



Pune Vidyarthi Griha's College of Engineering,  
Technology and Management, Pune

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

Department of  
**Electronics & Telecommunication  
Engineering**

**Outcome Based Education (OBE) Manual**  
**Academic Year 2025 - 26**



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



### **Vision of Institute**

To achieve excellence in engineering education

### **Mission of Institute**

- ❖ To satisfy all stakeholders.
- ❖ To develop ethical, highly motivated engineering professionals with good human values, requisite skills and competencies.
- ❖ To adopt innovative teaching mechanisms.
- ❖ To promote research culture.
- ❖ To contribute to country's economic developments.
- ❖ To be responsive to changes in technology, socio-economic and environmental conditions.



## Index

Vision Mission of Institute		
Sr.No.	Particulars	Page No.
1	<b>Introduction</b> 1.1 About Pune Vidyarthi Griha 1.2 PVG's COET & M, Pune 1.3 About Savitribai Phule Pune University 1.4 National Board of Accreditation 1.5 National Assessment and Accreditation Council (NAAC)	7
2	<b>Outcome Based Education</b> 2.1 OBE Philosophy 2.2 Core Philosophy and components 2.3 Principles of OBE 2.4 Implementation of OBE 2.5 Components of OBE Philosophy 2.6 Vision and Mission 2.7 PEOs, POs and PSOs 2.8 Process of defining Vision and Mission 2.9 Process of defining PEOs	11



PVG's College of Engineering, Technology and GKPIOM  
Department of Electronics and Telecommunication Engineering



	2.10 Correlation with PEOs with Mission	
3	<b>Course Outcomes</b> 3.1 Bloom's Taxonomy 3.2 Good Learning Outcomes : SMART approach 3.3 Smart Action verbs for Bloom's Taxonomy 3.4 Course Outcomes definition 3.5 Course Outcomes 3.6 Attainment of Course Outcomes 3.7 Attainment of PO and PSO 3.8 CO-PO/ CO-PSO Mapping and Attainment	19
4	<b>Summary</b>	49
5	<b>References</b>	50



### Important Definitions

**Lower order Thinking:** The lower-order thinking skills include Remembering, Understanding and Applying.

**Higher order Thinking:** refer to skills that go beyond memorizing information.

**Programme Educational Objective:** PEOs are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. Knowledge, Skill and Attitude are the three behavioral elements based on which PEOs are constructed.

**Course Outcomes:** It is a detailed description of what a student must be able to do at the conclusion of a course.

**Programme Outcome:** Program outcomes are statements that describe what students are expected to know and be able to do upon graduating from the program. These relate to the skills, knowledge, analytical ability, attitude and behavior that students acquire through the program.

**Programme Specific Outcomes:** Program Specific Outcomes are statements that describe what the graduates of a specific engineering program should be able to do.

**End Semester Examination:** ESE means the examinations to be held at the end of each semester separately for theory & practical part by the MSBTE

**Progressive Assessment:** Continuous Internal assessment is a form of educational examination that evaluates a student's progress throughout a prescribed course.

**Bloom's Taxonomy Level:** There are six levels of cognitive learning according to the revised version of Bloom's Taxonomy. Each level is conceptually different.



PVG's College of Engineering, Technology and GKPIOM  
Department of Electronics and Telecommunication Engineering



The six levels are remembering, understanding, applying, analyzing, evaluating, and creating.

**Course Objective:** A course objective describes what a faculty member will cover in a course. They are generally less broad than goals and broader than student learning outcomes. Objectives focus on content and skills within the classroom or program.

**Term work (TW)** refers to the continuous assessment of a student's performance throughout a semester, rather than solely relying on final exam results. It comprises a set of mandatory activities, assignments, and records that demonstrate a student's engagement with the curriculum.



## 1. Introduction

### 1.1 About Pune Vidyarthi Griha

The parent institute Pune Vidyarthi Griha, formerly known, as Pune Anath Vidyarthi Griha is a well-known charitable institution of Maharashtra, established in 1909, by a group of dedicated and visionary educationists.

The primary mission of the Institute is to provide progressive and value added education facilities for the deserving, poor students of the society.

Today, the institution has grown with its branches at Pune- Sadashiv Peth Main Campus, Pune – Vidyanagari Campus, Mumbai – Ghatkopar Campus, Navi Mumbai – Nerul Campus, Nashik – Mhasrul Campus, and Nashik – Talegaon Anjaneri Campus. The Institute conducts a wide spectrum of education programs from Pre-primary to Higher education, in professional fields like Engineering, Technology, Management, Computer Science, and Commerce & Science College etc.

### 1.2. PVG's COET & M, Pune

PVG's College of Engineering, Technology and Management formerly known as PVG's COET & GKPIOM, was established in 1985 with a pioneering branch of Printing Engineering. PVGCOET is affiliated to Savitribai Phule Pune University, approved by AICTE and by Government of Maharashtra. The Institute is accredited by NAAC with Grade 'A'. From 2025 Autonomy is granted to the college. The institute offers UG, PG and Ph.D. programs. The list of programs are given below.



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



The Institute is offering following UG Programs

<b>Name of Program</b>	<b>Program Level</b>	<b>Year of Start</b>	<b>Initial Intake</b>	<b>Sanctioned Intake</b>
Printing & Packaging Technology	UG	1985	60	60
Mechanical Engineering	UG	1991	60	120
Electrical Engineering	UG	1991	30	60
E&TC Engineering	UG	1991	30	120
Information Technology	UG	2001	60	60
Computer Engineering	UG	2002	60	60
Artificial Intelligence and Data Science	UG	2021	60	60

Postgraduate course run by the institute

<b>Name of Program</b>	<b>Program Level</b>	<b>Year of Start</b>	<b>Initial Intake</b>	<b>Sanctioned Intake</b>
Electrical Power System	PG	2000	18	18
Printing & Packaging Technology	PG	2009	18	9
Masters of Business Administration	PG	2011	60	60

PhD courses offered are outlined in the following table.

1	Electrical Engineering
2	Mechanical Engineering
3	Printing & Packaging Technology



### **1.3 About Savitribai Phule Pune University**

The Institute is affiliated to Savitribai Phule Pune University, one of the premier universities in India and is positioned in the North-western part of Pune city. It occupies an area of about 411 acres. It was established on 10th February, 1949 under the Poona University Act. The university houses 46 academic departments. It is popularly known as the 'Oxford of the East'. It has about 307 recognized research institutes and 612 affiliated colleges offering graduate and under-graduate courses. The university attracts many foreign students due to its excellent facilities. It offers good accommodation facility. There is a provision of hostel for the students. There is a well-stocked library containing plenty of books regarding various subjects. The university offers different scholarships to the students. The university conducts seminars and conferences for the students.

### **1.4 National Board of Accreditation (NBA)**

The National Board of Accreditation (NBA), India was initially established by the AICTE (All India Council of Technical Education) under section 10(u) of AICTE Act, in the year 1994, in order to assess the qualitative competence of the programs offered by educational institution from diploma level to post-graduate level in engineering and technology, management, pharmacy, architecture and related disciplines, which are approved by AICTE.

NBA came into existence as an independent autonomous body with effect from 7th January 2010 with the objectives of assurance of quality and relevance to technical education, especially of the programs in professional and technical disciplines, i.e., Engineering and Technology, Management, Architecture, Pharmacy and Hotel Management and Catering Technology, through the mechanism of accreditation of programs offered by technical institutions. The Memorandum of Association and



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



Rules of NBA were amended in April 2013, to make it completely independent of AICTE, administratively as well as financially. The NBA conducts evaluation of programs of technical institutes on the basis of laid down norms. This may include, but not limited to institutional missions and objectives, organization and governance, infrastructure facilities, quality of teaching and learning, curriculum design and review, support services (library, laboratory, instrumentation, computer facilities, etc.) and any other aspect as decided by the General Council and / or Executive Committee of NBA, which will help the graduates produced by the institutions as per industry requirements. Over the period of its existence, the NBA has introduced new processes,

parameters and criteria for accreditation that are in line with the best international practices and oriented to assess the outcomes of the programme.

### **1.5 National Assessment and Accreditation Council (NAAC)**

The NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL (NAAC) conducts assessment and accreditation of Higher Educational Institutions (HEI) such as colleges, universities or other recognized institutions to derive an understanding of the 'Quality Status' of the institution. NAAC evaluates the institutions for its conformance to the standards of quality in terms of its performance related to the educational processes and outcomes, curriculum coverage, teaching-learning processes, faculty, research, infrastructure, learning resources, organization, governance, financial wellbeing and student services.



