



B. P. PODDAR INSTITUTE OF MANAGEMENT & TECHNOLOGY

Approved by AICTE, New Delhi & Affiliated to MAKAUT, W.B



OUTCOME BASED EDUCATION MANUAL



OUTCOMES



TEACHING AND
LEARNING PROCESS



ASSESSMENT



CONTINUOUS
IMPROVEMENT



About the Institute

Established in 1999, B. P. Poddar Institute of Management & Technology (BPPIMT) stands as a tribute to Late B. P. Poddar, a visionary philanthropist, educationist, and the founding father of the B. P. Poddar Group. The Institute was founded with the mission to uphold his legacy of promoting excellence in education and social development.

Supported by the B. P. Poddar Foundation for Education, a trust devoted to enhancing the quality of technical education in India, BPPIMT is affiliated to the Maulana Abul Kalam Azad University of Technology (MAKAUT), West Bengal, and approved by the All India Council for Technical Education (AICTE).

The Institute strives to elevate society through transformative education, guided by a unique learning culture that emphasizes collaboration, communication, and innovation. Its dedicated and experienced faculty, drawn from diverse academic and professional backgrounds, nurture students to become competent professionals and responsible citizens.

Vision of the Institute

To emerge as a progressive and premier Institute for Engineering and Technology education with ethical values for creative engineering solutions commensurate with global changes.

Mission of the Institute

- Offer quality education through modern accessible, comprehensive and research oriented teaching-learning process.
- Create opportunities for students and faculty members in acquiring knowledge through research and development.
- Providing effective interface with industry by strengthening Industry-Institute interaction and developing entrepreneurial skills.
- Meet ever-changing needs for the nation through rational evolution towards sustainable and environment friendly technologies.

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CHAPTER: 1

OVERVIEW OF OUTCOME-BASED EDUCATION

Outcome-Based Education (OBE) is an educational approach that focuses on the outcomes—knowledge, skills, abilities, values, and attitudes—that students should demonstrate upon completing a program. It emphasizes what learners can do rather than what is taught. OBE ensures competency-based learning and continuous quality improvement by aligning curriculum design, teaching-learning processes, and assessment methods with clearly defined outcomes. It prepares graduates with both professional expertise and holistic attributes to meet global and societal needs.

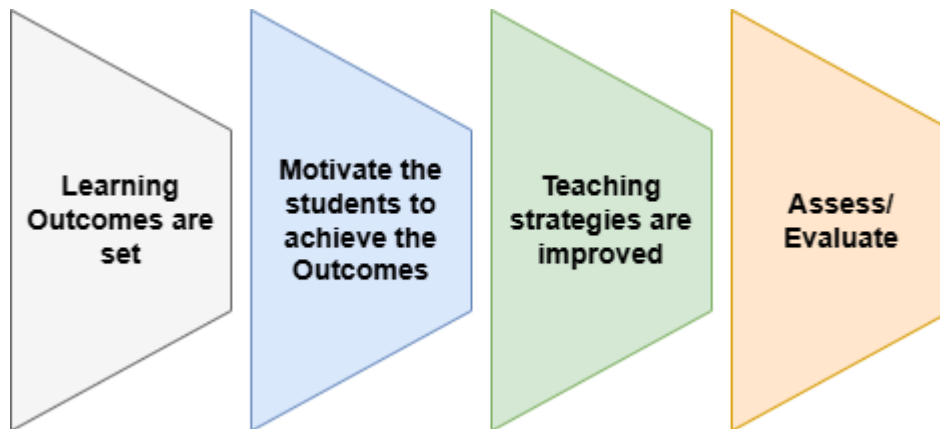


Fig. 1.1 The OBE approach

1.1 Traditional Education Vs. Outcome-Based Education (OBE)

- Traditional education mainly focuses on covering content and delivering lectures, which leads the curriculum to be content-centered and static, whereas the OBE provides a roadmap of learning outcomes and skills that have to be achieved by the students. This approach makes the curriculum dynamic and outcome-centered.
- The traditional education system is teacher-centered instruction with passive learning, and the teacher acts as the primary source of information. On the contrary, the OBE system is student-centered instruction with active learning where the teacher facilitates and guides learning.

- The learning environment is formal, structured, and rigid in the traditional system without any stakeholder participation in the decision-making process, and the OBE system provides a flexible, adaptive, and collaborative learning environment.
- Traditional systems prioritize mainly academic education alone. It results in the development of skills being neglected, and there is a lack of effective communication and interpersonal dynamics, which reduces the efficiency of the students' practical readiness for their professional life. The OBE aims at equipping learners with the knowledge, competence, and orientations needed for success after they leave the institution, thereby making them a competent professional.
- The presence of an assessment-feedback-improvement loop in the OBE system leads to continuous improvement in the overall performance of the students. This type of holistic approach is not followed in the traditional system.

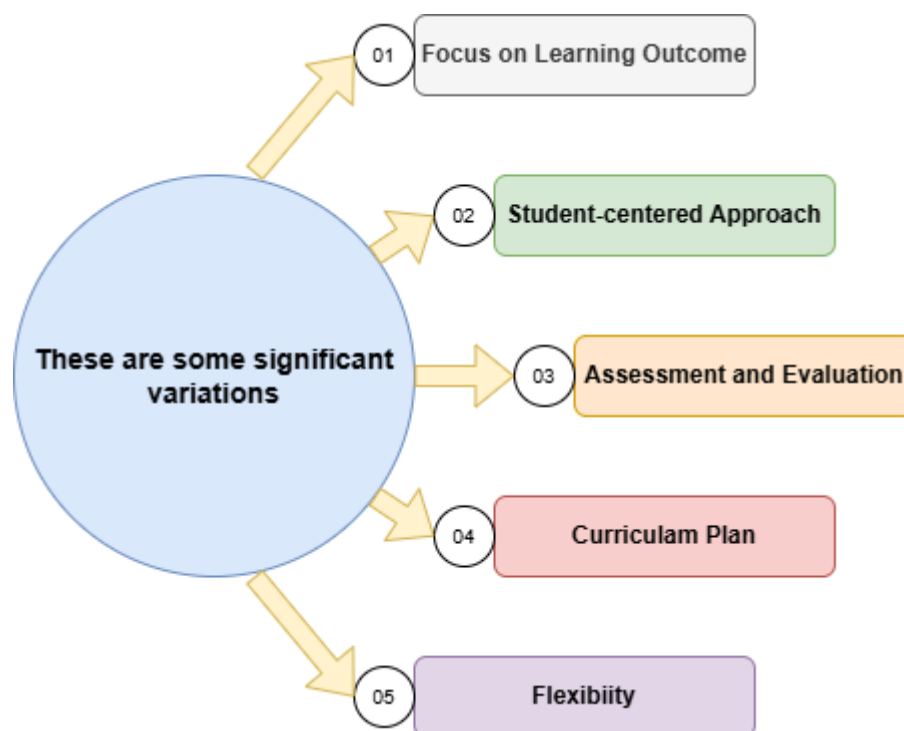


Fig. 1.2: Significance of the OBE system

1.2 The OBE Framework

The shift from the traditional to the OBE system is predominately focused in higher education institutions, as it is used as a framework by international and local academic accreditation

bodies. The P-D-C-A methodology (Plan-Do-Check-Act) has been applied for the optimum effectiveness and efficiency of the OBE.

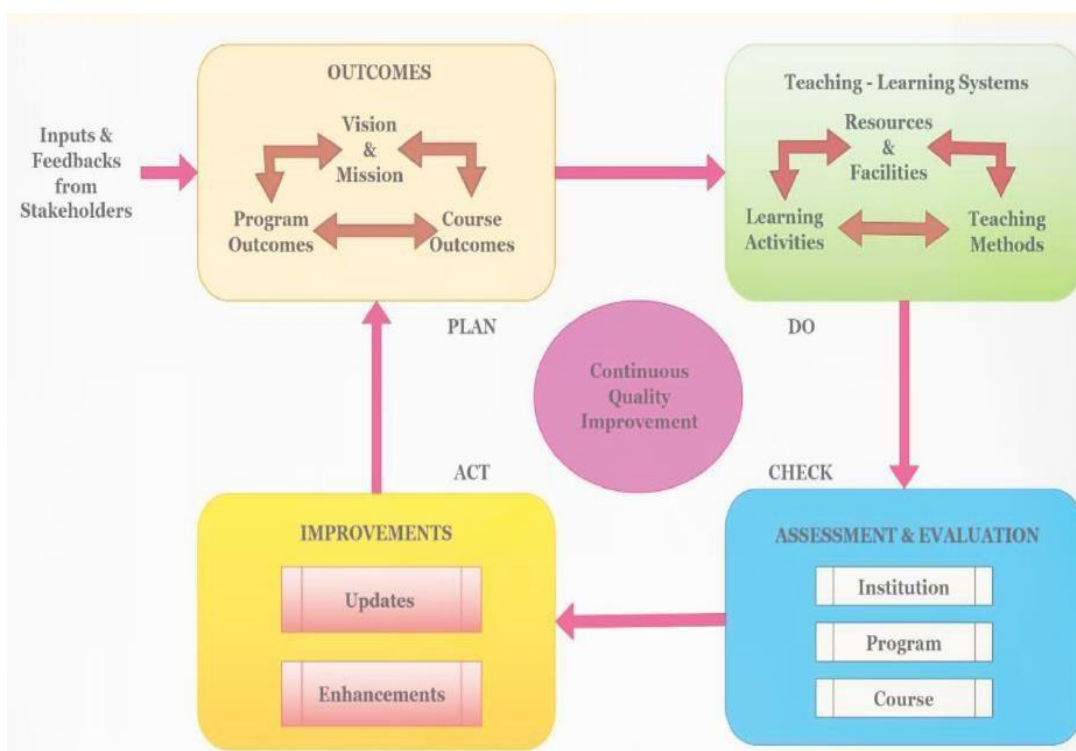


Fig. 1.3: The OBE framework

The implementation of the OBE promotes the practice of constructive alignment between outcomes, learning methods, and assessment tools. The stakeholders (Students, Alumni, Parents, and Employers) play a major role in the decision-making process of the OBE system. Each participant in the system interacts with others to enhance the quality of the education system, which, in turn, provides an efficient student community to the society.

1.3 Important Aspects of Outcome-Based Curriculum

Course: A course is defined as a theoretical, practical, or theory-cum-practical subject studied in a semester. Example: Analog Communication.

Program: A program is an integrated arrangement of courses, co-curricular, and extra-curricular activities designed to achieve specific goals, ultimately leading to the award of a degree. Example: B. Tech. in Electronics and Communication Engineering.

Degree: An academic degree is a qualification awarded to a student upon successful completion of a course of study in higher education, usually at a college or university.

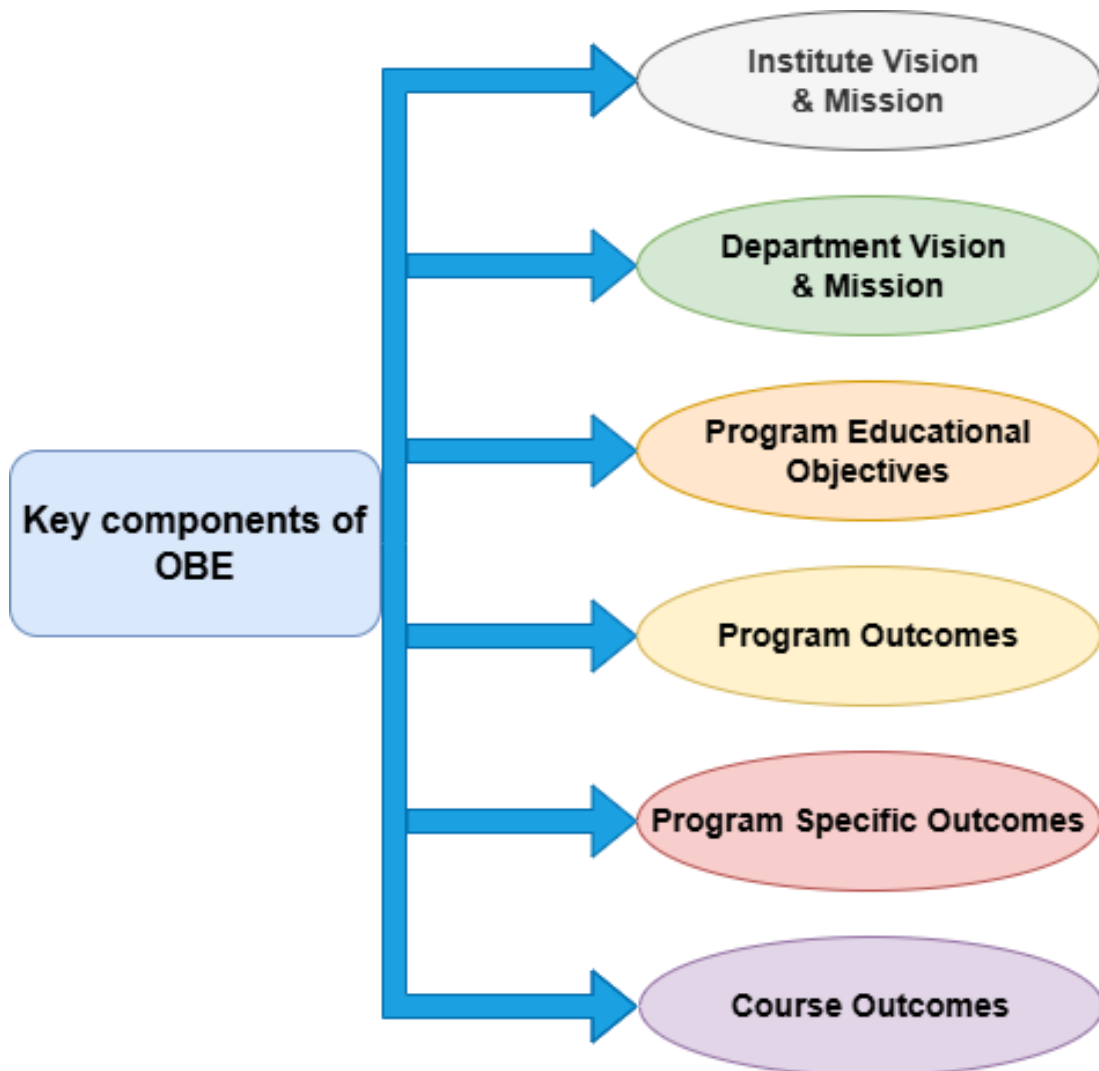
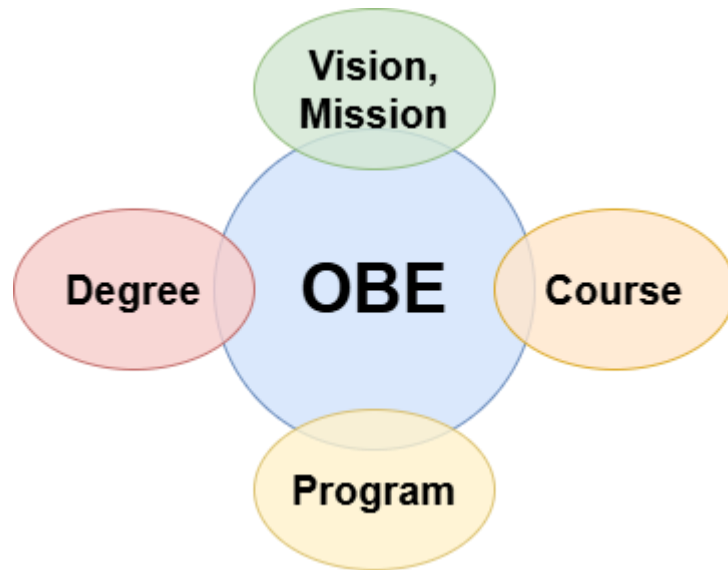


