measurement of physical quantities?	At what level do you able to apply principle of electricity and magnetism while solving engineering problems?	At what level do you able to use basic principle of heat & optics in related engineering applications?	At what level do you able to apply catalysis process?	At what level do you use corrosion preventive measures?	At what level do you able to understand the use engineering material?
1	Excellent	Very Good	Excellent	Excellent	Excellent	Excellent
2	Good	Good	Good	Good	Good	Good
3	Excellent	Very Good	Good	Good	Good	Good
4	Very Good	Very Good	Very Good	Very Good	Excellent	Excellent
5	Good	Good	Good	Good	Good	Good
6	Very Good	Good	Good	Very Good	Excellent	Very Good
7	Good	Good	Poor	Good	Good	Good
8	Very Good	Very Good	Excellent	Very Good	Good	Good
9	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
10	Very Good	Good	Very Good	Very Good	Very Good	Very Good
11	Excellent	Very Good	Good	Very Good	Very Good	Very Good
12	Excellent	Very Good	Good	Good	Good	Good
13	Good	Good	Good	Good	Good	Good
14	Excellent	Very Good	Very Good	Very Good	Very Good	Very Good
15	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
16	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good
17	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
18	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good
19	Very Good	Very Good	Excellent	Excellent	Excellent	Excellent
20	Very Good	Good	Good	Good	Very Good	Very Good
<b>COUNT</b>						
<b>20</b>	<b>168</b>	<b>152</b>	<b>152</b>	<b>156</b>	<b>160</b>	<b>158</b>
	<b>84.00</b>	<b>76.00</b>	<b>76.00</b>	<b>78.00</b>	<b>80.00</b>	<b>79.00</b>
	<b>2.52</b>	<b>2.28</b>	<b>2.28</b>	<b>2.34</b>	<b>2.40</b>	<b>2.37</b>
<i>Marks according to level</i>						
10	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
8	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good
6	Good	Good	Good	Good	Good	Good
4	Poor	Poor	Poor	Poor	Poor	Poor

Fig. 2 Course End Survey

Course Outcomes COs.	CO Direct Attainment						CO Indirect Attainment	Total CO Attainment = 0.8x+0.2y	
	Internal Assessment (IA)			External Assessment (EA)					
	Progressive Assessment			End Semester Exam			Course End Survey (Y)		
	TH PA	PR PA	Avg(I)	TH ESE	PR ESE	Avg (B)			0.4 A(I)+0.6 A(B) (X)
CO 1	2.26	1.07	1.66	3.00	2.11	2.56	2.20	2.33	2.23
CO 2	2.26	1.07	1.66	3.00	2.11	2.56	2.20	2.28	2.22
CO 3	2.26	1.07	1.66	3.00	2.11	2.56	2.20	2.31	2.23
CO 4	2.26	1.07	1.66	3.00	2.11	2.56	2.20	2.32	2.23
CO 5	2.26	1.07	1.66	3.00	2.11	2.56	2.20	2.25	2.21
CO 6	2.26	1.07	1.66	3.00	2.11	2.56	2.20	2.27	2.22
<b>Attainment of Course:</b>								<b>2.22</b>	

Fig.3. CO Direct Attainment

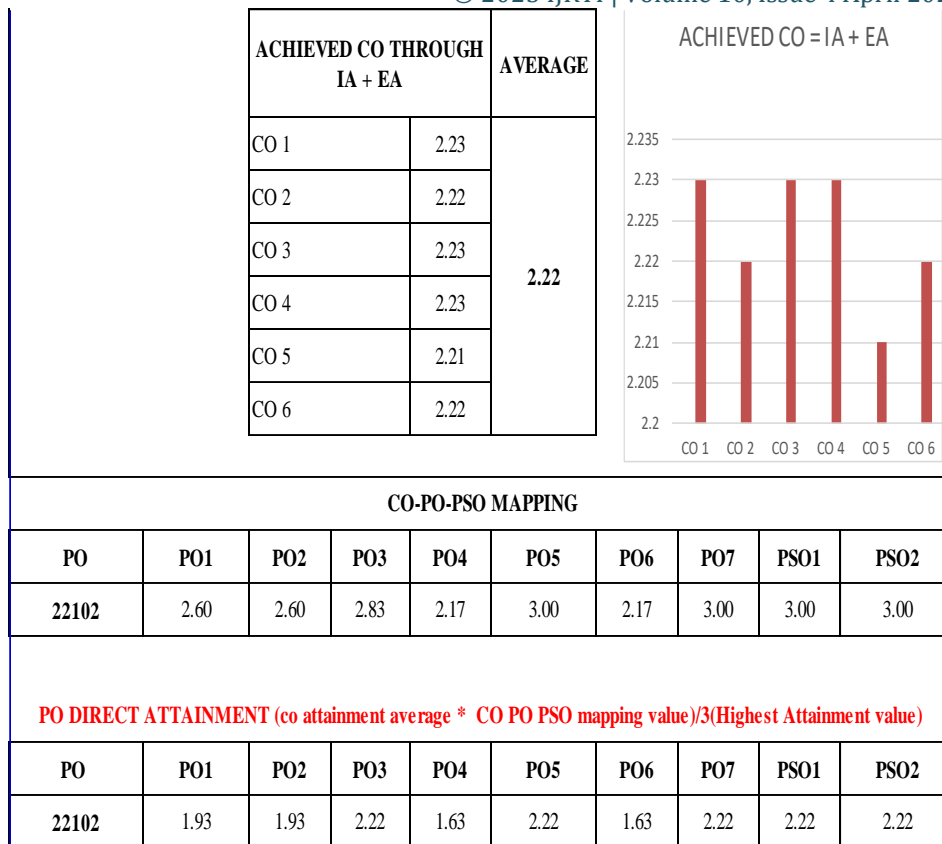


Fig. 4. PO Direct Attainment

#### IV. ACKNOWLEDGMENT

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#### REFERENCES

- [1] Shivakumar Ramchandra, Samita Maitra and K Mallikarjuna Babu, "Method for estimation of Attainment of Program outcome through Course outcome for Outcome based Education," B M S College of Engineering, Bangalore 560019, India, Published on IEEE 2014.
- [2] Mousami Vanjale, Sachin, Dr. P. B. Mane "Assessment of Course Outcomes (COs) in University Affiliated Engineering Programs" AISSMS's IOIT, Pune, India, Published on IEEE 2015.
- [3] Dr. Kiran Bailey, K. Sujatha, Dr. A. Meera and Dr. G. Poornima "Assessment of Program Outcomes Using Direct and Indirect Methods" B.M.S college of Engineering, Bangalore-560019, Published on IEEE 2017.