## 2. Outcome based Education

### 2.1 OBE Philosophy

**Outcome-Based Education (OBE)** is a student-centric, proactive philosophy focusing on what learners know and can do upon graduation rather than just content delivery. It utilizes a backward design to align curriculum, teaching, and assessment with specific, measurable, and real-world skills. This model signifies a transformation in the educational paradigm, prioritizing learning outcomes over teaching processes. All educational activities conducted within an Outcome- Based Education (OBE) framework should assist students in reaching the established objectives. Faculty members may modify their roles to serve as instructors, trainers, facilitators, or mentors, depending on the desired outcomes. The OBE approach represents an ongoing educational process that involves the continual enhancement of the curriculum, teaching methodologies, and assessment instruments. Key principles include high expectations, expanded opportunities for success, and clarity of focus.

### 2.2 Core Philosophy and Components

**Student-Centric Learning:** Shifts focus from teaching (input) to learning (outcome), placing the student at the centre of the educational process. **Outcome Focus:** Defines precise, measurable skills (course/program outcomes) learners should possess upon graduation. **Backward Design:** Curriculum is planned by first identifying desired results (career skills) and then mapping assessment and instruction to achieve them. **Competency Development:** Focuses on applying knowledge to real-world problems and developing professional skills.



### **2.3 Principles of OBE Clarity of Focus:**

All teaching-learning activities focus on achieving the defined outcomes. Expanded Opportunities: Provides multiple pathways and opportunities for students to learn, acknowledging that everyone can reach high standards. High Expectations: Promotes high standards for all students, encouraging them to excel. Key Design Downwards: Aligning curriculum with desired outcomes. Real-World Application: Preparing graduates with skills required for employment, including professional skills and social responsibility. Continuous Improvement: Using assessment data to improve teaching methodologies and curricula continuously. Transparency: Clearly defining learning goals for students, teachers, and stakeholders. Lifelong Learning: Fostering the ability to continue learning throughout their careers.



## 2.4 OBE Implementation

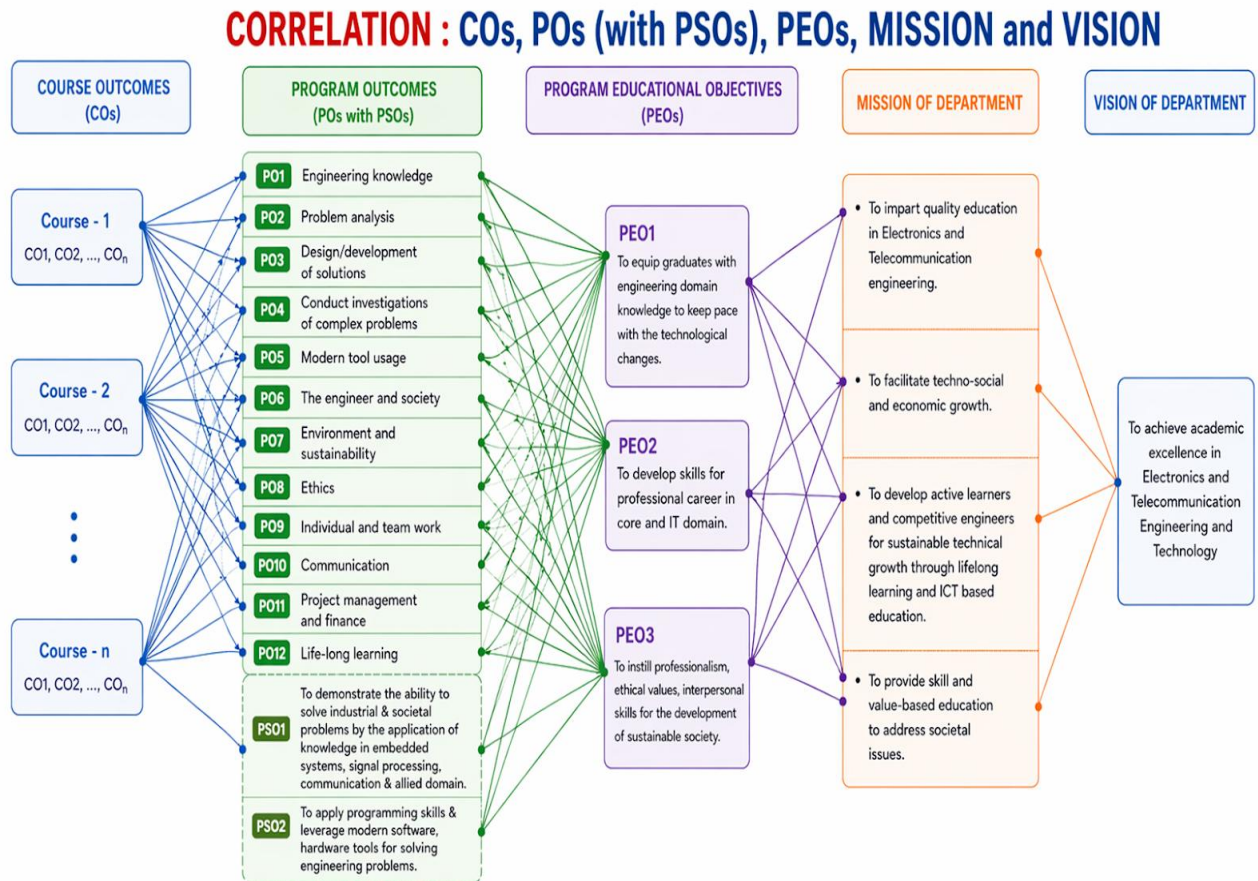


Fig.1 Correlation between COs, POs (with PSOs), PEOs, MISSION and VISION

### Steps in OBE implementation

1. Define the Vision and Mission statements for both the Institute and its respective department.
2. Define Program Educational Objectives
3. Program Outcome & Program Specific Outcome Statements
4. Define Course Objectives
5. Map course outcomes with program outcomes



6. Define Course Outcomes with Bloom's Taxonomy for each course
7. Mapping of topics with Course outcomes
8. Prepare lecture-wise Course Lesson Plan
9. Define pedagogical tools for course outcomes delivery
10. Define rubrics for Project Based Learning, Practical, seminar, Mini Project, Final year Project
11. Define various assessment tools such as Assignments, Quizzes, Class Test, Course End Survey
12. Measure the attainment of each Course Outcome through Direct/Indirect assessments
13. Monitor the academic progress of students
14. Identify Gaps in the Curriculum and plan appropriate measures to bridge the Gap
15. Compare PO/PSO for last 3 academic years and propose remedial actions
16. Assess the attainment of Program Educational Objectives

## **2.5 Components OBE Frame work**

- 1. Vision and Mission Statements** - vision statement is what the Institute wants to acquire and mission is what an Institute is all about.
- 2. Program Educational Objectives (PEOs):** Broad statements of what graduates are expected to achieve in their careers a few years after graduation.
- 3. Program Outcomes (POs):** Statements that describe what students should know and be able to do by the time of graduation.
- 4. Course Outcomes (COs):** Specific learning objectives for each course



## 2.6 Vision Mission Statements

### Vision of Department

To achieve academic excellence in Electronics and Telecommunication Engineering and Technology

### Mission of Department

- ❖ To impart quality education in Electronics and Telecommunication engineering.
- ❖ To facilitate techno-social and economic growth.
- ❖ To develop active learners and competitive engineers for sustainable technical growth through lifelong learning and ICT based education.
- ❖ To provide skill and value-based education to address societal issues.

## 2.7 PEOs, PSOs and POs of the Department

### Program Educational Objectives

**PEO1:** To equip graduates with engineering domain knowledge to keep pace with the technological changes.

**PEO2:** To develop skills for a professional career in core and IT domain.

**PEO3:** To instill professionalism, ethical values, interpersonal skills for the development of sustainable society.



### Program Specific Outcomes

**PSO1:** To demonstrate the ability to solve industrial & societal problems by the application of knowledge in embedded systems, signal processing, communication & allied domain.

**PSO2:** To apply programming skills & leverage modern software, hardware tools for solving engineering problems.

### Program Outcomes

**The Program Outcomes of the Department of Electronics and Telecommunication Engineering:**

**The graduates will be able to attain following skill sets**

**PO1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and engineering specialization to the solution of complex engineering problems.