Fig. 1.4: Key components of the OBE

1.4 Outcome-Based Teaching-Learning System

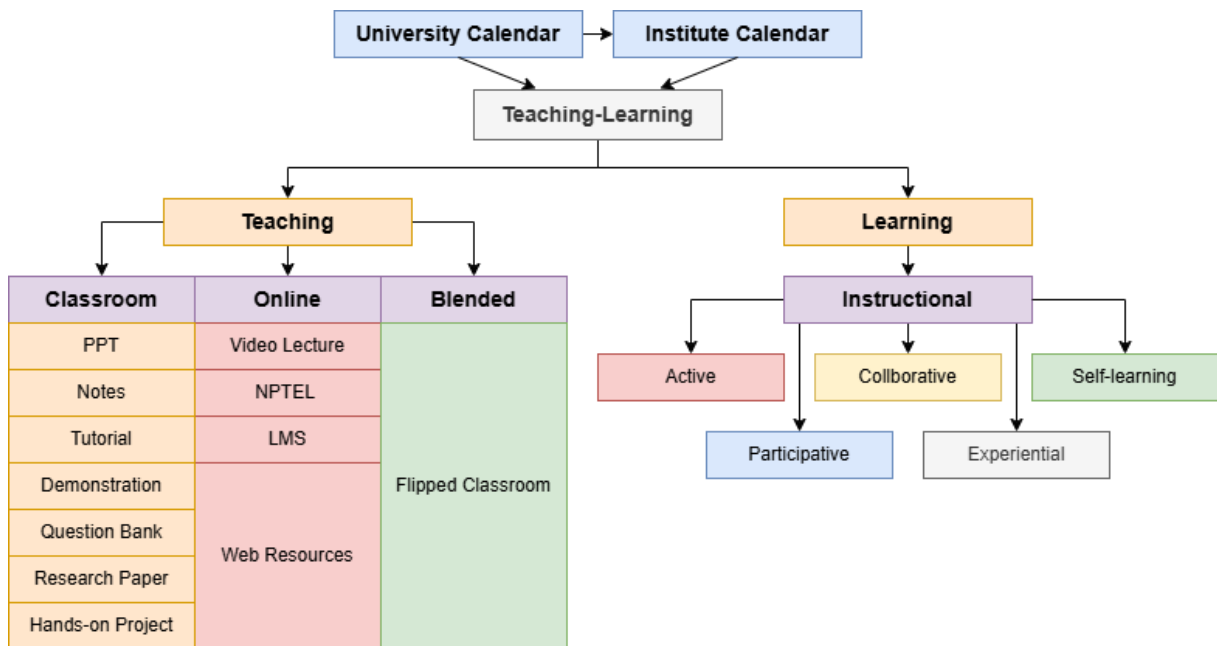


Fig. 1.5: Outcome-based teaching-learning system

1.5 Outcome-Based Assessment Process

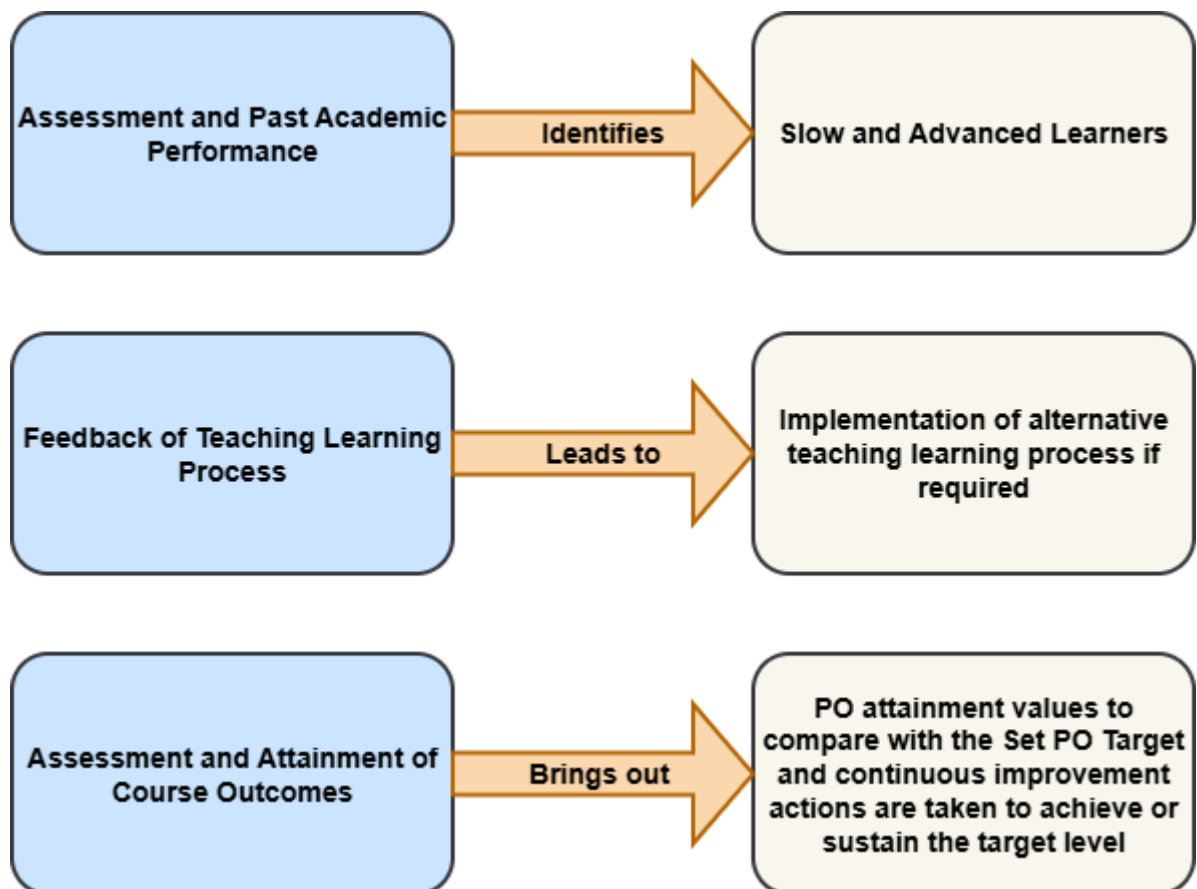


Fig. 1.6: Outcome-based assessment process

CHAPTER: 2

VISION AND MISSION

- The Vision statement is the core statement that defines the high-level goals of where one wants the Institute/Department to be and inspires all the stakeholders.
- A Mission statement, or simply a Mission, is a public declaration that educational organizations use to describe the purpose of establishing the organization and major organizational commitments—i.e., what they do and why they do it.
- In general, a Vision is a futuristic statement that the Institute/Department would like to achieve over a long period of time, and a Mission is how it proposes to move toward the stated vision.

2.1 Vision of the Institute

To emerge as a progressive and premier Institute for Engineering and Technology education with ethical values for creative engineering solutions commensurate with global changes.

2.2 Mission of the Institute

- Offer quality education through modern accessible, comprehensive and research oriented teaching-learning process.
- Create opportunities for students and faculty members in acquiring knowledge through research and development.
- Providing effective interface with industry by strengthening Industry-Institute interaction and developing entrepreneurial skills.
- Meet ever-changing needs for the nation through rational evolution towards sustainable and environment friendly technologies.

2.3 Departmental Vision and Mission

- Alignment of departmental vision and mission with those of the Institute is essential.

- A comprehensive mission statement may encompass program history, student demographics, academic framework, faculty engagement, community integration, and research contributions.

2.3.1 Vision and Mission of Various Departments

Department of Computer Science and Engineering	
Vision	Developing competent professionals in Computer Science and Engineering, who can adapt to constantly evolving technologies for addressing industrial and social needs through continuous learning.
Mission	<ul style="list-style-type: none"> ➤ Enrich students with sound knowledge in fundamentals and cutting edge technologies of Computer Science and Engineering to excel globally in challenging roles in industries and academics. ➤ Emphasize quality teaching, learning and research to encourage creative thoughts through application of professional knowledge and skill. ➤ Inspire leadership and entrepreneurship skills in evolving areas of Computer Science and Engineering with social and environmental awareness. ➤ Instill moral and ethical values to attain the highest level of accomplishment and personal growth.
Department of Electronics & Communication Engineering	
Vision	To emerge as a premier department for studies in Electronics and Communication Engineering.
Mission	<ul style="list-style-type: none"> ➤ Imparting innovative educational program through laboratory and project-based teaching-learning process for meeting the growing challenges of industry and research. ➤ Providing an inspiring and conducive learning environment to prepare skilled and competent engineers and entrepreneurs for sustainable development of the society. ➤ Creating a knowledge centre of advance technologies committed to societal growth using environment-friendly technologies.

Department of Information Technology	
Vision	To become a centre for advanced learning through research and development of innovative applications of information in industry and society.
Mission	<ul style="list-style-type: none"> ➤ Create a learner-centric environment that motivates adaptation of emerging technologies. ➤ Incubate students as industry-ready professionals, proficient researchers, and entrepreneurs. ➤ Promote social, environmental, and technological responsiveness among faculty and students.
Department of Electrical Engineering	
Vision	To emerge as a knowledge hub for higher learning and research in Electrical Engineering.
Mission	<ul style="list-style-type: none"> ➤ To create a conducive quality teaching –learning environment to make the student assimilate thorough knowledge in Electrical Engineering. ➤ To create a platform for building confidence among faculties and students by exchanging their views through research, interactive sessions with industry and by the use of modern tools. ➤ To adopt a goal driven teaching learning method to foster innovative entrepreneurship skills in student community with expertise in different engineering domains. ➤ To enable students to become authorities in the field of Electrical Engineering along with sustainable and environment friendly technologies to meet the societal needs.
Department of Computer Application	
Vision	To promote professionals with knowledge and understanding, by providing with latest developments in Computer Applications so that they contribute not only in the progress of software and its applications but even encompass the entire domain of computer technology.
Mission	<ul style="list-style-type: none"> ➤ To impart value-based, quality education that provides design, development as software applications in their entirety. ➤ To promote research-based activities through analysis and interpretation of data and synthesis of the information for utilization in resolving practical problems relating to computer applications. ➤ To make students eligible professionals for the requirement of the industry

Table 2.1: Vision and Mission of various departments

CHAPTER: 3

PROGRAM EDUCATIONAL OBJECTIVES, PROGRAM OUTCOMES, AND PROGRAM SPECIFIC OUTCOMES

3.1 Program Educational Objectives (PEOs)

- PEOs are the broad statements that describe the career and professional accomplishments for which the program is preparing its graduates to accomplish after 3 to 5 years of graduation.
- PEOs should be measurable, appropriate, realistic, and achievable.
- PEOs address the needs of the stakeholders.
- PEOs should be consistent with the mission statements of the Department.

3.1.1 Guidelines for the PEOs

- PEOs should be consistent with the mission of the Institution.
- The number of PEOs should be manageable.
- PEOs should be achievable by the program.
- PEOs should be specific to the program and not too broad.

3.1.2 Program Educational Objectives of Various Programs

B. Tech. in Computer Science and Engineering	
PEOs	<ul style="list-style-type: none">➤ Graduates of Computer Science and Engineering program will have good knowledge in the core concepts of systems, software and tools for analysing problems and designing solutions addressing the dynamic requirements of the industry and society, while employed in industries or work as entrepreneurs.➤ Graduates of Computer Science and Engineering program will opt for higher education and research in emerging fields of Computer Science & Engineering towards building a sustainable world.➤ Graduates of Computer Science and Engineering will have leadership skills, communication skills, ethical and moral values, team spirit and professionalism.

B. Tech. in Electronics & Communication Engineering	
PEOs	<ul style="list-style-type: none"> ➤ Graduates of Electronics and Communication Engineering will be able to use latest tools and techniques to analyze, design and develop novel systems and products to solve real life problems. ➤ Graduates of Electronics and Communication Engineering will have strong domain knowledge, skills and attitude toward employment in core and allied industries, higher studies and research or will become successful entrepreneurs. ➤ Graduates of Electronics and Communication will exhibit ethical values, professionalism, leadership, communication and management skills, team work and multi-disciplinary approach to adapt current trends in technology through life-long learning.
B. Tech. in Information Technology	
PEOs	<ul style="list-style-type: none"> ➤ Graduates will have strong knowledge of IT fundamentals and emerging technologies. ➤ Graduates will establish successful careers, pursue higher studies, or become entrepreneurs. ➤ Graduates will communicate effectively, demonstrate leadership, and uphold ethical and sustainable values.
B. Tech. in Electrical Engineering	
PEOs	<ul style="list-style-type: none"> ➤ Acquire adequate physical, analytical and technical knowledge of Electrical Engineering and allied fields to curate solutions which effectively address the challenges posed by dynamic work environments. ➤ Inculcate self-assurance, collaborative spirit, critical thinking and acumen for innovation towards gaining a competitive edge in research and development as well as in entrepreneurial ventures. ➤ Imbibe professional ethics and the attitude to bank on sustainable and eco-friendly practices only, for the wellbeing of society at large.