**PO2. Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4. Conduct investigations of complex problems:** use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

**PO5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.



PVG's College of Engineering, Technology and GKPIOM  
Department of Electronics and Telecommunication Engineering



**PO6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



## 2.8 Process of Defining Vision and Mission of the Department

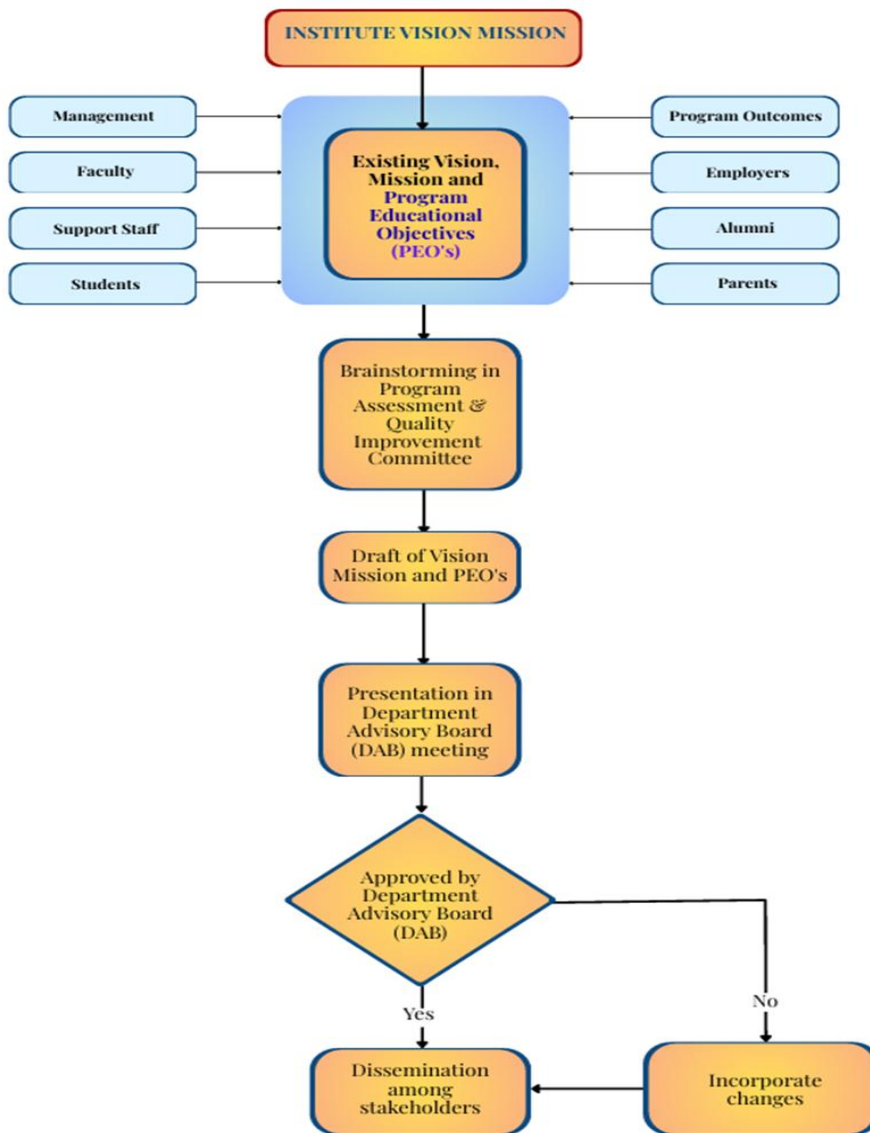


Fig.1 Process of Defining Vision and Mission of the Department



## 2.9 Correlation with PEOs and Mission:

**M1:** To impart quality education in Electronics and Telecommunication Engineering.

**M2:** To facilitate techno-social and economic growth

**M3:** To develop active learners and competitive engineers for sustainable technical growth through lifelong learning and ICT-based education.

**M4:** To provide skill and value-based education to effectively address societal issues

Program Educational Objectives (PEO)	M1	M2	M3	M4
<b>PEO1:</b> To equip graduates with engineering domain knowledge to keep pace with the technological changes	3	2	3	2
<b>PEO2:</b> To develop skills for professional career in core and IT domain	3	3	3	2
<b>PEO-3:</b> To instill professionalism, ethical values, interpersonal skills for the development of sustainable society	2	2	2	3



### 3.0 Course Outcomes

COs are the statements of Knowledge/ Skills/ Attitude that students are expected to know, understand and perform, as a result of learning experiences. Course Outcome remains the base of the hierarchy of outcomes and is the tools that can be used to measure student performance in each course. The course outcomes need to be concise descriptions of what learning is expected to take place by course completion.

Course Outcome statement may be broken down into two main components:

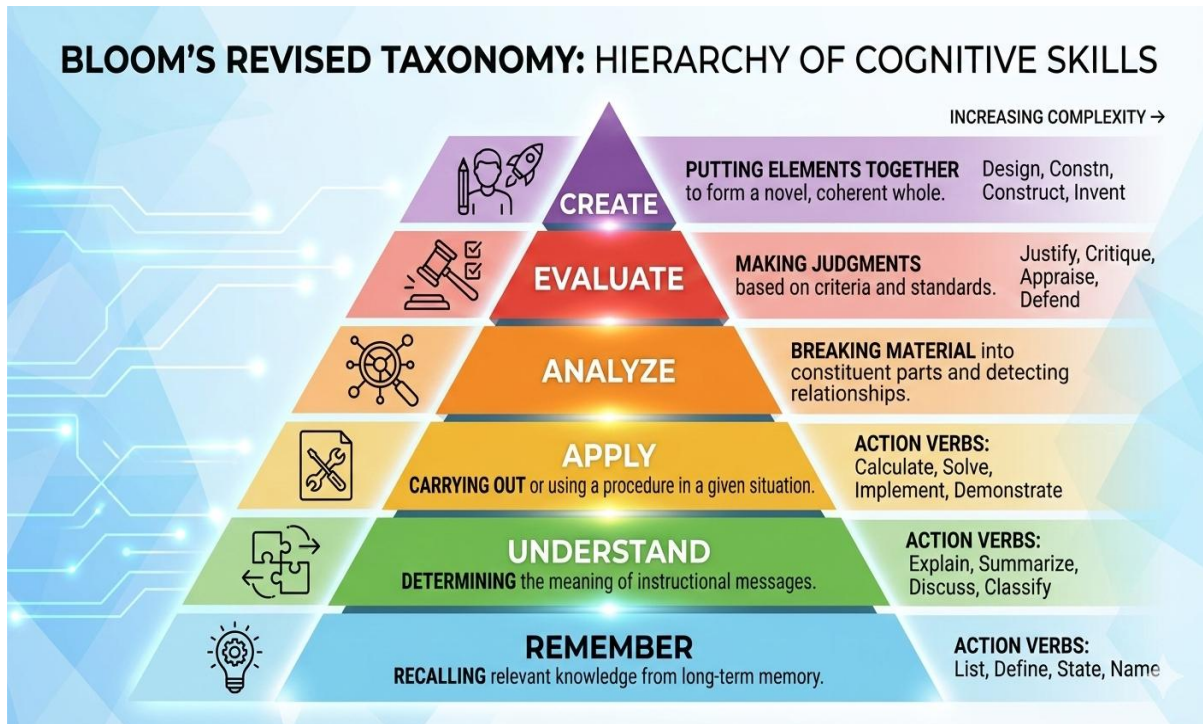
- **An action word** that identifies the performance to be demonstrated;
- **Learning statement** that specifies what learning will be demonstrated in the performance;

Examples of good action words to include in course outcome statements:

Compile, identify, create, plan, revise, analyze, design, select, utilize, apply, demonstrate, prepare, use, compute, discuss, predict, assess, compare, rate, critique, outline, or evaluate

### 3.1 Bloom's Taxonomy

There are six levels of cognitive learning according to the revised version of Bloom's Taxonomy. Each level is conceptually different. The six levels are remembering, understanding, applying, analyzing, evaluating, and creating. Bloom's Taxonomy is frequently used in writing the course outcomes as it provides a readymade structure and list of action verbs. All levels of Bloom's taxonomy of thinking skills can be incorporated into expected learning outcome statements.



**Fig. 3: Revised Bloom's Taxonomy**

### **3.2 Good Learning Outcomes: SMART**

1. Specific – to one learning behaviour (Clarity)
2. Measurable - includes the criteria for success (attainable)
3. Attainable - can be demonstrated with evidence, or Observed (intended output and specific)
4. Relevant – to future experiences or work place
5. Time-bound – to be achieved within certain time constraints



### 3.3 Action verbs for Bloom's level

Level and corresponding cues/ verbs for the examination/ test questions is given below:

Level	Skill Demonstrated	Question cues / Verbs for tests
1. Remember	<ul style="list-style-type: none"> <li>Ability to recall of information like facts, conventions, definitions, jargon, technical terms, classifications, categories, and criteria</li> <li>Ability to recall methodology and procedures, abstractions, principles, and theories in the field</li> <li>Knowledge of dates, events, places</li> <li>Mastery of subject matter</li> </ul>	list, define, tell, describe, recite, recall, identify, show, label, tabulate, quote, name, who, when, where
2. Understand	<ul style="list-style-type: none"> <li>Understanding information</li> <li>Grasp meaning</li> <li>Translate knowledge into new context</li> <li>Interpret facts, compare, contrast</li> <li>Order, group, infer causes</li> <li>Predict consequences</li> </ul>	describe, explain, paraphrase, restate, associate, contrast, summarize, differentiate, interpret, discuss
3. Apply	<ul style="list-style-type: none"> <li>Use information</li> <li>Use methods, concepts, laws, theories in new situations</li> <li>Solve problems using required skills or knowledge</li> <li>Demonstrating correct usage of a method or procedure</li> </ul>	calculate, predict, apply, solve, illustrate, use, demonstrate, determine, model, experiment, show, examine, modify