M. Tech. in Data Science	
PEOs	<ul style="list-style-type: none"> ➤ Graduates will acquire strong theoretical foundations and advanced knowledge in computing and data science, and engage in lifelong learning to adapt to evolving technologies and excel in challenging professional roles in industry and academia. ➤ Graduates will pursue higher studies, research, or innovation in emerging data science and artificial intelligence domains to support sustainable technological advancement. ➤ Graduates will demonstrate leadership, ethical conduct, effective communication, and teamwork in multidisciplinary and socially responsible professional roles.
M. Tech. in Internet of Things	
PEOs	<ul style="list-style-type: none"> ➤ Our graduates will be able to apply advanced concepts of IoT, embedded systems, networking, cloud and edge computing, and data analytics to develop efficient and reliable solutions for complex engineering problems. ➤ Our graduates will build successful professional careers in industry, R&D organizations, academia, or entrepreneurial ventures by demonstrating technical competence, innovation, and problem-solving skills in IoT-related domains. ➤ Our graduates will exhibit ethical conduct, teamwork, effective communication, and a commitment to lifelong learning to adapt to rapid technological advancements and societal requirements in IoT and cyber-physical systems.
Master of Computer Applications	
PEOs	<ul style="list-style-type: none"> ➤ Technical Expertise: Develop the ability to plan, analyze, design, code, implement, test and maintain the software product for real time systems that are technically sound, economically feasible and socially acceptable. ➤ Successful Career: Exhibit professionalism, ethical attitude with updated technologies in Computer Application based career and capability to set up their own enterprise in various sectors of Computer Applications. ➤ Soft Skills: Develop communication skills, team work and leadership quality in their professional multidisciplinary projects and adapt to current trends by engaging in lifelong learning.

Table 3.1: PEOs of various programs

3.2 Program Outcomes (POs)

POs are the statements that define the graduate attributes (Knowledge, Skills and Attitudes) the graduate of a formal engineering program should have. It is defined by NBA.

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

PO2. Problem analysis: Identify, formulate, review research literature, and analyze 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 the 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.

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.

3.3 Program Specific Outcomes (PSOs)

Each program is required to meet its own distinct set of criteria termed as PSOs. These outcomes are framed to address the specific demands of engineering practice within the relevant sub-discipline, ensuring alignment with industry standards and professional expectations.

3.3.1 PSOs of Various Programs

B. Tech. in Computer Science and Engineering	
PSOs	<ul style="list-style-type: none"> ➤ Students will have proficiency in emerging domains like artificial intelligence, data science and distributed computing to develop solutions through innovative projects and research. ➤ Students will have capabilities to work in synergized teams to cater to the dynamic needs of the industry and society.
B. Tech. in Electronics & Communication Engineering	
PSOs	<ul style="list-style-type: none"> ➤ Students will acquire knowledge in Advance Communication Engineering, Signal and Image Processing, Embedded and VLSI System Design. ➤ Students will qualify in various competitive examinations for successful employment, higher studies and research.
B. Tech. in Information Technology	
PSOs	<ul style="list-style-type: none"> ➤ Apply principles of computing and data analytics to develop innovative IT solutions. ➤ Employ modern tools and technologies to design, implement, and manage real-world systems.

B. Tech. in Electrical Engineering	
PSOs	<ul style="list-style-type: none"> ➤ The students will enhance their knowledge and acquire skills on Power System, Measurement and Control, Signal Processing Techniques and Automation to contribute in the field of Electrical Engineering and evolving domains like Renewable Energy Systems, Intelligent Systems, Health care and e-mobility sectors and emerge as successful entrepreneurs as well. ➤ The students shall apply their knowledge to pursue successful careers with Academia and R & D Laboratories across the globe, endorsing clean and eco-friendly technologies.
M. Tech. in Data Science	
PSOs	<ul style="list-style-type: none"> ➤ Design, implement, and evaluate advanced analytics and machine learning solutions using modern tools for large-scale and heterogeneous data. ➤ Collaborate effectively in interdisciplinary teams, applying ethical practices and domain knowledge to address industry and societal challenges.
M. Tech. in Internet of Things	
PSOs	<ul style="list-style-type: none"> ➤ The M.Tech in IoT graduates will be able to design and implement end-to-end IoT systems by integrating sensors, embedded platforms, communication protocols, cloud/edge services, and data analytics for real-world applications. ➤ The M.Tech in IoT graduates will be able to identify and address issues related to IoT security, privacy, interoperability, and scalability using appropriate tools, standards, and engineering practices.
Master of Computer Applications	
PSOs	<ul style="list-style-type: none"> ➤ Software System Design and Development: The ability to apply software development life cycle principles to design and develop the application software that meets the automation needs of society and industry. ➤ Computing and Research ability: The ability to employ modern computer languages, environments and platforms in creating innovative career paths in SMAC (Social, Mobile, Analytics and Cloud) technologies. ➤ Professionalism and Ethics: Efficient team leaders, effective communicators and capable of working in multi-disciplinary environment following ethical values.

Table 3.2: PSOs of various programs

3.4 Course Outcomes (COs)

- Course outcomes are specific, measurable statements that describe what a student will know or be able to do by the end of a course, including knowledge, skills, and attitudes.
- They are used to guide curriculum design, teaching methods, and student assessment, ensuring that each course contributes to the overall learning goals of a program.
- These outcomes are typically made clear to students at the beginning of the course and should be specific, measurable, achievable, relevant, and time-bound.

CHAPTER: 4

PROCESS OF DEFINING AND REFINING THE VISION AND MISSION OF THE DEPARTMENT

4.1 Process of Defining the Vision and Mission of the Department

The Vision and Mission of the Department are derived from the Vision and Mission of the Institute and the Program Outcomes (POs). The Department establishes its Vision and Mission through consultation process involving the internal stakeholders (management, faculties, and students) and external stakeholders (alumni, employers, parents, industry persons, and professional society members). For creating the Vision and Mission of the Department, the following steps are followed:

Step 1: The Vision and Mission of the Institute and POs are taken as the basis.

Step 2: Suggestions and feedbacks are collected from the internal and external stakeholders of the department.

Step 3: The accepted views are analyzed and the Vision and Mission of the Department are formulated.

Step 4: The Vision and Mission of the Department are reviewed by the Program Assessment Committee (PAC). The suggestions given by the PAC are incorporated (for any changes) and those statements are forwarded to the Department Advisory Committee (DAC).

Step 5: If the DAC validates the Department's Vision and Mission statements, they are forwarded to the Board of Governors (BOG) for the final approval, else they return back to Step 4.

Step 6: If they are approved, they are proceeded further to Step 7, else they return back to Step 4 to incorporate modifications.

Step 7: The Vision and Mission statements of the Department are published and disseminated.

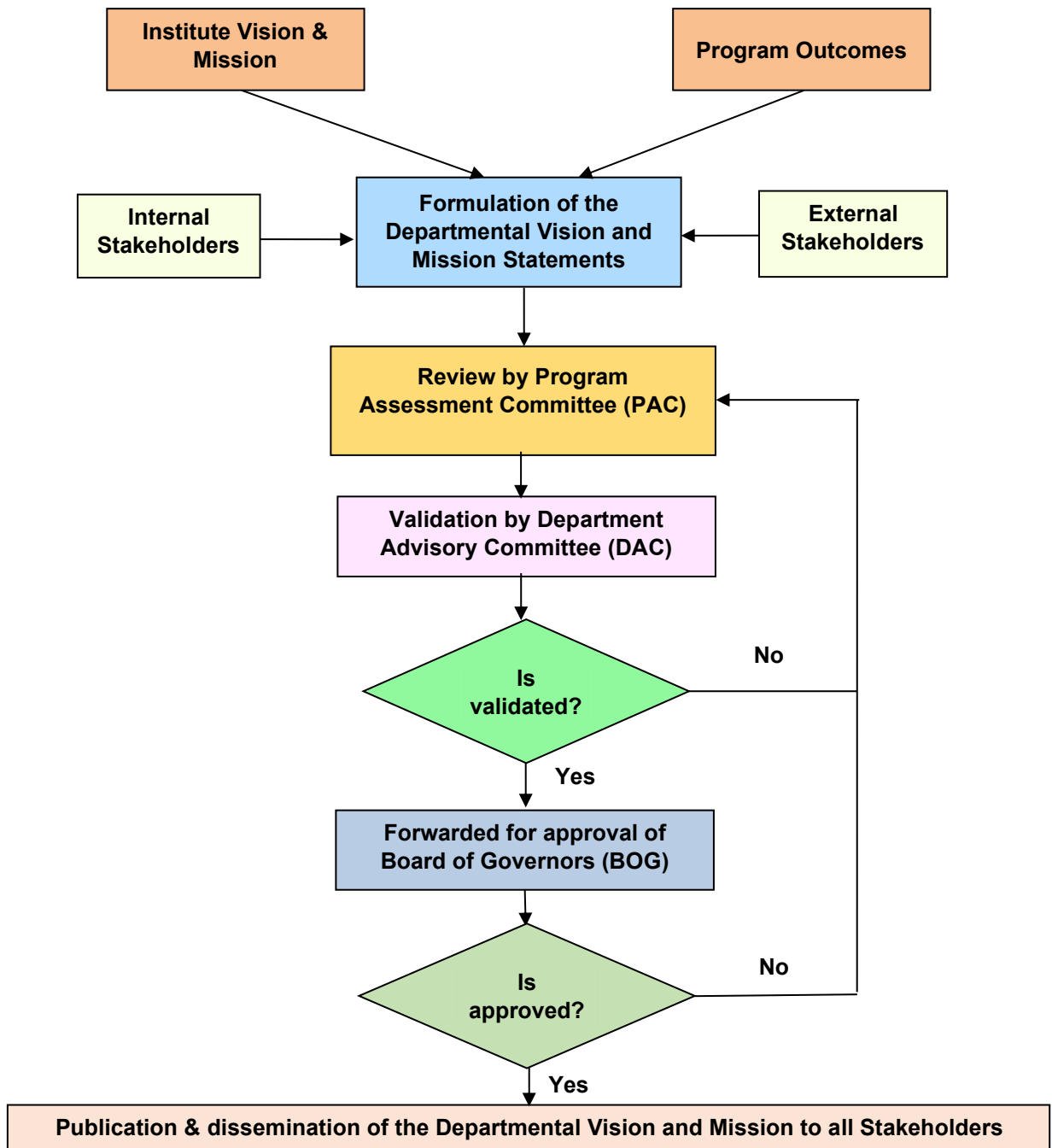


Fig. 4.1: Process of defining the Vision and Mission of the department

4.2 Process of Refining the Vision and Mission of the Department

For any modification in the Vision and Mission Statements of the Department, the following steps are involved:

Step 1: The Vision and Mission of the Institute, the existing Vision and Mission of the Department and POs are taken as the basis.

Step 2: Suggestions and feedbacks are collected from the internal and external stakeholders of the department.

Step 3: The accepted views are analyzed.

Step 4: If no revision is required, the Vision and Mission of the Department remain the same and are proceeded to Step 7. If the majority are in favor of any modification, new drafts are prepared by the Program Assessment Committee (PAC) and are forwarded to the Department Advisory Committee (DAC).

Step 5: If the DAC validates the Department's new Vision and Mission statements, they are forwarded to the Board of Governors (BOG) for the final approval, else they return back to Step 4.

Step 6: If they are approved, they are proceeded further to Step 7, else they return back to Step 4 to incorporate modifications.

Step 7: The Vision and Mission statements of the Department are published and disseminated.

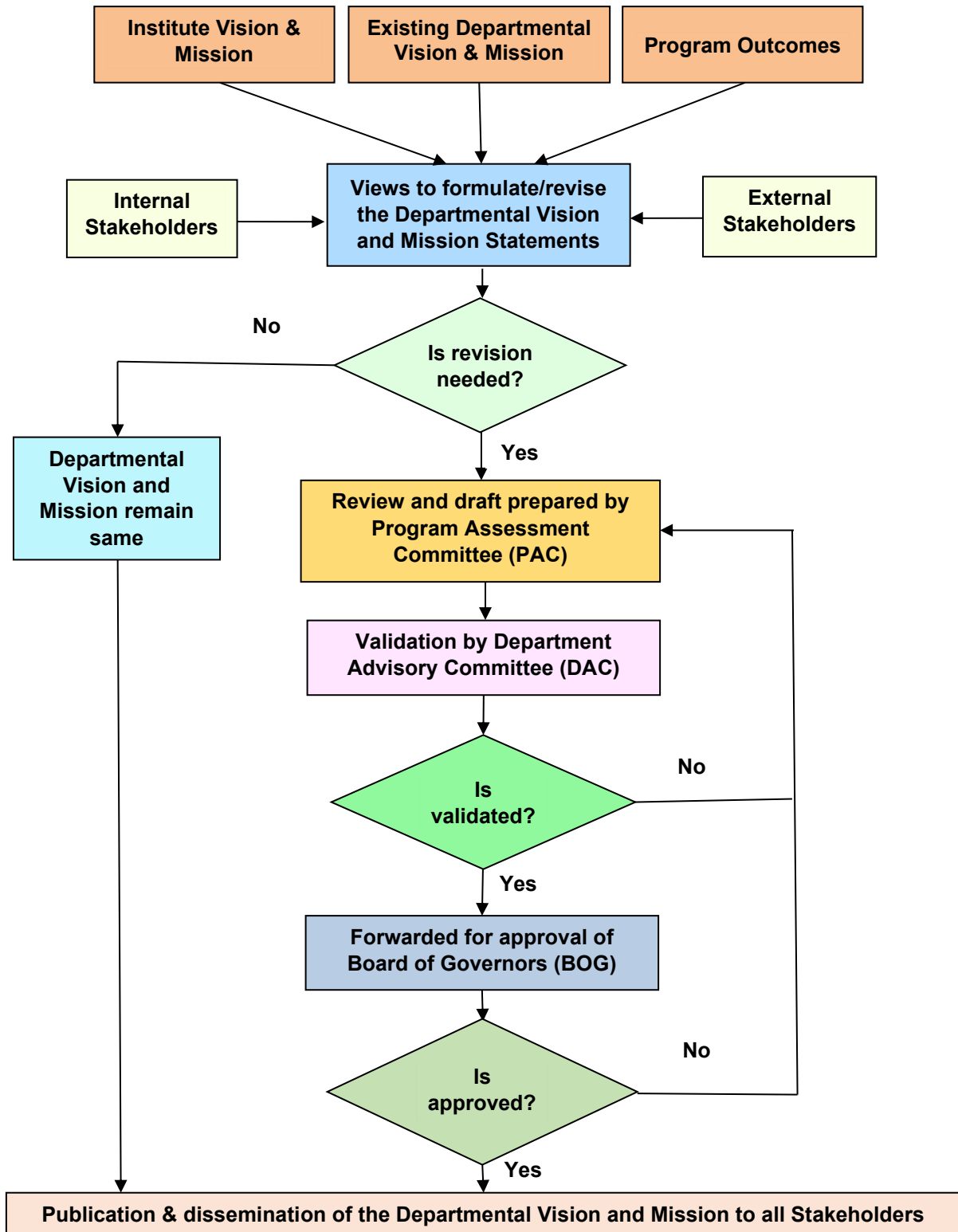


Fig. 4.2: Process of refining the Vision and Mission of the department

CHAPTER: 5

PROCESS OF DEFINING AND REFINING PROGRAM EDUCATIONAL OBJECTIVES

5.1 Process of Defining the Program Educational Objectives (PEOs)

The PEOs are established through the following process steps:

Step 1: The Vision and Mission Statements of the Department and POs are taken as the primary inputs for this process.

Step 2: Suggestions and feedbacks are collected from the internal and external stakeholders of the department.

Step 3: The accepted views are analyzed and the PEOs are formulated.

Step 4: The PEOs are reviewed by the Program Assessment Committee (PAC). The suggestions given by the PAC are incorporated (for any changes) and those statements are forwarded to the Department Advisory Committee (DAC).

Step 5: If the DAC validates the PEOs, they are forwarded to the Board of Governors (BOG) for the final approval, else they return back to Step 4.

Step 6: If they are approved, they are proceeded further to Step 7, else they return back to Step 4 to incorporate modifications.

Step 7: The PEOs are published and disseminated.

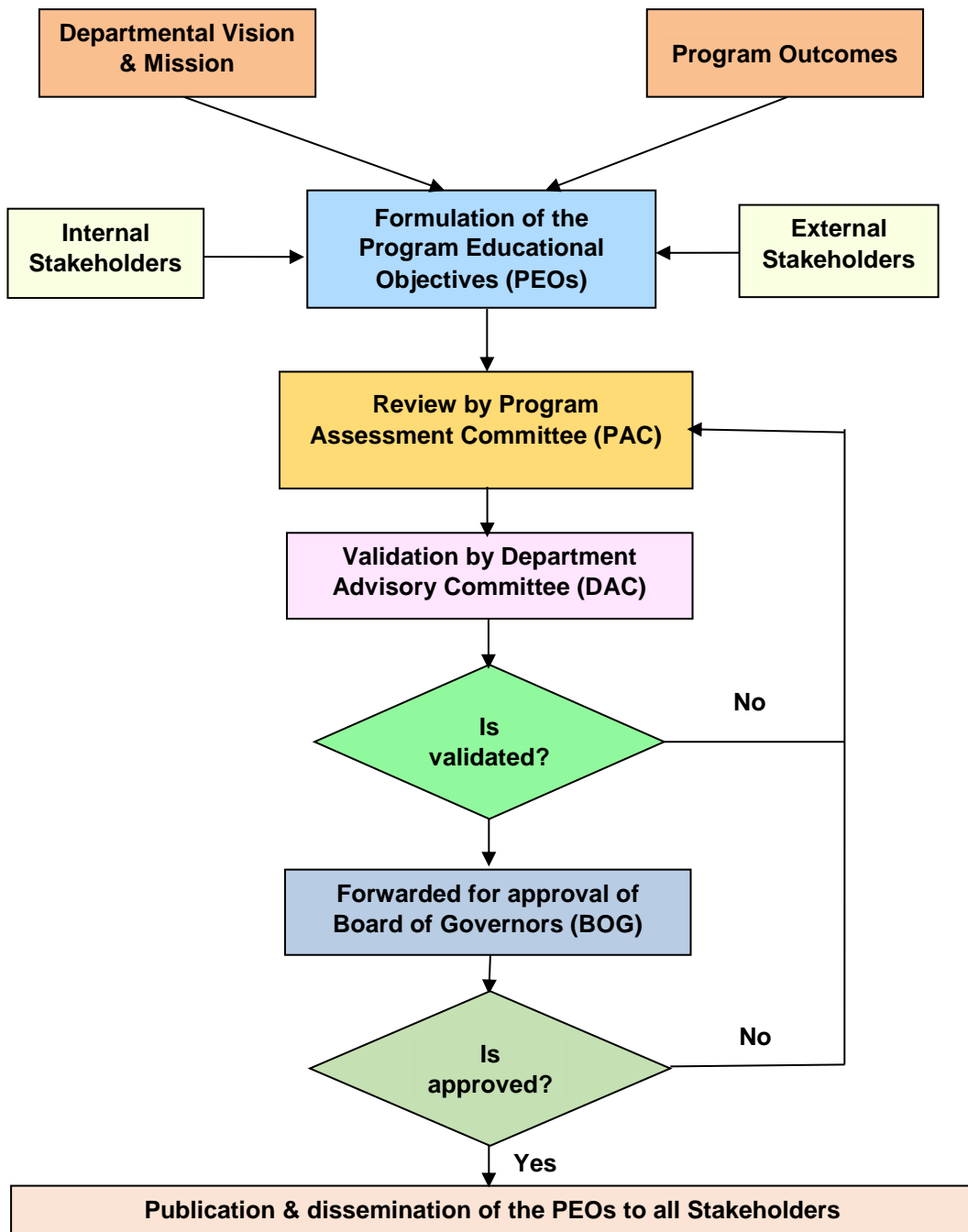


Fig. 5.1: Process of defining the PEOs

5.2 Process of Refining the Program Educational Objectives (PEOs)

For any modification in the PEOs, the following steps are followed:

Step 1: The Vision and Mission Statements of the Department and POs are taken as the primary inputs for the process.

Step 2: Suggestions and feedbacks are collected from the internal and external stakeholders of the department.

Step 3: The accepted views are analyzed.

Step 4: If no revision is required, the PEOs remain the same and are proceeded to Step 7. If the majority are in favor of any modification, new drafts are prepared by the Program Assessment Committee (PAC) and are forwarded to the Department Advisory Committee (DAC).

Step 5: If the DAC validates the new PEOs, they are forwarded to the Board of Governors (BOG) for the final approval, else they return back to Step 4.

Step 6: If they are approved, they are proceeded further to Step 7, else they return back to Step 4 to incorporate modifications.

Step 7: The PEOs are published and disseminated.

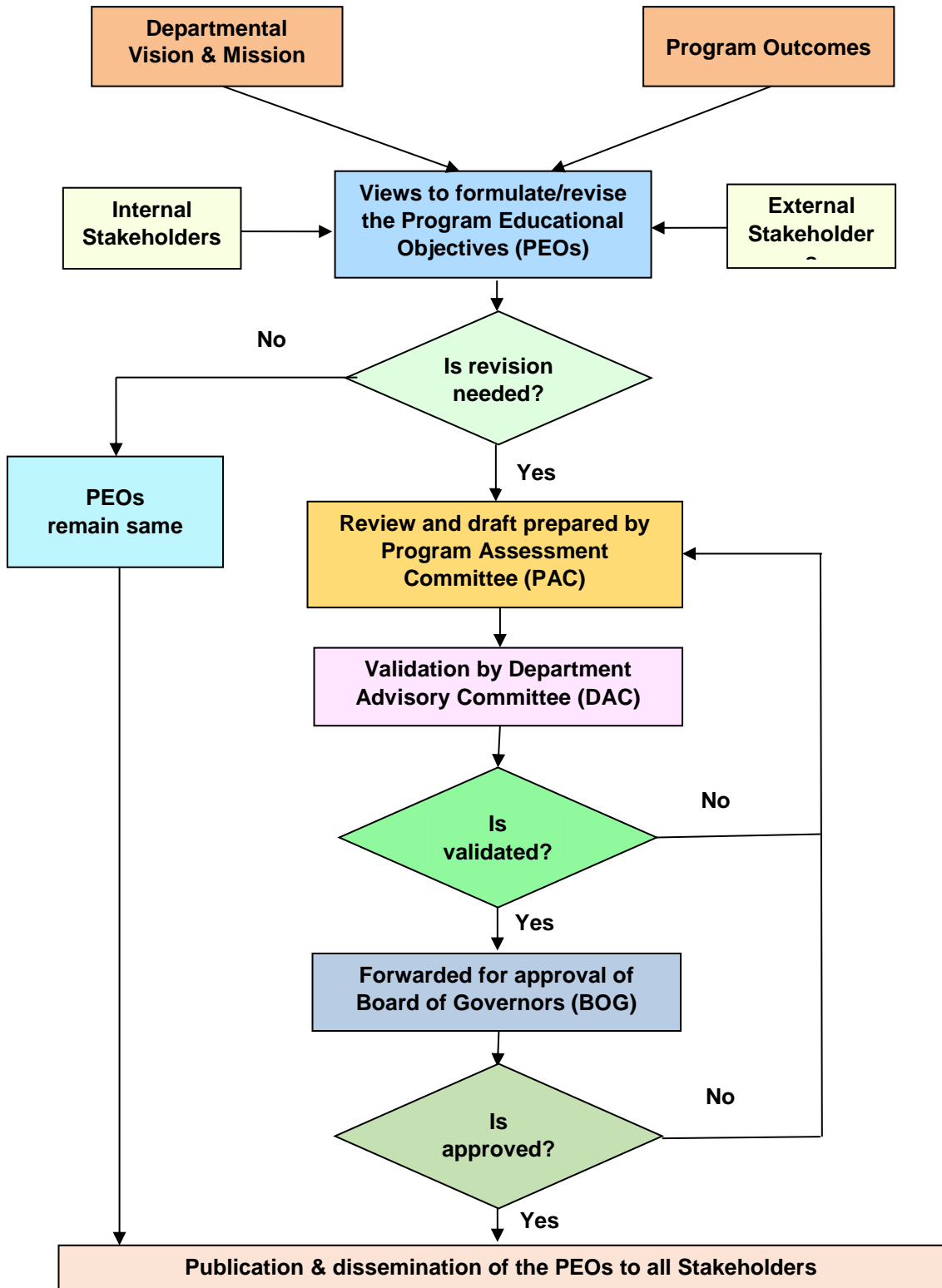


Fig. 5.2: Process of refining the PEOs

5.3 Publishing Modes of the Vision, Mission, and PEOs

The Vision, Mission (Institute & Department) and PEOs are published in documents as per the following table:

S. No.	Document	Institute		Department			Target Stakeholders	
		Vision	Mission	Vision	Mission	PEOs	Internal	External
1	Departmental Newsletter & Magazine	√	√	√	√	√	Management, Faculty and Staff, Students	Alumni, Industry, Academia, Professional Society Members
2	Course files	√	√	√	√	√	Faculty	
3	Lab Manual & Lab Records	√	√	√	√	√	Faculty and Staff, Students	
4	Personal Files	√	√	√	√	√	Faculty	
5	Admission (Institute & Department) Brochures	√	√	√	√	√	Management, Faculty and Staff, Students	Parents
6	Orientation Booklet	√	√				Faculty and Staff, Students	Parents
7	Conference/Workshop Brochures			√	√	√	Management, Faculty and Staff, Students	Alumni, Industry, Academia, Professional Society Members
8	Student Portfolio	√	√	√	√	√	Faculty and Staff, Students	
9	Project Reports			√	√	√	Faculty and Staff, Students	Industry, Academia, Professional Society Members
10	Academic Calendar	√	√	√	√	√	Management, Faculty and Staff, Students	
11	Event Flyer			√	√	√	Management, Faculty and Staff, Students	Parents, Alumni, Industry, Academia, Professional Society Members

Table 5.1: Documents containing the Vision, Mission (Institute & Department) and PEOs

The Institute Vision & Mission, Department Vision & Mission, and PEO statements are displayed in the following locations:

S. No.	Location	Institute		Department			Target Stakeholders	
		Vision	Mission	Vision	Mission	PEOs	Internal	External
1	Institute Website (https://bppimt.ac.in/academics/department-of-electrical-engineering/)	√	√	√	√	√	Management, Faculty and Staff, Students	Parents, Alumni, Employers, Industry, Academia, Professional Society Members
2	Front Office	√	√				Management, Faculty and Staff, Students	Parents, Alumni, Employers, Industry, Academia, Professional Society Members
3	Block A, B, C	√	√	√	√	√	Management, Faculty and Staff, Students	Parents, Alumni, Employers, Industry, Academia, Professional Society Members
4	Principal's Office	√	√				Management, Faculty and Staff, Students	Parents, Alumni, Employers, Industry, Academia, Professional Society Members
5	HOD Rooms			√	√	√	Faculty and Staff, Students	Parents, Alumni, Employers, Industry, Academia, Professional Society Members
6	Faculty and Staff Rooms			√	√	√	Faculty and Staff, Students	
7	Departmental Notice Boards	√	√	√	√	√	Faculty and Staff, Students	Alumni, Industry, Academia Professional Society Members
8	Classrooms			√	√	√	Faculty Students	
9	Central Library	√	√				Management, Faculty and Staff, Students	
10	Departmental library			√	√	√	Faculty and Staff, Students	
11	Seminar Hall & Auditorium	√	√				Management, Faculty and Staff, Students	Parents, Alumni, Employers, Industry, Academia Professional Society Members
12	Conference Room	√	√				Faculty and Staff	Alumni

S. No.	Location	Institute		Department			Target Stakeholders	
		Vision	Mission	Vision	Mission	PEOs	Internal	External
13	Department Corridors	√	√	√	√	√	Faculty and Staff, Students	Alumni, Industry, Academia, Professional Society Members
14	Departmental Conference Room			√	√	√	Faculty and Staff, Students	Alumni, Industry, Academia, Professional Society Members
15	Departmental Wall Magazine			√	√	√	Management, Faculty and Staff, Students	Alumni, Industry, Academia, Professional Society Members
16	Students' Activity Room	√	√				Students	
17	Girls and Boys Common Room	√	√				Students	
18	All Laboratories			√	√	√	Faculty and Staff, Students	Industry, Academia, Professional Society Members
19	Canteen	√	√				Management, Faculty and Staff, Students	Alumni
20	Moodle	√	√	√	√	√	Faculty, Students	
21	Registrar's Office	√	√				Management, Faculty and Staff, Students	Parents, Alumni, Employers
22	Deputy Registrar's Office	√	√				Management, Faculty and Staff, Students	Parents, Alumni
23	Account's Office	√	√				Faculty and Staff, Students	
24	Examination Cell	√	√				Faculty and Staff, Students	Industry, Academia, Professional Society Members
25	Placement Cell	√	√				Staff, Students	Employers

Table 5.2: Locations displaying the Vision, Mission (Institute & Department) and PEOs

5.4 Disseminating Modes of Vision, Mission and PEOs

Modes of dissemination of the Vision Mission (Institute & Department) and PEO statements are shown in the following table:

S. No.	Dissemination Modes	Institute		Department			Target Stakeholders	
		Vision	Mission	Vision	Mission	PEOs	Internal	External
1	PAC Meetings			√	√	√	Faculty	
2.	Departmental Committee Meetings			√	√	√	Faculty and Staff	
3	DAC Meetings	√	√	√	√	√	Faculty Students	Parents, Alumni, Industry, Academia, Professional Society Members, Employers
4	BOG Meetings	√	√	√	√	√	Management, Faculty	Industry, Academia, Professional Society Members
5	Institutional Committee Meetings	√	√				Management, Faculty and Staff, Students	Industry, Academia, Professional Society Members
6	Lecture Sessions			√	√	√	Faculty Students	
7	Seminars, Workshops, Conferences, FDPs, Guest Lectures	√	√	√	√	√	Faculty and Staff, Students	Alumni, Industry, Academia, Professional Society Members
8	Professional Society Activities	√	√	√	√	√	Faculty and Staff, Students	Industry, Academia, Professional Society Members, Employers
9	Parent Teacher Meetings	√	√	√	√	√	Faculty	Parents
10	Alumni Meetings	√	√	√	√	√	Faculty	Alumni
11	First Year Orientation Program	√	√	√	√	√	Faculty and Staff, Students	Parents

S. No.	Dissemination Modes	Institute		Department			Target Stakeholders	
		Vision	Mission	Vision	Mission	PEOs	Internal	External
12	First Year Induction Program	√	√				Faculty and Staff, Students	
13	Technical/Cultural Festivals	√	√				Management, Faculty and Staff, Students	Parents, Alumni, Industry, Academia, Professional Society Members
14	Outreach Activities	√	√	√	√	√	Faculty and Staff, Students	Industry, Academia, Professional Society Members
15	Industry Visits	√	√	√	√	√	Faculty and Staff, Students	Employers, Industry, Academia, Professional Society Members
16	Epilogue Program	√	√	√	√	√	Faculty and Staff, Students	Alumni

Table 5.3: Modes of dissemination of the Vision, Mission (Institute & Department) and PEOs

CHAPTER: 6

COURSE OUTCOMES AND BLOOMS TAXONOMY

COs

- Course outcomes are specific, measurable statements that describe what a student will know or be able to do by the end of a course, including knowledge, skills, and attitudes.
- They are used to guide curriculum design, teaching methods, and student assessment, ensuring that each course contributes to the overall learning goals of a program.
- These outcomes are typically made clear to students at the beginning of the course and should be specific, measurable, achievable, relevant, and time-bound.