4. Analyse	<ul style="list-style-type: none"> <li>• Break down a complex problem into parts</li> <li>• Identify the relationships and interaction between the different parts of a complex problem</li> <li>• Identify the missing information, sometimes the redundant information and the contradictory information, if any</li> </ul>	classify, outline, break down, categorize, analyze, diagram, illustrate, infer, select
5. Evaluate	<ul style="list-style-type: none"> <li>• Compare and discriminate between ideas</li> <li>• Assess value of theories, presentations</li> <li>• Make choices based on reasoned argument</li> <li>• Verify value of evidence</li> <li>• Recognize subjectivity</li> <li>• Use of definite criteria for judgments</li> </ul>	assess, decide, choose, rank, grade, test, measure, defend, recommend, convince, select, judge, support, conclude, argue, justify, compare, summarize, evaluate
6. Create	<ul style="list-style-type: none"> <li>• Use old ideas to create new ones</li> <li>• Combine parts to make (new) whole,</li> <li>• Generalize from given facts</li> <li>• Relate knowledge from several areas</li> <li>• Predict, draw conclusions</li> </ul>	design, formulate, build, invent, create, compose, generate, derive, modify, develop, integrate

**Table 1: Assessment methods for different Bloom's cognitive levels**



### 3.4 CO Definition

#### Course Outcome (CO) Formation Process

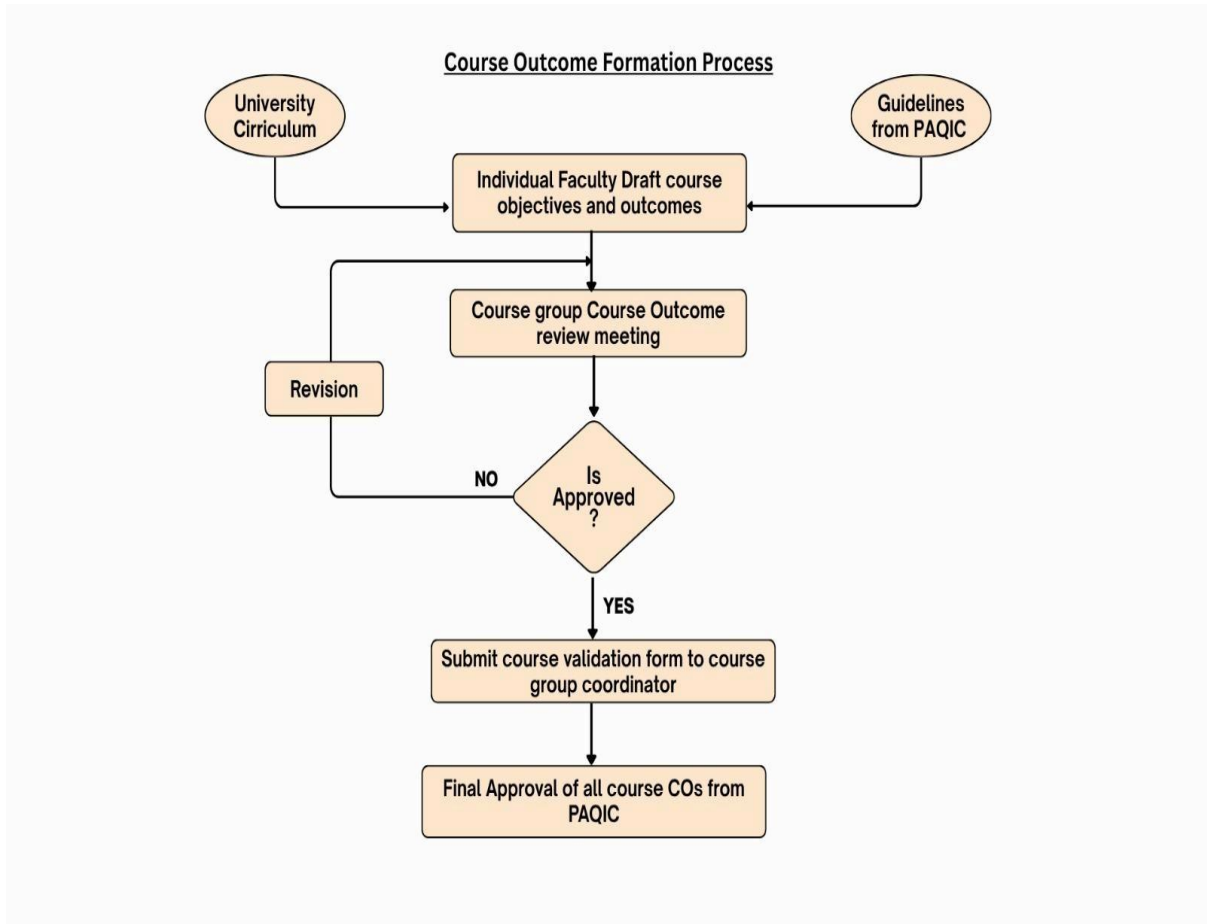


Fig. 4: Course Outcome (CO) Formation Process

PVG's COET & GKPIOM, Pune, is affiliated with Savitribai Phule Pune University (SPPU), which provides the Electronics and Telecommunication Engineering curriculum. The curriculum combines engineering basics, cutting-edge technology, skill-based courses, communication skills, and courses from various fields. The curriculum is taught in eight semesters, with more than 64 courses (including credit-bearing, audit, and project/internship components)



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



throughout the programme. The Academic Council and SPPU faculty of science and technology provide guidelines for the syllabus, while rules and recommendations from regulatory organisations are also considered. Industry representatives and faculty members collaborate during syllabus revision workshops to develop a unified curriculum, and a teaching and grading plan. Since the 2019 syllabus change, SPPU has implemented course outcomes for every course, which can be used by department faculty members. The outcomes are evaluated for consistency, adequacy, and alignment with Blooms taxonomy levels and learning objectives.

The key aspect in Outcome-Based Education (OBE) is the assessment of course outcomes. At the initial stage of OBE implementation, the Course Outcomes (COs) for each course are defined based on the Program Outcomes (POs) and other requirements. At the end of each course, the COs need to be assessed and evaluated to check whether they have been attained or not.

Course Outcomes (COs) are clear statements that describe what students are expected to know and be able to do at the end of a course. As per the guidelines of OBE, COs must be well-defined, measurable, and aligned with Program Outcomes (POs) and Program-Specific Outcomes (PSOs).

The process of attainment of COs, POs and PSOs starts from writing appropriate COs for each course of the program from first year to fourth year in a four-year engineering degree program. The course outcomes are written by the respective faculty member using action verbs of learning levels suggested by Bloom and Anderson. Then, a correlation is established between COs and POs in the scale of 1 to 3, 1 being the slight (low), 2 being moderate (medium) and 3 being substantial (high). A mapping matrix is prepared in this regard for every course in the program



including the elective subjects. The course outcomes written and their mapping with POs are reviewed frequently by a committee of senior faculty members before they are finalized.

### 3.5 Course Outcomes (COs)

- A **Course Outcome (CO)** clearly defines the specific knowledge, skills, and abilities that a student is expected to demonstrate upon successful completion of a course.
- Course Outcome remains the base of the hierarchy of outcomes and is the tools that can be used to measure student performance in each course.
- CO's should be concise, specific, and measurable, with a clear student-centered approach rather than being instructor-focused.
- Well-written COs facilitate the faculty in measuring the attainment of the CO at the end of the semester. It also helps the faculty in designing suitable delivery and assessment methods to achieve the intended attainment.
- Course Outcomes (COs) should be revised and reformulated whenever there are changes in the course content.

### Articulation of Cos

The Course Outcome (CO) statements are developed based on the content covered in each module of the course, ensuring that all key topics are adequately addressed. Each CO is aligned with the depth and scope of the module and is framed to reflect measurable knowledge, skills, and competencies that students are expected to achieve.



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



The following procedure is adopted at the department level for the articulation of Course Outcomes (COs):

1. Faculty members refer to guidelines given by the Program Quality Assurance Committee (PAQIC) for framing COs.
  - i. Articulate 3 to 6 Course Outcomes for every course
  - ii. Ensure each outcome follows SMART criteria
  - iii. Leverage Bloom's taxonomy to define action words of CO
  - iv. Select suitable assessment tool for measurement of CO attainment
2. Individual faculty members frame CO statements for their courses. The CO statements are articulated by considering course content and course outcomes given by the university.
3. Emphasize the learning outcomes achieved by students rather than describing the activities or instructional methods used in the course.
4. It also enables faculty to design appropriate teaching strategies and assessment methods aligned with the defined Course Outcomes.
5. CO statements are reviewed in relevant course group meetings, and necessary revisions are incorporated based on the discussions.
6. The framed Course Outcomes (COs) are submitted for review and approval by the PAQIC.