6.1 Bloom's Taxonomy

The original Taxonomy of Educational Objectives, commonly referred to as Bloom's Taxonomy, was created by Benjamin Bloom in 1956, and later revised in 2001. Bloom categorized and classified the cognitive domain of learning into varying levels according to complexity and richness. In Bloom's Taxonomy from 1956, he outlined six main categories: knowledge, comprehension, application, analysis, synthesis, and evaluation. In 2001, a group of cognitive psychologists, curriculum theorists, instructional researchers, and testing specialists revised the category names of Bloom's Taxonomy from nouns to verbs as shown in Fig. 6.1.

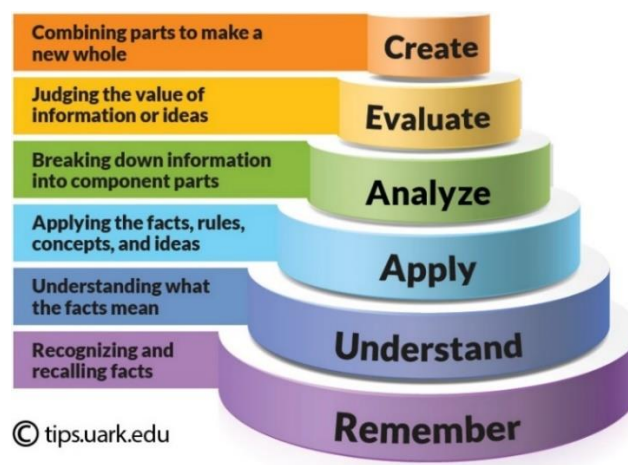


Fig. 6.1: Bloom's Taxonomy representation
(Credit: Jessica Shabaturo; <https://tips.uark.edu/using-blooms-taxonomy>)

6.1.1 Revised Bloom's Taxonomy Action Verbs

Definitions	I. Remembering	II. Understanding	III. Applying	IV. Analyzing	V. Evaluating	VI. Creating
Bloom's Definition	Exhibit memory of previously learned material by recalling facts, terms, basic concepts and answers.	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break Information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations .	Present and defend opinions by making judgements about information, validity of ideas or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
	<ul style="list-style-type: none"> • Choose • Define • Find • How • Label • List • Match • Name • Omit • Recall • Relate • Select • Show • Spell • Tell • What • When • Where • Which • Who • Why 	<ul style="list-style-type: none"> • Classify • Compare • Comprehend • Contrast • Demonstrate • Describe • Explain • Extend • Illustrate • Infer • Interpret • Outline • Relate • Rephrase • Show • Summarize • Translate 	<ul style="list-style-type: none"> • Apply • Build • Calculate • Choose • Construct • Develop • Experiment with • Identify • Interview • Make use of • Model • Organize • Plan • Select • Solve • Utilize 	<ul style="list-style-type: none"> • Analyze • Assume • Categorize • Classify • Compare • Conclude • Contrast • Deduce • Discover • Dissect • Distinguish • Divide • Examine • Function • Infer • Inspect • List • Motivate • Relate • Simplify • Survey • Take part in • Test for • Theme 	<ul style="list-style-type: none"> • Agree • Appraise • Assess • Award • Choose • Compare • Conclude • Criticize • Decide • Deduct • Defend • Determine • Disprove • Estimate • Evaluate • Explain • Influence • Interpret • Judge • Justify • Mark • Measure • Opine • Perceive • Prioritize • Prove • Rate • Recommend • Rule on • Select • Support • Value 	<ul style="list-style-type: none"> • Adapt • Build • Change • Choose • Combine • Compile • Compose • Construct • Create • Delete • Design • Develop • Discuss • Elaborate • Estimate • Formulate • Happen • Imagine • Improve • Invent • Make up • Maximize • Minimize • Modify • Originate • Plan • Predict • Propose • Solve • Suppose • Synthesize • Test • Theorize • Write

Table 6.1: Revised Bloom's Taxonomy action verbs

(Ref: Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing, Abridged Edition*. Boston, MA: Allyn and Bacon)

6.2 Process of Defining COs

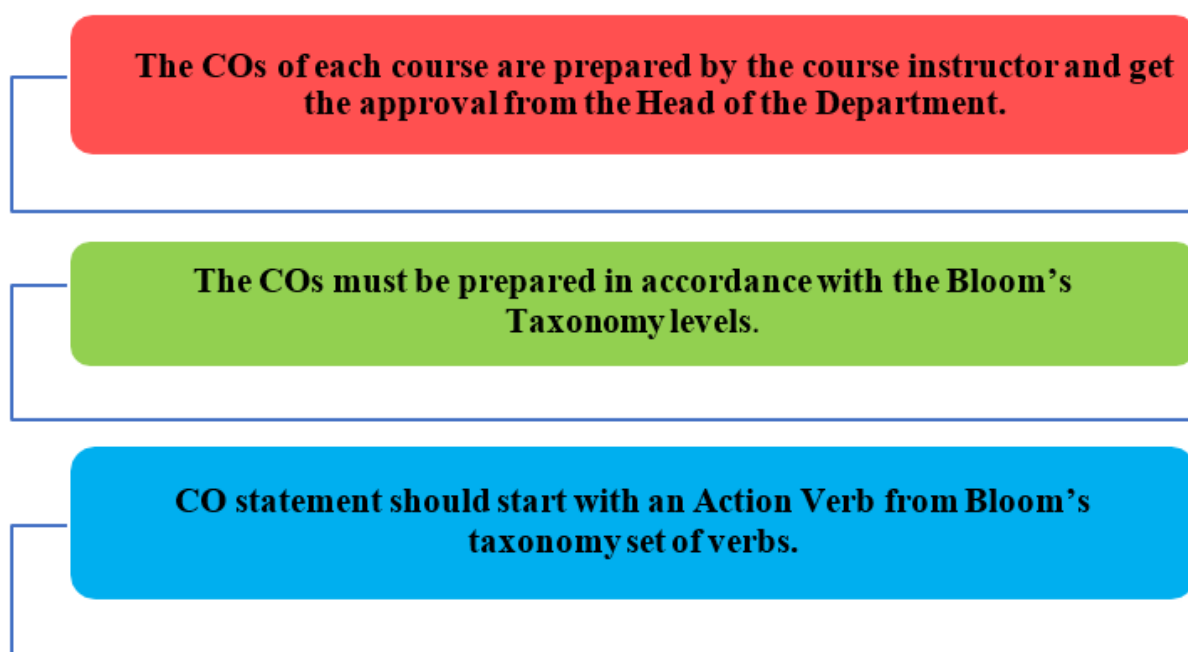


Fig. 6.2: Process of defining COs

6.2.1 Sample COs

Analog Communication (EC401)

CO No.	Course Outcome	Blooms Level
CO1	Solve problems on modulation index, transmission bandwidth, transmission power and circuit design for DSB-FC, DSB-SC, SSB and VSB modulation and demodulation techniques.	Apply
CO2	Solve problems on modulation index, frequency deviation, transmission bandwidth and circuit design for frequency and phase modulation and demodulation techniques.	Apply
CO3	Calculate intermediate frequency, image frequency and rejection ratio for superheterodyne radio receivers.	Apply
CO4	Solve problems on conditional probability, joint probability, statistical independence, cumulative distribution function and probability density function of Gaussian, Rayleigh and Rician distribution.	Apply
CO5	Analyze the noise performance of DSB-FC, DSB-SC, SSB-TC, SSB-SC and FM in terms of Signal to Noise Ratio.	Analyze

Table 6.2: Sample COs

6.3 CO-PO and CO-PSO Mapping

Level of Correlation

It indicates to what extent a certain component is mapped with the other. The correlation between CO-PO and PSO describes the level at which a particular PO and PSO is addressed through a CO.

Level 3	Indicates High mapping (<i>high correlation towards attainment</i>)
Level 2	Indicates Moderate mapping (<i>moderate correlation towards attainment</i>)
Level 1	Indicates Low mapping (<i>low correlation towards attainment</i>)

Table 6.3: Level of correlation

6.3.1 Sample CO-PO/PSO Mapping

Analog Communication (EC401)

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	2	-	-	-	1	1	1	-	-	2	2
CO2	3	2	1	2	-	-	-	1	1	1	-	-	2	2
CO3	3	2	1	2	-	-	-	1	-	1	-	-	2	2
CO4	3	2	1	2	-	-	-	1	-	1	-	-	2	2
CO5	3	3	2	2	-	-	-	1	-	1	-	1	2	2
Total	15	11	6	10	-	-	-	5	2	5	-	1	10	10
No. of COs Mapped with POs	5	5	5	5	-	-	-	5	2	5	-	1	5	5
Avg.	3	2.2	1.2	2	-	-	-	1	1	1	-	1	2	2

Table 6.4: Sample CO-PO/PSO mapping

The CO-PO-PSO mapping for all courses in the curriculum are done and the consolidated CO-PO-PSO mapping is tabulated and the framed Program articulation matrix depicts the correlation between all the courses of the program and POs and PSOs.

6.4 Curriculum Gap Identification

- Curriculum gaps are identified from the Program articulation matrix.
- The threshold value is obtained from the average value of all mapped POs and PSOs of the courses in the curriculum.
- The average value of POs and PSOs are compared with this threshold value.
- The POs and PSOs which have lesser value than this threshold value are considered as Curriculum Gaps.