### **CO validation Process**

The Course Outcome (CO) validation process at the department level ensures that the defined COs are clear, measurable, and aligned with program objectives and industry requirements. Initially, the COs are articulated based on the course content and appropriate Bloom's Taxonomy levels. The COs are presented before a



validation committee comprising the course coordinator, course in-charge, and senior faculty members. The committee reviews the COs, provides suggestions if required, and ensures their effectiveness in achieving the intended learning outcomes. Based on the evaluation, COs may be approved as defined, modified, or redefined. A systematic validation checklist is employed to assess key aspects such as clarity, measurability, relevance, appropriateness of action verbs, cognitive level, and alignment with industry requirements.

### Course Outcome (CO) Validation Format

#### 1. Course Details

Course Code	
Course Title	
Program	B.E. (E&TC Engineering)
Semester	
Academic Year	
Faculty Name	
Course Type	Core / Elective / Laboratory / Audit/Project/Internship/PBL

#### 2. Defined Course Outcomes (COs)

University COs:

CO No.	Statement	Bloom's Level
CO1		
CO2		
CO3		
CO4		
CO5		
CO6		

Modified COs (If modified): Justification of modification



CO No.	Statement	Bloom's Level
CO1		
CO2		
CO3		
CO4		
CO5		
CO6		

**3. CO-PO/PSO Mapping Matrix**

CO\ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2

Criteria	Description	Yes/No	ReMarks
1. Alignment with POs/PSOs	Does the CO contribute meaningfully to one or more Program Outcomes / PSOs?		
2 Clarity	Is the CO statement clearly written and easy to understand?		
3. Measurability	Can the CO be assessed using quantifiable tools (assignments, tests, etc.)?		
4 Appropriateness of Action Verb	Is the verb aligned with the correct Bloom's Taxonomy level?		
5. Level of Learning	Is the cognitive level (remember → create) appropriate?		



6. Industry Relevance	Does the CO reflect current trends, technologies, or needs from the industry perspective?		
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### 5. Validation Committee Details

Name	Designation	Role in Validation	Signature

### 6. Remarks / Suggestions from Committee

### 7. Final Validation Outcome

- COs Approved as Defined
- COs Require Minor Modification
- COs Rejected – Redefinition Needed

Validated On: [Date]

Chairperson Signature: \_\_\_\_\_

### CO-PO Mapping Guidelines

The key competencies of PO statements are leveraged to provide guidelines for CO-PO mapping. These guidelines provide a structured approach for mapping Course Outcomes (COs) with Program Outcomes (POs) using defined key competencies in the PO statements. The objective is to ensure consistency, justification, and measurability in CO–PO mapping.

General Guidelines for CO–PO Mapping



- Mapping must be based on the alignment of CO statements with PO competencies
- Each CO should be mapped only to relevant POs (avoid over-mapping)
- Mapping should reflect the level of contribution (1–Low, 2–Moderate, 3–High)
- COs must be mapped considering their Bloom's Taxonomy (BT) level
- Justification should clearly explain how the CO contributes to the PO competency.

### **Steps for CO–PO Mapping Using Competencies**

#### **Step 1: Identify CO Components**

- Break the CO into key action + content
- Identify the BT level of the CO

#### **Step 2: Refer to PO Key Competencies**

- Select relevant PO
- Match CO action with corresponding competency of that PO

#### **Step 3: Establish Mapping Level**

- 3 (High): Strong and direct alignment with competency
- 2 (Moderate): Partial or indirect contribution
- 1 (Low): Minimal contribution
- - : no contribution



## Step 4: Write Justification

- Clearly state:
  - What the student does (from CO)
  - Which competency is addressed
  - How it contributes to PO

### Parameters Considered for CO–PO Mapping

#### 1. Alignment with PO Competency

- Identify whether the CO directly, partially, or indirectly supports the PO

#### 2. Bloom's Taxonomy (BT Level Consideration)

- Compare CO BT level with expected PO level

#### 3. Depth of Coverage

- Determine the extent of PO coverage in CO

#### 4. Assessment Support

- Ensure that attainment is measured through appropriate assessment tools

The following table presents the Program Outcome (PO) competencies. These competencies are derived from the NBA PO statements and aligned with appropriate Bloom's Taxonomy levels to ensure clarity, measurability, and relevance. They serve as key indicators for facilitating systematic CO–PO mapping, assessment, and attainment analysis in accordance with Outcome-Based Education (OBE) practices.



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**Department of Electronics and Telecommunication Engineering**



<b>PO</b>	<b>PO Description (Short)</b>	<b>BT Level</b>	<b>Key Competencies</b>
<b>PO1</b>	Engineering Knowledge	Apply	<ol style="list-style-type: none"> <li>1. Apply mathematical principles</li> <li>2. Apply scientific concepts</li> <li>3. Apply engineering fundamentals</li> </ol>
<b>PO2</b>	Problem Analysis	Analyze	<ol style="list-style-type: none"> <li>1. Analyze engineering problems</li> <li>2. Analyze signals and systems</li> <li>3. Interpret analytical results</li> </ol>
<b>PO3</b>	Design/ Development	Create	<ol style="list-style-type: none"> <li>1. Design circuits and systems</li> <li>2. Develop solutions</li> <li>3. Integrate constraints</li> </ol>
<b>PO4</b>	Investigation	Analyze / Evaluate	<ol style="list-style-type: none"> <li>1. Analyze experimental results</li> <li>2. Evaluate data</li> <li>3. Investigate problems</li> </ol>
<b>PO5</b>	Modern Tool Usage	Apply	<ol style="list-style-type: none"> <li>1. Apply engineering tools</li> <li>2. Use simulation tools</li> <li>3. Identify tool limitations</li> </ol>
<b>PO6</b>	Engineer & Society	Understand / Apply	<ol style="list-style-type: none"> <li>1. Understand societal impact</li> <li>2. Apply solutions for society</li> <li>3. Assess safety/legal issues</li> </ol>
<b>PO7</b>	Environment Sustainability &	Understand / Analyze	<ol style="list-style-type: none"> <li>1. Understand environmental impact</li> <li>2. Analyze sustainability</li> <li>3. Promote eco-friendly design</li> </ol>
<b>PO8</b>	Ethics	Understand / Apply	<ol style="list-style-type: none"> <li>1. Understand ethical responsibilities</li> <li>2. Apply ethical principles</li> <li>3. Demonstrate integrity</li> </ol>
<b>PO9</b>	Individual & Team Work	Apply	<ol style="list-style-type: none"> <li>1. Apply teamwork skills</li> <li>2. Contribute effectively</li> <li>3. Demonstrate leadership</li> </ol>
<b>PO10</b>	Communication	Apply / Create	<ol style="list-style-type: none"> <li>1. Apply communication skills</li> <li>2. Create reports</li> <li>3. Present ideas effectively</li> </ol>



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



<b>PO11</b>	Project Management	Apply / Analyze	1. Apply management principles 2. Analyze cost/resources 3. Plan projects
<b>PO12</b>	Life-long Learning	Apply	1. Apply self-learning strategies 2. Adapt to new technologies 3. Upgrade skills continuously

### **Pedagogical Initiatives in Curriculum Delivery**

- Well-structured delivery as per academic plan and university guidelines.
- Effective use of ICT tools (PPTs, simulations, online platforms).
- Google Classroom used for content sharing, assignments, and communication.
- Continuous assessment through tests, quizzes, and assignments.
- Remedial sessions and mentoring support for slow learners.
- Adoption of student-centric methods: collaborative learning, interactive sessions, real-life examples.
- Extensive use of virtual labs and online certification platforms.
- Activities like industrial visits and guest sessions for practical exposure.
- Encouragement of self-learning and problem-based learning.

### **3.6 Attainment of Course Outcomes**

After defining CO the next phase is to establish the process of Course Outcome attainment. The discussions were carried out in departmental and OBE meetings for CO, PO and PSO attainment. The course group meeting also helped in deciding subject difficulty levels, target attainment levels for all subjects.



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



The department has established a well-defined CO attainment process after gradual reforms. The process is based on the guidelines given in NBA documentation. The department has developed an MS- Excel based template for CO attainment.

For calculation of attainment, various inputs are required, such as

1. Formation of course groups for taking decisions for subject difficulty level, setting targets etc.
2. Assessment tools used for attainment – Internal and External tools
3. Average marks for setting target marks
4. Decision of weight function for target marks based on subject difficulty level
5. Mapping of COs with internal and external assessment tools.

Assessment tools for theory courses, practical courses and project works are depicted in Table 1.