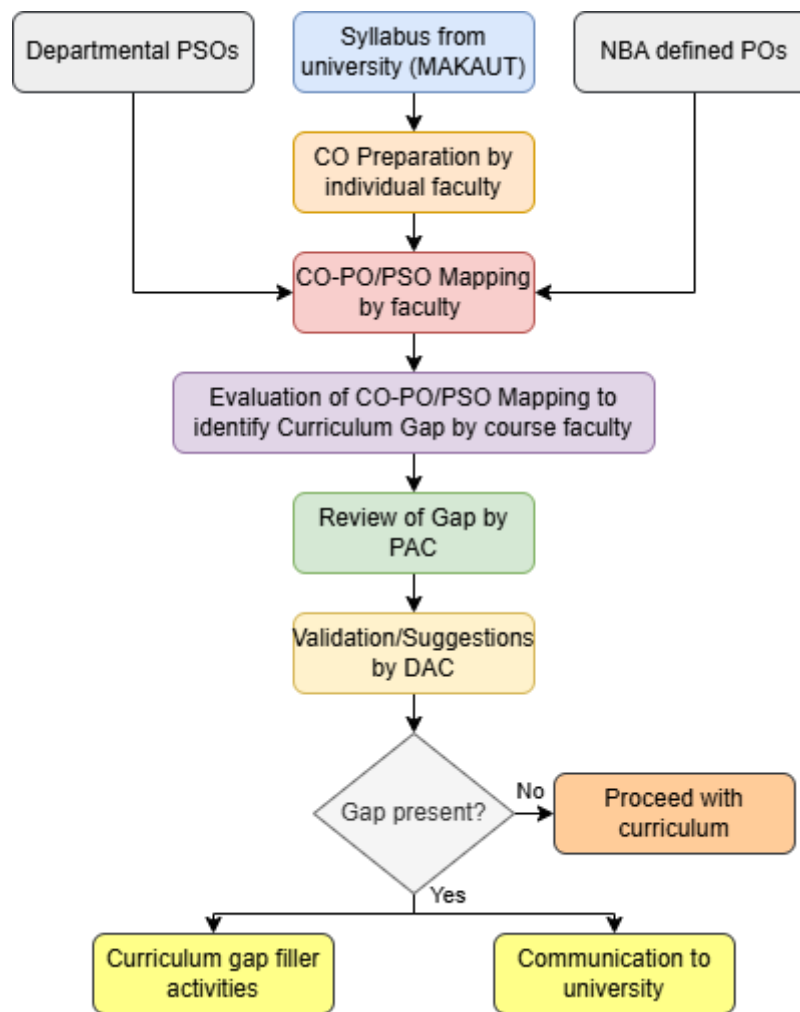


Fig. 6.3: Process to identify curriculum gaps to attain POs and PSOs

CHAPTER: 7

CO ASSESSMENT AND ATTAINMENT PROCESS

7.1 Course Assessment Tools

Theory

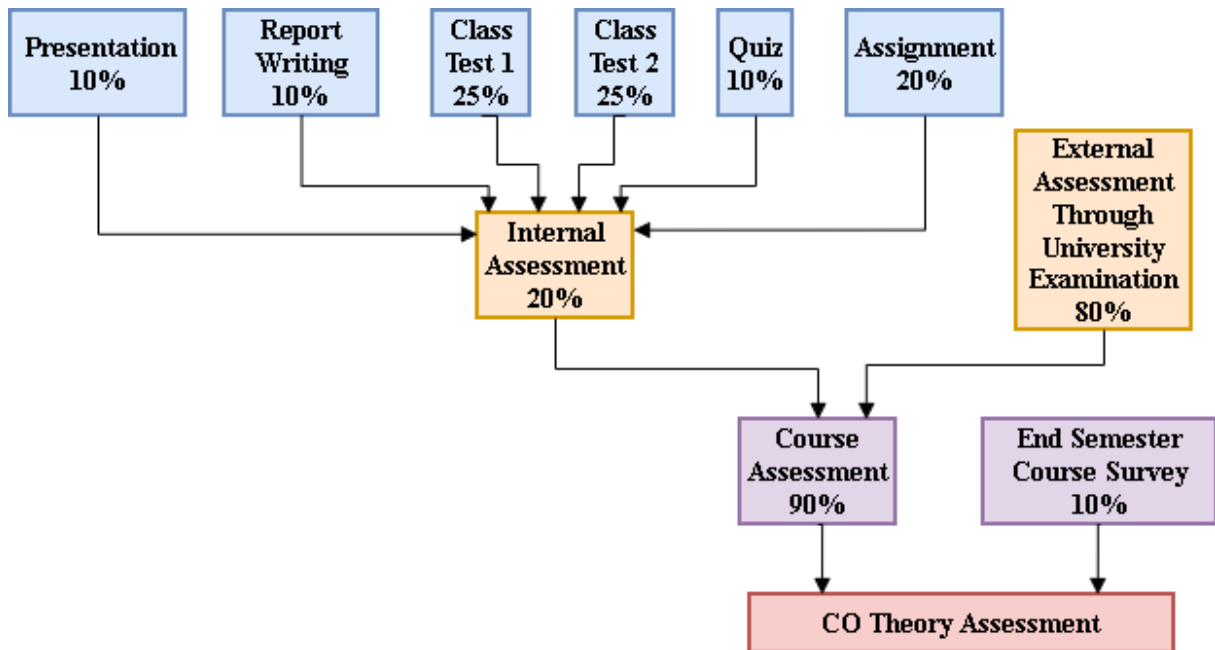


Fig. 7.1: Course assessment tools for theory

Laboratory

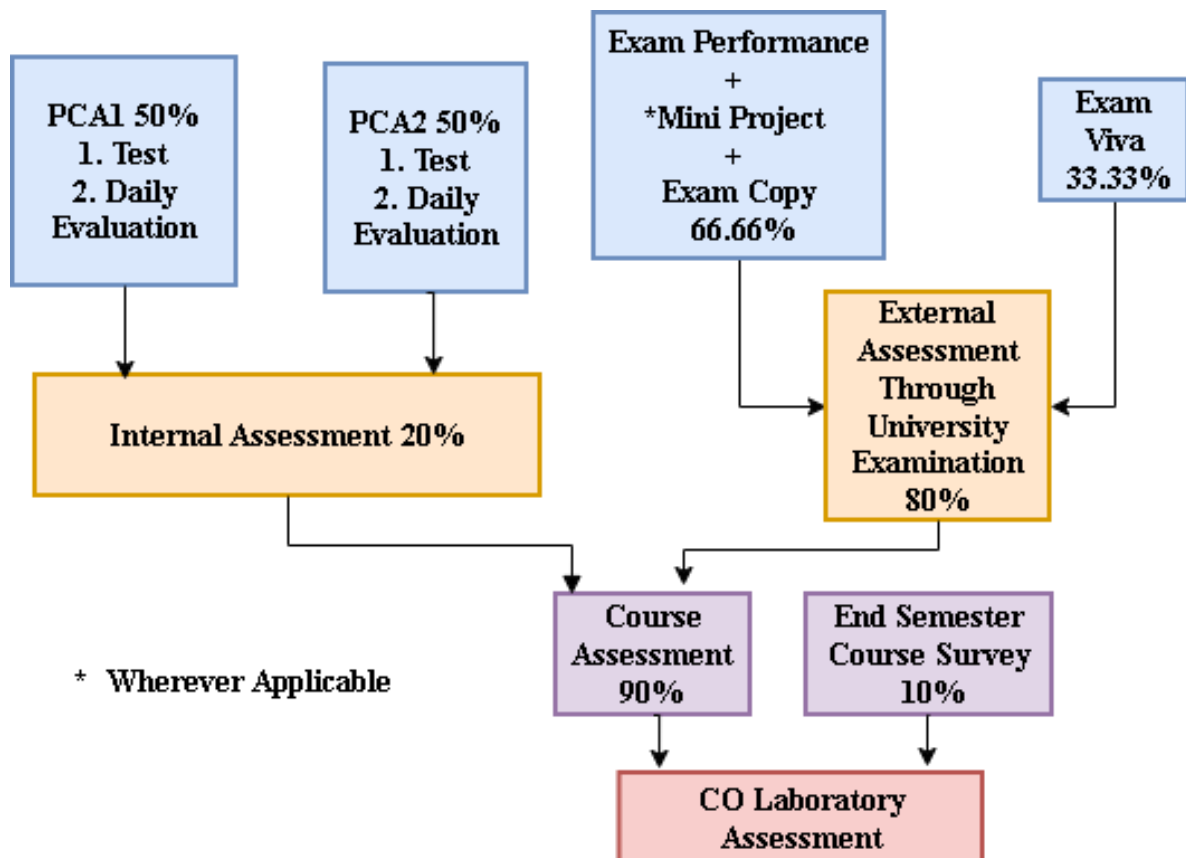


Fig. 7.2: Course assessment tools for laboratory

7.2 Course Assessment Tools and Frequency

Course	Description	Assessment Tools			Frequency	In-charge	Reviewer	
Theory	It is a process to assess the attainment of course outcomes, student's learning domains and to improve the teaching-learning process	Course Assessment	Internal Assessment	Presentation	Once in a semester	Course Faculty	HoD	
				Report Writing	Once in a semester	Course Faculty	HoD	
				Class Test	2 times per semester	Course Faculty	HoD	
				Quiz	Once in a semester	Course Faculty	HoD	
				Assignment	Once in a semester	Course Faculty	HoD	
		External Assessment	University Examination	End of the semester	University	University		
End Semester Course Survey				End of the Semester	Course Faculty	HoD		
Laboratory	It is a process to assess the attainment of course outcomes, student's learning domains and to improve the teaching-learning process	Course Assessment	Internal Assessment	(PCA1) Evaluation 1	Test	Weekly	Course Faculty	HoD
					Daily Evaluation			
				(PCA2) Evaluation 2	Test	Weekly	Course Faculty	HoD
					Daily Evaluation			
		External Assessment	Viva			End of the Semester	External Examiner	University
			Test Copy					
Test Performance								
End Semester Course Survey				End of the Semester	Course Faculty	HoD		

Table 7.1: Course assessment tools and frequency

7.3 Internal Assessment Tools for Theory Courses

7.3.1 Internal Assessment Tools and Mapping with COs

The total marks of the course are distributed among six assessment tools as follows:

1. Presentation (25 marks) – CO1
2. Report Writing (25 marks) – CO2
3. Class Test 1 (25 marks) – CO1 to CO3
4. Class Test 2 (per CO 10 marks) – CO4 to CO5/CO6
5. Quiz (per CO 5 marks) – CO1 to CO5/CO6
6. Assignment (per CO 5 marks) – CO1 to CO5/CO6

Each assessment tool is evaluated through defined sub-parameters with rubrics, mapped with the relevant Course Outcomes (COs).

S. No.	Assessment Tool	Marks	Mapped COs	Assessment Policy
1	Presentation	25	CO1	Individual & Group
2	Report Writing	25	CO2	Group
3	Class Test 1	25	CO1- CO3	Individual
4	Class Test 2	20/30	CO4-CO5/ CO6	Individual
5	Quiz	25/30	CO1– CO5/ CO6	Individual
6	Assignment	25/30	CO1– CO5/ CO6	Individual

Table 7.2: Different internal assessment tools and their mapping with COs

7.3.2 Sub-attributes of Presentation (Mapped with CO1)

Sub-attribute	Max Marks	Criteria
Quality of Content	10	Depth of topic coverage, accuracy
Presentation Skill	5	Clarity, confidence, voice, engagement
Knowledge of Topic	5	Conceptual understanding
Visual Representation	5	Aesthetic, readability
Total	25	

Table 7.3: Sub-attributes of Presentation

7.3.3 Sub-attributes of Report Writing (Mapped with CO2)

Sub-attribute	Max Marks	Criteria
Report Structure & Formatting	10	Neatness, logical order
Content Accuracy	10	Correctness, analysis
Relevance	5	Graphs, tables, drawings
Total	25	

Table 7.4: Sub-attributes of Report Writing

7.3.4 Components of Class Test 1 (Mapped with CO1, CO2 and CO3)

Type	Mapped COs	Marks
5 Very Short Qs	CO1	$5 \times 1 = 5$
1 Short Q	CO2	$1 \times 5 = 5$
3 Short Qs	CO3	$3 \times 5 = 15$
Total	CO1–CO3	25

Table 7.5: Components of Class Test 1

7.3.5 Components of Class Test 2 (Mapped with CO4 to CO5/CO6)

Type	Mapped COs	Marks
2 Short Qs	CO4	$2 \times 5 = 10$
2 Short Qs	CO5	$2 \times 5 = 10$
2 Short Qs	CO6	$2 \times 5 = 10^*$
Total	CO4–CO5 / CO6	20/30

* Only applicable for the Program having 6 COs.

Table 7.6: Components of Class Test 2

7.3.6 Quiz (Covering All COs)

5 MCQ type questions will be set from each CO.

7.3.7 Assignment (Covering All COs)

Mainly long analytical type questions carrying 5 marks will be set from each CO.

7.4 Rubrics and Scheme of Evaluation for Theory Courses

7.4.1 Rubrics for Presentation (CO1)

Criteria	10	9	8	7	6	5	4	3	2	1
Quality of Content (10 Marks) (Group Marking)	Exceptional depth, fully accurate, insightful, and highly relevant content.	Excellent detail, strong clarity, minor conceptual gap only.	Very good information, well-structured, slight lack in analysis.	Competent coverage of major points but lacks depth of explanation.	Adequate content with noticeable gaps and limited examples.	Basic coverage, surface-level understanding, partially aligned with topic.	Limited content, missing major points and elaboration.	Minimal topic coverage lacking clarity and relevance.	Very low-quality content with significant inaccuracies.	Content largely incorrect or irrelevant.
Presentation Skill (5 Marks) (individual Marking)	—	—	—	—	—	Admirable — confident and clear delivery with good engagement.	Fair — understandable but limited expression and confidence.	Modest — audible but monotone with weak interaction.	Hesitant — unclear or very low voice with minimal confidence.	Struggling — very unclear and difficult to follow.
Knowledge of Topic (5 Marks) (Individual Marking)	—	—	—	—	—	Impressive — strong conceptual clarity; answers accurate.	Reasonable — partial understanding, occasional inaccuracy.	Developing — fragmented conceptual understanding.	Restricted — mostly incorrect understanding and unclear responses.	Confused — fundamental misunderstanding of the topic.
Visual Representation (5 Marks) (group Marking)	—	—	—	—	—	Impactful — attractive visuals, well-organized, highly supportive to content.	Acceptable — readable visuals with minor formatting issues.	Basic — visuals present but weakly structured.	Incoherent — visuals cluttered or confusing.	Disjointed — visuals missing or unrelated.

Table 7.7: Rubrics for Presentation

7.4.2 Rubrics for Report Writing (CO2)

Criteria	10	9	8	7	6	5	4	3	2	1
Report Structure & Formatting (10 Marks)	Exceptionally organized; flawless formatting; professional layout with precise sequencing.	Highly organized; minimal formatting errors; smooth transitions and polished layout.	Well-structured report; clear sections; occasional minor formatting issues.	Good structure but a few sections lack flow or consistency in formatting.	Acceptable structure; some disorganization and formatting inconsistencies present.	Basic arrangement with readable formatting; noticeable alignment issues.	Weak structure; transitions unclear; formatting frequently inconsistent.	Poorly arranged sections; hard to follow; formatting rarely maintained.	Very unorganized with disordered sections; major formatting flaws.	Fragmented structure with no logical order or formatting logic.
Content Accuracy (10 Marks)	Highly accurate information with deep analysis and strong interpretation of findings.	Accurate content with sound explanation; minor analytical limitations.	Good accuracy with sensible interpretation; slightly shallow discussion.	Mostly accurate but lacks analytical depth; explanations occasionally weak.	Generally correct content but noticeable conceptual gaps and partial analysis.	Basic correctness with limited evaluation and explanation.	Some correct points but several inaccuracies or weak reasoning.	Low accuracy with insufficient understanding and flawed discussion.	Very few correct statements; major misconceptions and faulty reasoning.	Content largely incorrect with little identifiable logic.
Relevance (5 Marks)	—	—	—	—	—	Highly relevant use of visuals (graphs/tables/models/diagrams) supporting core content effectively.	Mostly relevant visuals; minor alignment issues with discussion.	Limited relevance; visuals exist but weak connection to report content.	Poor relevance; visuals confusing or unrelated to explanation.	Very weak relevance; visuals misrepresent content or add no value.

Table 7.8: Rubrics for Report Writing

7.4.3 Sample Scheme of Evaluation for Class Test 1, Class Test 2 and Assignment

As there is no specific rubric for CT1, CT2 and Assignment, the scheme of evaluation is prepared by individual faculty members for each course based on the types of questions. A sample question paper for CT1 and the corresponding scheme of evaluation are presented below:

ANALOG COMMUNICATION (EC 401)			
OUTCOME BASED EDUCATION (OBE)			
Question No.	Knowledge Domain & Level	Allotted Marks	CO
1	Apply (L3)	5	1
2	Apply (L3)	5	2
3, 4, 5	Apply (L3)	15	3

Group- A

(Very Short Answer Type Questions)

1. Answer the following questions.

5×1=5

- Calculate the resultant modulation index of AM when two modulating signals are modulated simultaneously with modulation indices of 0.6 and 0.4.
- A 1 MHz sinusoidal carrier is DSB-TC modulated by a symmetrical sine wave of frequency 10 kHz. Calculate the frequencies which will be present in the modulated signal.
- A carrier is amplitude modulated to a depth of 40%. The increase in power is _____.
- Calculate the modulation index if V_{\max} and V_{\min} of the modulated signal are 5.9 V and 1.2 V respectively.
- A sinusoidal carrier with amplitude of 100 V is amplitude modulated with sinusoidal signal having amplitude of 70 V. Calculate each sideband amplitude.

Group-B

Answer all the questions.