<b>Theory courses</b>				
<b>Assessment Tool</b>		<b>Assessment frequency</b>	<b>Assessed by</b>	<b>CO mapped</b>
Internal Assessment tool	Class Test	After completion of UNIT 1 and 2	Subject in charge	CO1 ,CO2
	Assignments,Quiz/puzzle/ presentations etc	As per CO assessment planned		CO1 to CO6
External Assessment tool	University Theory Exam	Twice per semester (Insemester , End Semester)	University	CO1 to CO6



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



<b>Practical Courses</b>				
Internal Assessment tool	Internal lab continuous evaluation	Every week	Subject in charge	All COs defined for course
External Assessment tool	University Oral/Practical /Termwork Exam	Once per semester	University	
<b>Mini-project work</b>				
Internal Assessment tool	1st Review	3rd week after the commencement of semester-II	A separate internal project review committee is assigned for each project group for evaluation	CO1 ,CO2
	2nd Review	2 weeks after the first review		CO3, CO4, CO5
	3rd Review	4 weeks after the Second review		All COs defined for course
	Review Cum Participation In Project Competition / Poster Presentation/ Exhibition.	2/3 weeks after the 3rd review	Alumina or Industry expert	All COs defined for course
External Assessment tool	University Exam	Once per semester	SPPU	
<b>Project Based Laboratory</b>				



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



Internal Assessment tool	1st Review	4th week after the commencement of semester-II	Separate Internal Project Review Committee assigned for each project group for evaluation	CO1, CO2
	2nd Review	4 weeks after the first review		CO3, CO4, CO5
	Review Cum Participation In Project Competition / Poster Presentation/ Exhibition	2/3 weeks after the 3rd review	Internal Evaluation	All COs defined for course
External Assessment tool	University Exam	Once per semester	Internal and External examiners appointed by SPPU	All COs defined for course
<b>Major Project Work</b>				
<b>Assessment Tool</b>		<b>Assessment period</b>	<b>Assessed by</b>	<b>CO mapped</b>
Internal Assessment tool	Project stage-I: 1st Review	4 weeks after commencement of semester-I	Separate Project Review Committee assigned for each project group	CO1
	Project stage-I: 2nd Review	4 weeks after the first review		CO2, CO3, CO4
	Project stage II: 1st Review			CO1, CO2



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



		4 weeks after commencement of semester-II		
	Project stage-II: 2nd Review/project competition	4 weeks after Project Stage II: 1st Review	Alumina or Industry expert	All COs defined for the course.
External Assessment tool	Project Viva-Voce	Once per semester	Internal and External examiners appointed by SPPU	

**Setting CO attainment target level for Course:**

The fundamental component of OBE is well-defined COs and its attainment measurement. CO attainment provides a measure of the extent to which the students have achieved learning outcomes of the course. Setting CO attainment targets help faculty in determining the effectiveness of teaching pedagogies and track academic progress.

**Guidelines for determining course difficulty level:**

Courses are classified into three difficulty level groups based on their contents, instructor evaluations, and student performance to set the target. The course material and university scores for the particular course are used to map the difficulty levels. PAQIC approves the confirmation of difficulty levels after they are considered in course group meetings.

The criteria for deciding the difficulty levels of the courses are listed below:

1. Course contents and its complexity
2. Mathematical analysis involved



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Department of Electronics and Telecommunication Engineering



3. Analytical skills required
4. Past results of course
5. Contact hours
6. Assessment Frequency
7. Bloom's Taxonomy levels in assessment
8. Student Feedback
9. Analytical skills required
10. Hands on Skills expected

**CO attainment Target Levels based on difficulty level of course:**

Numeric Level out of 3	Level	Interpretation
1.5	H	High difficulty, realistic target
1.8	M	Medium difficulty, moderate target
2.1	L	Low difficulty, high expectation

**Sample cases of CO attainment target setting based on difficulty level of course**

- **High** (50% of 3= 1.5) for courses with intensive mathematical analysis, abstract theoretical concepts, and complex laboratory work. Example courses include Electronic Circuits, M-III, DSP, VLSI, Digital Communication, EM Theory, Embedded Systems etc
- **Medium** (60% of 3=1.8) for courses that are moderately math driven, with blend of theory and applications. Example courses include Data structure,



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**Department of Electronics and Telecommunication Engineering**



OOP, Digital Circuits, Power Devices, Radiation and Microwave Techniques etc

- **Low** (70%=of 3= 2.1): non-core subjects, Example courses include Project Management, Digital Marketing etc

<b>Year and Semester</b>	<b>Course Number</b>	<b>Course Name</b>	<b>CO Attainment Target</b>
<b>SE SEM-I</b>	C202	Electronic Circuits	<b>H</b>
	C203	Digital Circuits	<b>M</b>
<b>SE SEM-II</b>	C212	Signals & Systems	<b>M</b>
	C219	Data Analytics Lab	<b>L</b>
<b>TE SEM-I</b>	C301	Digital Communication	<b>H</b>
	C302	Electromagnetic Field Theory	<b>H</b>
	C304	Microcontrollers	<b>M</b>
	C305a	Digital Signal Processing	<b>L</b>
<b>TE SEM-II</b>	C312	Cellular Networks	<b>M</b>
	C313	Project Management	<b>L</b>
	C315 a	Digital Image Processing	<b>H</b>
<b>BE SEM-I</b>	C401	Radiation & Microwave Theory	<b>M</b>
	C402	VLSI Design and Technology	<b>H</b>



PVG's College of Engineering, Technology and GKPIOM  
Department of Electronics and Telecommunication Engineering



<b>BE SEM-II</b>	C410	Fiber Optic Communication	<b>H</b>
	C412d	Digital Marketing	<b>L</b>
	C414	Digital Business Management	<b>L</b>

**1. Setting Threshold marks for CO Attainment calculation:**

- i. For each course, the average of the university examination scores of the last three batches is chosen.
- ii. In 2020-21 and 2021-22, however, because of the pandemic and lockdown, university exams were conducted online using multiple-choice questions with no negative marking or proctoring. For these batches, the university scores were very good, so the average marks for threshold marks are also fairly high. The target grades for all courses for the 2022–2023 and 2023–2024 batches have been impacted by this.
- iii. As a result, the average marks are lowered by taking into account the right weights. The threshold is derived from the average scores of students in the same course over the preceding three years, by adding appropriate weights.
  - A. If CO attainment calculated is equal to or greater than CO attainment target set, for next Academic year change CO attainment target by 5/10%
  - B. If CO attainment calculated is less than CO attainment target set, for next Academic year continue with old CO attainment target set.
  - C. If CO attainment calculated is equal to or greater than CO attainment target set=3, for next Academic year change threshold marks 5/10%.



### 3.7 PO-PSO Attainment Process and Tools

Outcome-Based Education (OBE) is a student-centric approach that focuses on achieving clearly defined learning outcomes in terms of knowledge, skills, and attitudes. OBE ensures that the teaching–learning process is aligned with what students are expected to demonstrate at the end of the program. In this framework, Program Outcomes (POs) and Program Specific Outcomes (PSOs) serve as key indicators of the competencies that graduates must attain.

In an OBE framework, the attainment process begins with the formulation of well-defined Course Outcomes (COs) for each course, which are mapped to POs and PSOs based on their relevance and contribution. Student performance in various assessments is then systematically analyzed to determine the level of CO attainment. These CO attainments are further aggregated using predefined mapping relationships to evaluate the attainment of POs and PSOs at the program level.

A key feature of the PO–PSO attainment process is the integration of both direct and indirect assessment methods. Direct assessment evaluates actual student performance in examinations, assignments, laboratories, and projects, while indirect assessment captures stakeholder perceptions through surveys such as course exit feedback, alumni feedback, and employer feedback. The combination of these methods ensures a holistic evaluation of outcome attainment.

The process is improvement-oriented. By comparing the calculated attainment levels with predefined targets, gaps in student learning are identified. This enables us to take informed corrective actions, such as revising teaching strategies, modifying assessment methods, and organizing skill development sessions, etc.