4×5 = 20

- An angle-modulated signal is described by $x(t) = 10 \cos[2\pi(10^6)t + 0.1 \sin \pi(10^3)t]$.
 - Considering the given signal as a PM signal with $k_p = 10$, calculate the message signal.
 - Considering the given signal as an FM signal with $k_f = 10\pi$, calculate the message signal.
- Find the RF signal frequency, local oscillator frequency and image frequency for a standard broadcast band AM receiver using a 455 kHz IF and tuned to a station at 640 kHz.
- For a broadcast superheterodyne AM receiver having no RF amplifier, the loaded quality factor Q of the antenna coupling circuit is 100. Now if the intermediate frequency is 455 kHz, calculate (i) the image frequency and its rejection ratio at an incoming frequency of 1000 kHz, (ii) the image frequency and its rejection ratio at an incoming frequency of 25 MHz.
- A tuned radio frequency receiver (TRF) has to be designed with a single tuned circuit using a 9×10^{-6} H inductor. The ideal 10 kHz bandwidth occurs at 1100 kHz. (i) Determine the capacitance range of the variable capacitor in the LC tank circuit required to tune the receiver in 550 to 1550 kHz range. (ii) Determine the bandwidth (BW) of the receiver at 550 and 1550 kHz.

Scheme of Evaluation of Class Test 1 (Analog Communication, EC 401)

1.

Description	Marks awarded	Knowledge level attained
If the answer is correct	1+1+1+1+1	Apply

2.

Description	Marks awarded	Knowledge level attained
If the expression for PM is correct	1	Remember
If the message signal is calculated	1	Apply
If the expression for FM is correct	1	Remember
If the integral part is identified	1	Understand
If the message signal is calculated	1	Apply

3.

Description	Marks awarded	Knowledge level attained
If the RF signal frequency is identified	1	Understand
If the expression for local osc. freq. is correct	1	Remember
If the local osc. freq. is calculated	1	Apply
If the expression for image freq. is correct	1	Remember
If the image freq. is calculated	1	Apply

4.

Description	Marks awarded	Knowledge level attained
If the image freq. is calculated	1	Apply
If ρ is calculated	1	Apply
If the rejection ratio is calculated	1	Apply
If the image freq. is calculated	1	Apply
If the rejection ratio is calculated	1	Apply

5.

Description	Marks awarded	Knowledge level attained
If C is calculated at 550 kHz	1	Apply
If C is calculated at 1550 kHz	1	Apply
If Q is calculated	1	Apply
If BW is calculated at 550 kHz	1	Apply
If BW is calculated at 1550 kHz	1	Apply

7.5 Sample Tables for Internal Assessment for Theory Courses

Presentation (25 Marks, CO1)

Student	Gr. no	Quality of Content * (10)	Presentation Skill (5)	Knowledge of Topic (5)	Visual Representation* (5)	Total (25)
S1	1	9	4	5	4	22
S2	1	9	3	4	4	20
S3	2	7	3	3	3	16
S4	3	6	2	3	2	13
S5	4	5	2	2	1	10

Report Writing (25 Marks, CO2)

Student	Gr. No	Report Structure & Formatting (10)*	Content Accuracy (10)*	Relevance (5)*	Total (25)
S1	1	9	9	4	22
S2	2	8	8	3	19
S3	2	8	8	3	19
S4	2	8	8	3	19
S5	3	5	4	1	10

* Represents the group marking.

Class Test 1 (CO1–CO3, 25 Marks)

Student	CO1 (5) Q1	CO2 (5) Q2	CO3 (10) Q3-Q5	Total
S1	4	4	10	18
S2	5	4	8	17
S3	3	3	7	13
S4	2	3	6	11
S5	2	2	5	9

Class Test 2 (CO4-CO5/CO6, 20/30 Marks)

Student	CO4 (10) Q1+Q2	CO5 (10) Q3+Q4	CO6 (10) Q5+Q6	Total
S1	7	8	9	24
S2	6	7	8	21
S3	5	6	6	17
S4	3	4	5	12
S5	2	3	4	9

¥ The sample table is made considering 6 COs. For 5 COs, Q5 and Q6 are not included.

Quiz (CO1–CO5/CO6, 25/30 Marks)

Student	CO1 (5)	CO2 (5)	CO3 (5)	CO4 (5)	CO5 (5)	CO6 (5)	Total
S1	4	5	4	5	4	5	27
S2	5	4	3	4	4	5	25
S3	3	4	3	3	4	4	21
S4	2	3	2	3	3	2	15
S5	1	2	2	2	2	3	12

¥ The sample table is made considering 6 COs. For 5 COs, Q6 is not included.

Assignment (CO1–CO5/CO6, 25/30 Marks)

Student	CO1 (5)	CO2 (5)	CO3 (5)	CO4 (5)	CO5 (5)	CO6 (5)	Total
S1	5	5	4	5	4	5	28
S2	4	4	4	4	4	4	24
S3	3	4	3	3	3	4	20
S4	2	3	2	3	2	3	15
S5	1	2	1	2	2	2	10

¥ The sample table is made considering 6 COs. For 5 COs, Q6 is not included.

Table 7.9: Sample assessment tables

7.6 Calculation of CO Attainment for Theory Courses

Weight Distribution for Internal Assessment

Assessment Tool (x)	Weight (w)
Presentation	0.10
Report Writing	0.10
Class Test 1	0.25
Class Test 2	0.25
Quiz	0.10
Assignment	0.20

Table 7.10: Weight distribution for internal assessment

Process

1. All marks are converted into percentage.
2. Percentage of CO for each student considering all internal assessment is calculated as follows: $\% CO = \sum_i x_i w_i$.
3. For internal and external assessments, attainment level of each CO (considering all students) is obtained as per following table:

Threshold Marks for Internal Exam (IE) Set by Program	Threshold Marks for University Exam (UE) Set by Program
Attainment Level: 3 ($\geq 80\%$ students scoring \geq threshold marks) 2 ($\geq 70\%$ students scoring \geq threshold marks) 1 ($\geq 60\%$ students scoring \geq threshold marks)	

Table 7.11: Threshold marks and attainment level for theory courses

4. Levels of internal (IE) and external (UE) CO assessment are added using the following formula: $\text{Level}_{\text{IE+UE}} = 0.2 \times \text{Level}_{\text{IE}} + 0.8 \times \text{Level}_{\text{UE}}$
5. End Semester Course Survey is added with the above value using the following formula to calculate the individual CO attainment:

Individual final CO attainment = $0.9 \times \text{Level}_{\text{IE+UE}} + 0.1 \times \text{Level}_{\text{Survey}}$
6. The average of all CO attainment is calculated to obtain the Overall CO Attainment for each section.
7. The average of Overall CO Attainment of all sections is the Final CO Attainment of the course.

7.6.1 Sample CO Attainment for Theory Courses

Continuous Assessments (Internal Exams) with Corresponding Weightage

Weightage →			0.1	0.1	0.25			0.25		0.1					0.2				
S. No.	Univ. Roll No.	Name	CA1 (PPT) (100%)	CA2 (RW) (100%)	CA3 (CT1) (100%)			CA4 (CT2) (10*2)		CA5 (Quiz) (100%)					CA6 (Assignment) (100%)				
			CO1	CO2	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5
1			80	92	80	80	87	80	90	32	32	32	32	32	100	60	100	100	80
2			80	92	60	60	47	70	100	0	0	0	0	0	60	60	60	60	60
3			80	92	60	100	60	80	100	0	0	0	0	0	60	60	80	100	60
4			92	80	100	60	80	60	60	52	52	52	52	52	100	60	60	60	100
5			92	80	80	80	93	90	60	40	40	40	40	40	100	100	100	60	100
6			92	80	100	60	53	60	100	36	36	36	36	36	100	100	80	100	100
7			88	80	80	100	53	100	80	52	52	52	52	52	100	60	80	60	60
8			88	80	80	80	53	70	60	36	36	36	36	36	100	80	80	60	100
9			92	80	60	100	40	60	90	28	28	28	28	28	60	80	80	80	100
10			80	80	20	80	40	70	60	44	44	44	44	44	80	80	100	60	60
11			80	80	60	100	73	30	60	40	40	40	40	40	60	80	60	80	60
12			80	80	80	20	73	100	100	36	36	36	36	36	100	80	60	60	100
13			80	80	80	60	67	90	40	36	36	36	36	36	100	80	100	100	100
14			80	80	100	80	80	70	40	52	52	52	52	52	60	80	100	60	80
15			80	80	80	80	40	60	90	48	48	48	48	48	100	100	100	100	60
16			80	80	40	20	47	60	40	44	44	44	44	44	60	60	60	60	100
17			80	80	20	20	47	60	60	52	52	52	52	52	80	100	100	60	60
18			80	80	80	20	87	50	80	40	40	40	40	40	80	80	80	60	60
19			80	80	60	40	93	80	20	32	32	32	32	32	60	100	60	80	60

Weightage →			0.1	0.1	0.25			0.25		0.1					0.2				
S. No.	Univ. Roll No.	Name	CA1 (PPT) (100%)	CA2 (RW) (100%)	CA3 (CT1) (100%)			CA4 (CT2) (10*2)		CA5 (Quiz) (100%)					CA6 (Assignment) (100%)				
			CO1	CO2	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5
20			60	80	80	0	100	60	50	40	40	40	40	40	80	60	100	100	80
21			80	80	40	80	73	50	80	48	48	48	48	48	60	60	60	80	100
22			88	92	20	80	100	70	60	52	52	52	52	52	60	60	100	60	80
23			88	92	80	40	47	70	90	44	44	44	44	44	100	80	60	100	100
24			88	92	60	60	53	40	60	32	32	32	32	32	100	80	80	100	80
25			88	92	20	60	53	60	40	44	44	44	44	44	60	80	60	80	60
26			80	80	20	80	53	50	30	52	52	52	52	52	60	100	80	80	60
27			80	80	80	40	60	100	70	48	48	48	48	48	80	100	80	60	100
28			80	80	80	60	73	50	70	48	48	48	48	48	80	80	80	80	100
29			80	72	20	60	47	60	60	48	48	48	48	48	100	80	60	60	100
30			84	72	0	100	87	100	90	40	40	40	40	40	60	80	60	80	60
31			88	72	40	60	93	70	100	28	28	28	28	28	100	100	100	60	60
32			92	80	60	0	47	100	30	52	52	52	52	52	100	80	100	60	60
33			88	80	60	100	33	50	40	32	32	32	32	32	60	100	60	100	100
34			88	80	80	0	47	30	0	68	68	68	68	68	100	60	100	80	100
35			96	80	100	60	40	50	30	48	48	48	48	48	60	100	100	100	80
36			96	80	60	40	73	100	70	32	32	32	32	32	100	80	80	100	100
37			88	80	40	0	47	60	100	84	84	84	84	84	80	80	60	60	100
38			92	92	60	60	67	70	70	96	96	96	96	96	80	80	80	80	80
39			92	92	100	80	73	90	30	72	72	72	72	72	60	100	60	80	100
40			92	92	80	40	33	60	40	52	52	52	52	52	100	60	100	80	100
41			92	92	80	100	33	100	90	68	68	68	68	68	60	80	100	60	100
42			92	92	80	100	87	30	70	64	64	64	64	64	60	100	80	60	80
43			88	92	60	20	93	50	40	44	44	44	44	44	100	60	60	100	60
44			80	92	40	100	60	60	60	72	72	72	72	72	100	100	60	60	60

Weightage →			0.1	0.1	0.25			0.25		0.1					0.2				
S. No.	Univ. Roll No.	Name	CA1 (PPT) (100%)	CA2 (RW) (100%)	CA3 (CT1) (100%)			CA4 (CT2) (10*2)		CA5 (Quiz) (100%)					CA6 (Assignment) (100%)				
			CO1	CO2	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5
45			80	92	60	80	80	30	90	72	72	72	72	72	100	80	60	100	80
46			80	92	60	60	73	60	90	72	72	72	72	72	80	80	80	80	80
47			88	92	80	60	53	0	80	72	72	72	72	72	100	60	60	80	60
48			92	92	80	60	100	60	90	72	72	72	72	72	60	100	80	80	60
49			88	92	100	20	73	60	80	72	72	72	72	72	80	80	80	100	100

Table 7.12: Sample internal marks with weightage

Direct Attainment

S. No.	Univ. Roll No.	Name	CO Attainment from Internal Exam					CO Attainment from University Exam				
			CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5
1			79	68	82	79	76	50	50	50	50	50
2			54	56	43	54	67	50	50	50	50	50
3			54	71	56	73	67	80	80	80	80	80
4			91	62	68	59	73	60	60	60	60	60
5			82	80	86	70	71	60	60	60	60	60
6			89	72	60	70	88	80	80	80	80	80
7			83	77	63	77	68	60	60	60	60	60
8			81	73	60	60	70	0	0	0	0	0
9			60	80	52	61	82	0	0	0	0	0
10			51	74	63	62	57	100	100	100	100	100
11			60	82	62	50	56	90	90	90	90	90
12			79	50	62	74	88	60	60	60	60	60
13			79	66	73	84	61	90	90	90	90	90
14			77	76	82	63	57	70	70	70	70	70
15			81	81	63	72	71	0	0	0	0	0
16			53	45	51	57	63	60	60	60	60	60
17			53	59	67	59	59	90	90	90	90	90
18			74	51	76	52	65	70	70	70	70	70
19			59	63	70	71	37	70	70	70	70	70
20			71	37	89	71	59	60	60	60	60	60
21			54	69	64	61	81	70	70	70	70	70
22			48	71	91	63	66	90	90	90	90	90
23			82	61	51	76	85	80	80	80	80	80
24			72	67	59	60	62	60	60	60	60	60
25			46	69	54	64	48	60	60	60	60	60
26			46	82	63	61	45	80	80	80	80	80
27			75	66	65	76	77	50	50	50	50	50
28			75	67	71	61	77	80	80	80	80	80
29			58	66	52	58	72	50	50	50	50	50
30			38	80	68	82	70	90	90	90	90	90
31			64	69	84	59	72	80	80	80	80	80
32			76	45	67	77	45	60	60	60	60	60
33			60	86	43	65	60	60	60	60	60	60
34			86	41	70	55	49	60	60	60	60	60
35			79	74	63	68	51	80	80	80	80	80
36			74	57	68	88	74	80	80	80	80	80