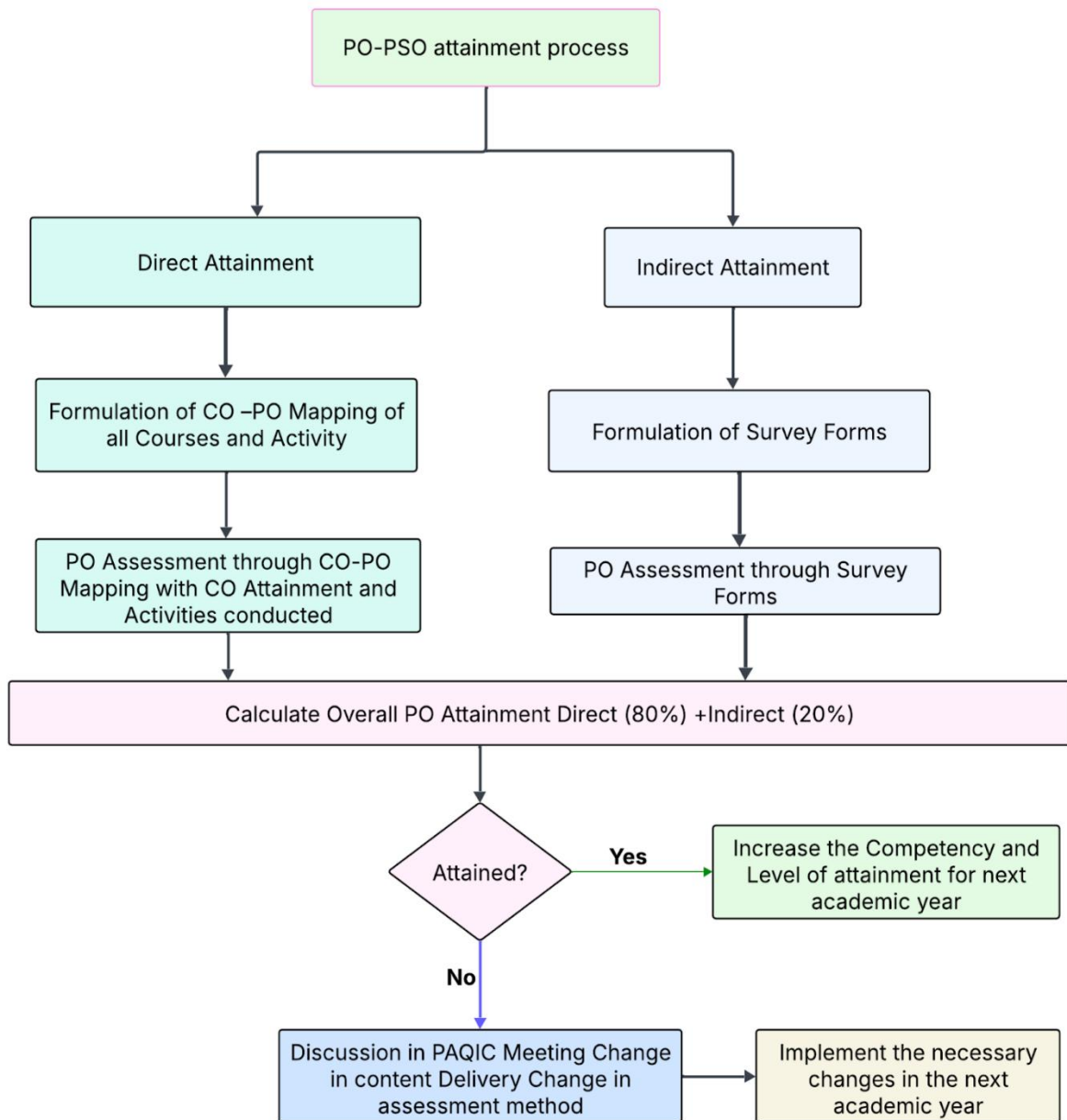


Fig.4: PO-PSO Attainment Process

### Components of PO-PSO Attainment (Direct and Indirect Assessment)

A key characteristic of this attainment process is the incorporation of both Direct and Indirect Assessment methods, with an assigned weightage of 80% to direct assessment and 20% to indirect assessment, ensuring a balanced and comprehensive evaluation of outcome attainment. Direct assessment is given



higher weightage as it is based on actual student performance data. Indirect assessment, though important, is perception-based and hence assigned lower weightage.

**PO/PSO Attainment (Overall) = 0.8x Direct Attainment + 0.2x Indirect Attainment**

### **Direct Assessment: Course Outcome–Based PO–PSO Attainment**

Each Course Outcome is mapped to relevant Program Outcomes (POs) and Program Specific Outcomes (PSOs) using a predefined mapping scale (e.g., 1–Low, 2–Medium, 3–High; 0 for no mapping). Based on student performance in various assessment tools, CO attainment levels are calculated.

The attainment of a particular PO/PSO is then determined by considering the contribution of all COs mapped to it. This is achieved by computing the weighted average of CO attainments, taking into account the strength of mapping. For each course, PO/PSO attainment is calculated, and subsequently, the overall attainment for a batch is obtained by averaging the PO/PSO attainments across all courses mapped to that particular outcome.

Steps for Evaluation of PO–PSO Attainment through Courses:

- Map each Course Outcome (CO) to relevant POs and PSOs using defined correlation levels.
- Calculate CO attainment based on student performance in direct assessment tools as well as indirect assessment tools.
- Multiply CO attainment values with their respective CO–PO/PSO mapping levels.
- Compute the weighted average to obtain PO and PSO attainment for each course.



- Determine overall PO/PSO attainment for the batch by averaging across all courses contributing to the respective PO/PSO.

$$PO \text{ Attainment(Direct)} = \frac{CO - PO \text{ mapping value} * \text{Actual CO attainment value}}{\text{Number of Attainment levels(3)}}$$

$$\text{Final PO attainment for each PO} = \frac{\sum(\text{PO attainment of mapped courses})}{\text{Number of COs.}}$$

### **Indirect Assessment through Surveys and Feedback (Reframed)**

Indirect assessment methods capture the perceptions and opinions of stakeholders regarding the attainment of Program Outcomes (POs) and Program Specific Outcomes (PSOs). These methods encourage stakeholders to reflect on the knowledge, skills, and competencies acquired by students during the program. Such feedback provides valuable qualitative insights that complement direct assessment and supports Outcome-Based Education (OBE) practices.

A total weightage of 20% is assigned to indirect assessment in the overall PO–PSO attainment process. This component is derived from multiple feedback sources, each contributing with a defined share as outlined below:

- Course Exit Feedback – 10%
- Program Exit Feedback – 20%
- Alumni Survey – 10%
- Student Activity Feedback (Co-curricular and Extra-curricular Activities) – 15%
- Employer Feedback – 20%
- Internship / Project Evaluation – 10%
- Parent Feedback – 5%
- Examiner Feedback – 10%



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



Each of these feedback mechanisms is designed to assess specific aspects of student development, such as academic learning, professional readiness, practical exposure, and overall program effectiveness. The responses are collected using structured questionnaires, analyzed, and mapped to relevant POs and PSOs.

The consolidated indirect assessment score is then computed by applying the respective weightages, ensuring a balanced and comprehensive evaluation of outcome attainment from multiple stakeholder perspectives.

<b>S. No.</b>	<b>Indirect Assessment Method</b>	<b>Method Description</b>
1	Alumni Feedback	Collects information from alumni regarding program effectiveness, relevance of curriculum, and overall satisfaction with the institution.
2	Program/Course Exit Feedback	Obtains feedback from final-year students on course delivery, program outcomes, teaching–learning process, and institutional facilities.
3	Parent Feedback	Gathers parents' perspectives on the quality of education, student development, and overall satisfaction with the program and institution.
4	Employer / Internship / Project Feedback	Collects inputs from employers, internship supervisors, and project evaluators regarding students' technical skills, professional competencies, and workplace readiness.
5	Student Activity Feedback	Captures feedback on co-curricular and extra-curricular activities, focusing on the development of skills aligned with PO–PSO such as teamwork, leadership, and communication.



### Details of PO Assessment Tools:

Assessment Type	Tools	Documentation	Frequency of Assessment
<b>Direct Assessment (Continuous Internal Evaluation)</b>	Internal Assessment (Class test)	assessment papers, answers sheets	once in every semester
	Assignments / Tutorials/ quiz, puzzles etc)	Assignment Sheets, Answer Keys	3-6 times per semester
	Laboratory assessment	Lab Manuals, Observation Book, Viva Sheets	Every week in a semester
	Projects/PBL/Miniprojects	Rubric based evaluations	2-4 times in semester
<b>Direct Assessment (External Evaluation)</b>	University Theory Examinations	University Result list, Question-CO Mapping	Odd Sem: Feb-Mar Even Sem: July-Aug
	University Practical /Oral/term work Examinations	University Practical /oral/Term work Marks List	
<b>Indirect Assessment</b>	Course End Survey	Google Forms / Excel Feedback Sheets	End of the semester for each course
	Program exit feedback	Google Forms / Excel Feedback Sheets	Conducted every year for final semester students
	Examiner feedback	Online /offline forms with excel sheet	Once in semester
	Employer Feedback	Google Forms / Excel Feedback Sheets	Once in year



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**Department of Electronics and Telecommunication Engineering**



	Activity Feedback / Assessment	Depending on the activity	As per activity schedule (includes industrial visit/SDP/workshops , etc.)
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**Quality and relevance of assessment processes/tools used**

Sr. No.	Parameter	Description
1	<b>Alignment with COs</b>	Assessment tools are mapped to Course Outcomes to ensure proper measurement of each outcome.
2	<b>Bloom's Taxonomy Coverage</b>	Questions are designed to address various higher cognitive levels such as application, analysis, and Evaluation.
3	<b>Transparency and Mapping</b>	CO mapping, BT level mapping shown in question papers.
4	<b>Use of Multiple Assessment Methods</b>	Multiple tools such as class tests, assignments, MCQs, In-sem, End-sem examinations are used for comprehensive evaluation of knowledge and skills.
5	<b>Inclusion of Indirect Assessment</b>	Course exit surveys are used to capture student perception and validate direct assessment results.



**PVG's College of Engineering, Technology and GKPIOM**  
**Department of Electronics and Telecommunication Engineering**



<b>6</b>	<b>Weightage Allocation between Internal and External Assessment</b>	80% weightage is assigned to Direct assessment and 20% for indirect assessment
<b>7</b>	<b>Practical and Industry Relevance</b>	focus on practical, industry-relevant problems e.g., case studies, presentations, etc
<b>8.</b>	<b>Peer Review of Assessment Tools</b>	Peer review is conducted for assessment tools to ensure quality, relevance, and alignment with COs.
<b>9</b>	<b>Consistency and Fairness in Evaluation</b>	Use of defined rubrics for lab work, presentations, and mini-projects
<b>10</b>	<b>Continuous Improvement</b>	Actions taken based on attainment results. eg remedial sessions

**Criteria for Overall PO Attainment Levels**

For evaluating the overall attainment of Program Outcomes (POs), attainment levels are defined based on the percentage of students achieving the expected outcome level, considering both direct and indirect assessment components. The criteria are as follows:

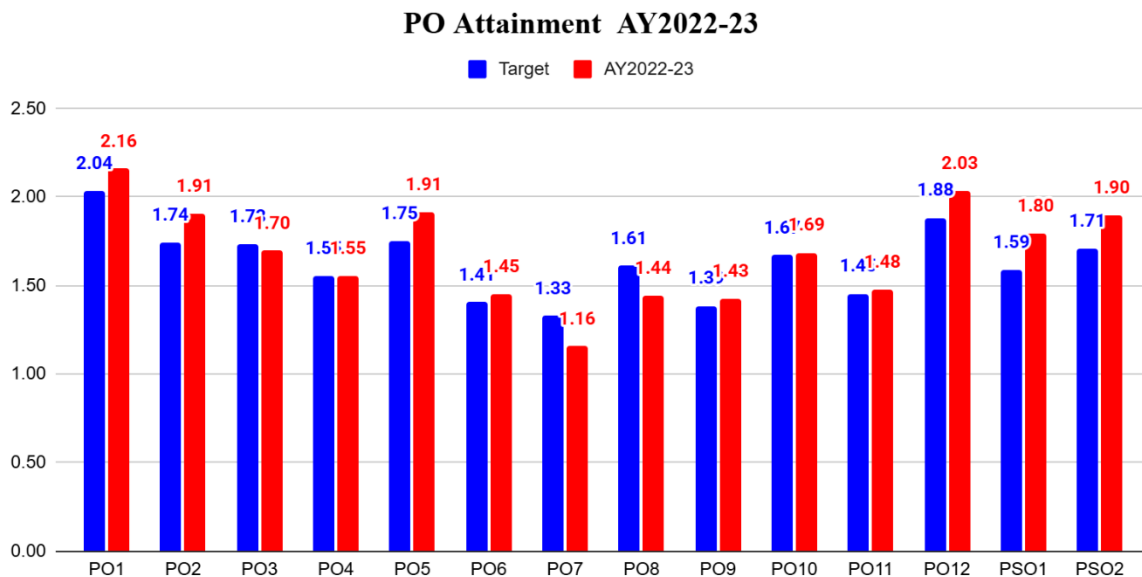
<b>Attainment Level</b>	<b>Criteria</b>
<b>Level 3 (High)</b>	$\geq 80\%$ of students achieve the expected PO level
<b>Level 2 (Medium)</b>	$\geq 70\%$ and $< 80\%$ of students achieve the expected PO level



<b>Level 1 (Low)</b>	$\geq 60\%$ and $< 70\%$ of students achieve the expected PO level
<b>Below Level 1</b>	$< 60\%$ of students achieve the expected PO level ( <i>Corrective action required</i> )

A similar calculation will be done for PSO attainment

Sample PO and PSO attainment graphs are presented below.



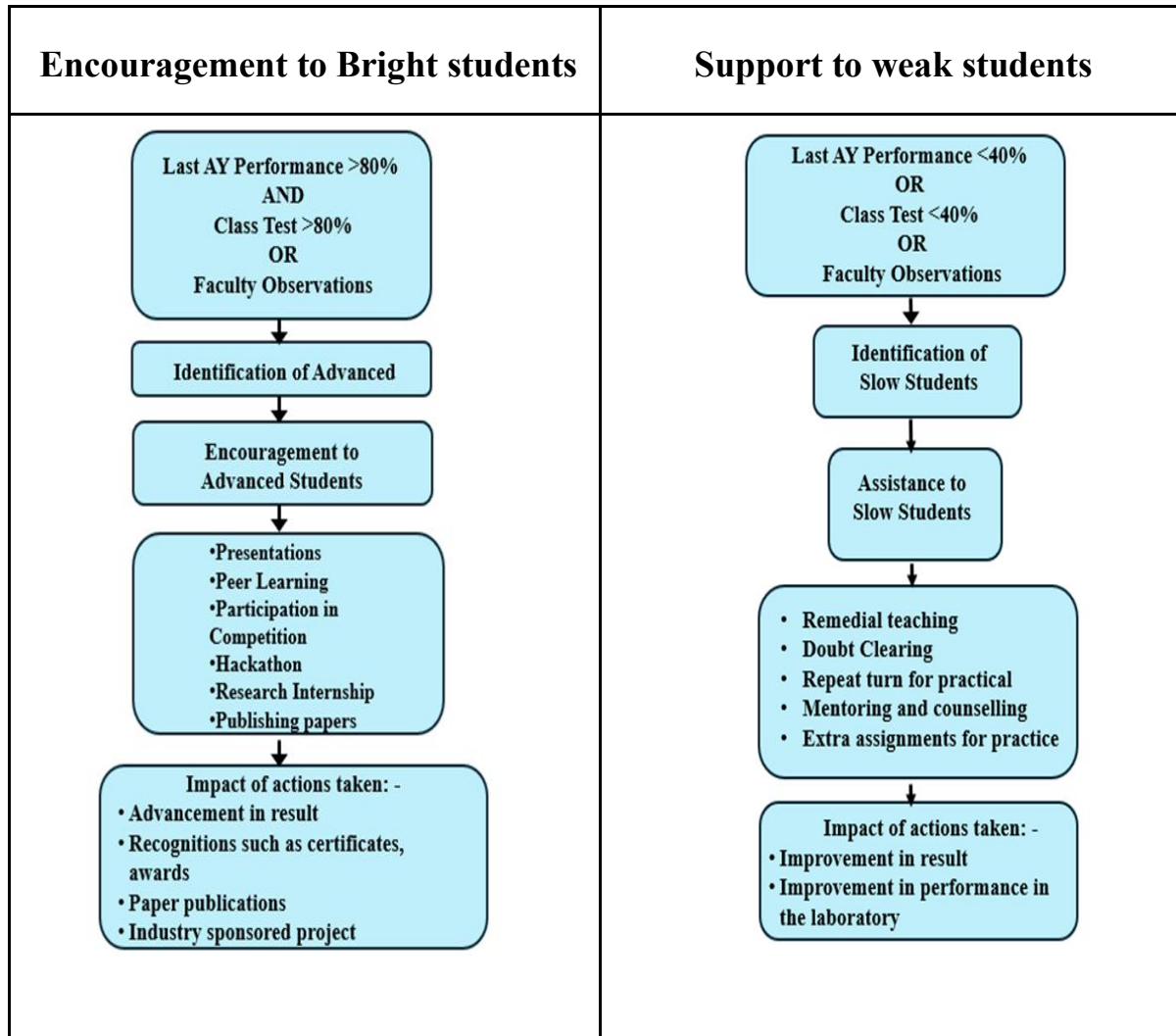
**Fig.5: PO Attainment AY 2022-23**

### **Academic Support and Student Enrichment**

The Department of E&TC has established a structured academic support system to ensure the overall development of students with diverse learning needs. Special emphasis is placed on providing additional guidance and enrichment opportunities for bright students to enhance their academic excellence, innovation, and competitive exam readiness. At the same time, focused support mechanisms such as remedial classes, mentoring, and personalized academic assistance are provided



to help weak students improve their understanding of fundamental concepts and achieve expected learning outcomes. This balanced approach promotes inclusive learning and ensures continuous academic progression of all students.



**Fig.5 : Encouragement to Bright students & Support to weak students**



#### 4. Summary

- Implementation of Outcome Based Education (OBE) in the Dept. of E&TC has enabled students to excel in core industries, reflected through increased placements in core sectors.
- OBE in the Dept. of E&TC has ensured that students acquire requisite skills for industry readiness and higher education, promoting student-centric learning.
- With the adoption of OBE, the Dept. of E&TC is progressively shifting from conventional teaching to active and experiential learning methodologies.
- Faculty in the Dept. of E&TC are encouraged to adopt innovative pedagogical approaches to facilitate active learning, especially in large classroom settings.
- For effective implementation, institutional support in terms of resources, training, and infrastructure has been and continues to be provided to the Dept. of E&TC.
- Effective OBE implementation in the Dept. of E&TC has created a win-win situation for all stakeholders, including students, faculty, industry, and the institution.



## 5. References

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