S. No.	Univ. Roll No.	Name	CO Attainment from Internal Exam					CO Attainment from University Exam				
			CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5
37			66	50	58	64	97	70	70	70	70	70
38			77	77	77	78	78	60	60	60	60	60
39			82	87	68	83	63	90	90	90	90	90
40			84	56	61	66	64	80	80	80	80	80
41			74	88	64	80	90	80	80	80	80	80
42			73	93	80	47	73	60	60	60	60	60
43			74	47	72	67	48	70	70	70	70	70
44			70	94	62	62	62	80	80	80	80	80
45			77	81	71	63	83	80	80	80	80	80
46			71	73	76	69	83	80	80	80	80	80
47			86	67	59	42	71	0	0	0	0	0
48			74	79	88	69	76	70	70	70	70	70
49			88	58	76	77	86	80	80	80	80	80
Total number of students scored more than/equal to threshold (60% for Internal Exam and 50% for University Exam)			37	36	36	38	37	45	45	45	45	45
Percentage of students scored more than/equal to threshold			76	73	73	78	76	92	92	92	92	92
Attainment Level			2	2	2	2	2	3	3	3	3	3

Table 7.13: Direct attainment

Indirect Attainment (End Semester Students' Survey)

CO1	CO2	CO3	CO4	CO5
2.52	2.81	2.63	2.52	2.71

Table 7.14: Indirect attainment

Overall CO Attainment

	Weightage	CO1	CO2	CO3	CO4	CO5
Internal Exam	20%	2	2	2	2	2
University Exam	80%	3	3	3	3	3
CO Attainment (from IE and UE)	90%	2.80	2.80	2.80	2.80	2.80
End Semester Course Survey	10%	2.52	2.81	2.63	2.52	2.71
Final CO Attainment		2.77	2.80	2.78	2.77	2.79
Overall CO Attainment		2.78				

Table 7.15: Overall CO attainment

7.7 Assessment and Attainment for Laboratory Courses

Similar process is adopted for laboratory courses. For internal and external assessments, attainment level of each CO (considering all students) is obtained as per following table:

Threshold Marks for Internal Exam Set by Program	Threshold Marks for University Exam Set by Program
Attainment Level: 3 ($\geq 80\%$ students scoring \geq threshold marks) 2 ($\geq 70\%$ students scoring \geq threshold marks) 1 ($\geq 60\%$ students scoring \geq threshold marks)	

Table 7.16: Threshold marks and attainment level for laboratory courses

7.8 Process of Set Target Identification

X: Set Target		Y: Attainment
Rule No.	Condition	Action / Decision
1	$Y \geq X$ and $(Y-X) \leq 10\%$	Next year's target = $X + 10\%X = 1.1X$
2	$Y > X$ and $(Y-X) > 10\%$	Next year's target = Y
3	$Y \geq 90\%$ means 2.7 in 3 scale	Increase thresholds (internal/external) by 10%; redefine target = 60% i.e. 1.8 in 3 scale
4	Threshold > 80%	Increase rubric % by 10%; redefine target = 60%; threshold = 60% (internal), 50% (external)
5	$Y < X$ and $(X - Y) \leq 10\%$	Next year's target = $Y + 10\%Y = 1.1Y$
6	$Y < X$ and $(X - Y) > 10\%$	Next year's target = Y
7	$Y < X$ for two consecutive years	Keep target constant until Y reaches X

Table 7.17: Table for set target identification

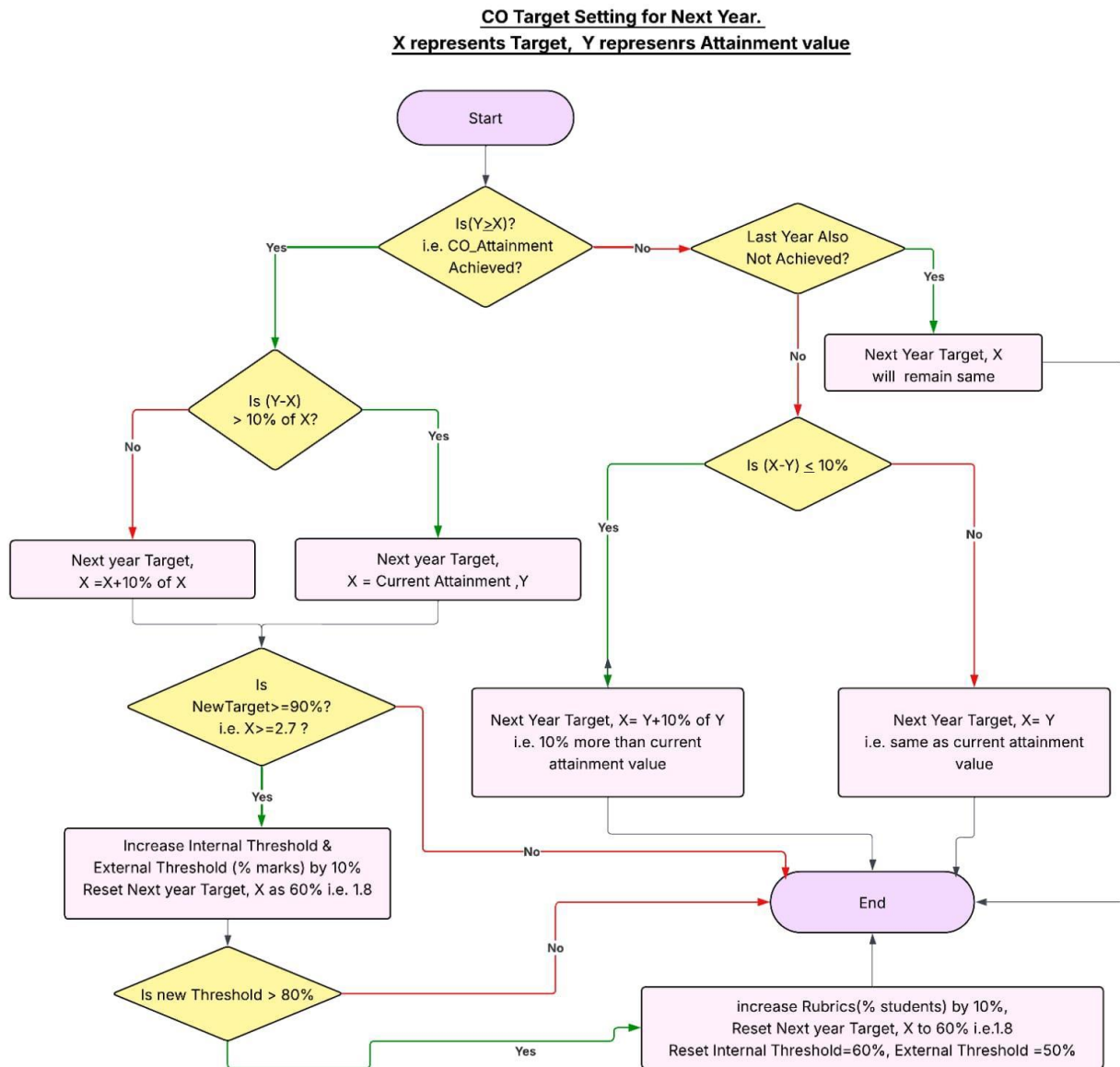


Fig. 7.3: Flowchart for set target identification

CHAPTER: 8

PO AND PSO ASSESSMENT AND ATTAINMENT PROCESS

- Both direct and indirect evaluation strategies are used to evaluate the accomplishment of POs and PSOs.
- Based on the students' performance on university exams and continuous assessments, POs and PSOs are directly evaluated.

The Program Exit Survey, Alumni Survey, Parent Survey, and Employer Survey serve as the foundation for indirect assessment.

8.1 Direct Assessment

8.1.1 PO & PSO Attainment through CO-PO Mapping from Syllabus and Project

Through Internal Assessment Tests, Assignments and Model Examination, the faculty member assesses the Program Outcomes and Program Specific Outcomes. POs & PSOs are assessed using the result obtained for every course and the CO-PO/PSO Mapping. The Weightage for this is fixed as 70%. Each individual Project is mapped with the POs and PSOs based on the title of the project and the corresponding attainment is calculated for the project and weightage assigned for this is 30%.

8.1.2 PO & PSO Attainment through Curriculum Gap Filler Activities

- To address this curriculum gap, certain curriculum gap activities are carried out. They are mapped to PO1-PO12, PSO1 and PSO2.
- Attainment values are calculated based on the activities conducted and weightage for PO5-PO12 is fixed as 50%.

8.1.3 Rubrics for Project Evaluation

Components of Assessment for 7th Semester Evaluation

Assessment Type	Evaluation method	Evaluator	Assessment rubrics	Percentage of marks
0 th Review	Project synopsis, Demonstration	Project Review Committee	Reviewers comment	Approved / modification required
Midterm evaluation	Presentation slides, Demonstration	Project Review Committee & other Panel members	Rubrics R1	20%
End semester evaluation	Report, Presentation slides, Demonstration, Execution	External examiner	Rubrics R2	60%
Internal evaluation by Supervisor	Periodic report to the supervisor	Supervisor	Rubrics R3	20%

Table 8.1: Components of assessment for 7th semester evaluation

Rubrics for Midterm Evaluation (R1)

Evaluation method	Parameters	Level of Achievement				
		Excellent (5)	Good (4)	Satisfactory (3)	Needs improvement (2)	Poor (1)
Project Report/ PPT	Survey of existing work & challenge identification	Comprehensive review with clear articulation of gaps and challenges	Adequate review with some challenge identification	Basic review with limited challenge insight	Minimal review, vague challenges	No review or irrelevant content
	Clarity of problem statement and well-defined objectives	Clear, concise problem statement with well-defined objectives	Mostly clear with minor ambiguities	Understandable but lacks clarity or completeness	Vague or incomplete objectives	No clear problem statement
	Identifying the solution methods & resources	Innovative and feasible methods with well-justified resources	Appropriate methods with reasonable resource identification	Basic methods with limited resource planning	Incomplete or unclear methods/ resources	No clear methods or resources
Individual Presentation & Viva-Voce	Individuals understanding	Demonstrates deep understanding and ownership of the project	Good grasp of concepts and project scope	Basic understanding with some gaps	Limited understanding, needs guidance	No clear understanding of the project

Table 8.2: Rubrics for midterm evaluation

Rubrics for End Semester Evaluation (R2)

Report (20)	Level of Achievement				
Parameters	Excellent (5)	Good (4)	Satisfactory (3)	Needs improvement (2)	Poor (1)
Report format	Strict adherence to format with professional presentation	Mostly follows format with minor deviations	Acceptable format with noticeable issues	Poor formatting and structure	No adherence to format
References and citations	All references are relevant, properly cited, and well-organized	Most references are cited correctly	Some references cited, but inconsistently	Few references, poorly cited	No references or citations
Diagrams / Circuits / Flow charts	clear, relevant, and enhance understanding	mostly appropriate and neat	present but basic	unclear or irrelevant	No or poorly drawn
Contents	Chapters are well-written, logically structured, and formatted professionally	Mostly clear and structured chapters	Acceptable content with some formatting issues	Disorganized or unclear chapters	Poorly written or missing content

Table 8.3: Rubrics for end semester evaluation for Report

Presentation (20)	Level of Achievement				
Parameters	Excellent (5)	Good (4)	Satisfactory (3)	Needs improvement (2)	Poor (1)
Explanation and understanding of the project	Clear, confident explanation with deep understanding	Good explanation with sound understanding	Basic explanation with some gaps	Limited explanation and understanding	No clear explanation or understanding
Communication Skill	Highly articulate and confident delivery	Good communication with minor issues	Understandable but lacks confidence	Hesitant or unclear communication	Incoherent or no communication
Slides	Visually appealing slides with strong demos	Good slides with relevant visuals	Basic slides with limited visuals	Poorly constructed slides	No visuals or ineffective slides
Teamwork & coordination	Excellent coordination and shared responsibility	Good teamwork	Acceptable coordination	Limited collaboration	No teamwork

Table 8.4: Rubrics for end semester evaluation for Presentation

Design and Implementation (20)	Level of Achievement				
Parameters	Excellent (5)	Good (4)	Satisfactory (3)	Needs improvement (2)	Poor (1)
Execution	Implementation as per plan	Partly implemented	Basic implementation with some issues	Incomplete or inefficient design	No working design
Demonstrations of Working Model	Excellent & Flawless	Clear & Effective	Partial but functional	Incomplete & unclear	Failed to demonstrate
Results	Results are well-validated and critically interpreted	Results are mostly accurate and analyzed	Basic results with limited analysis	Incomplete or poorly analyzed results	No results or analysis
Novelty & Innovation	Exceptional creativity and novel application	Good innovation and application	Some creativity evident	Minimal innovation	No creativity or innovation

Table 8.5: Rubrics for end semester evaluation for Design and Implementation

Rubrics for Internal Evaluation by Supervisor (R3)

Parameters	Level of Achievement				
	Excellent (5)	Good (4)	Satisfactory (3)	Needs improvement (2)	Poor (1)
Adapting new Ideas/ Technologies	Have passion for learning	Shows interest in learning	Willing to learn with guidance	Reluctant to explore new ideas	No interest in learning
Self-motivation and determination	Highly motivated and consistently driven	Good motivation and effort	Acceptable motivation	Needs encouragement	Lacks motivation
Regularity and consistency	Consistently reports progress and maintains steady work	Regular updates with minor lapses	Occasional reporting and work	Irregular reporting and inconsistent effort	No reporting or progress
Team Work	Excellent collaboration and communication	Good team interaction	Acceptable group work	Limited collaboration	Almost no teamwork

Table 8.6: Rubrics for internal evaluation by Supervisor

Components of Assessment for 8th Semester Evaluation

Assessment Type	Evaluation method	Evaluator	Assessment rubrics	Percentage of marks
Mid-term evaluation	Presentation slides, Demonstration	Project Review Committee	Rubrics R1	20%
Final evaluation	Report, Presentation slides, Demonstration, Execution	External examiner	Rubrics R2	60%
Internal evaluation by Supervisor	Periodic report to the supervisor	Supervisor	Rubrics R3	20%

Table 8.7: Components of assessment for 8th semester evaluation

Rubrics for Midterm Evaluation (R1)

Evaluation method	Parameters	Level of Achievement				
		Excellent (5)	Good (4)	Satisfactory (3)	Needs improvement (2)	Poor (1)
Project Report/ PPT	Incorporation of Suggestions	Effectively applies and builds on feedback for strong improvement	Applies feedback well with noticeable improvement	Applies some feedback with moderate improvement	Applies feedback partially with limited effect	Ignores or misapplies feedback; no improvement
	Further Implementations	Proposes innovative and practical extensions beyond current work	Suggests relevant and achievable improvements	Offers basic ideas for future enhancement	Provides limited or vague future suggestions	No meaningful ideas for further implementation
	Partial Result Analysis	Analyzes results thoroughly with clear insights and interpretations	Provides good analysis with relevant observations	Basic analysis with some relevant points	Limited analysis with minimal understanding	No meaningful analysis or interpretation
Individual Presentation & Viva-Voce	Individuals understanding	Demonstrates deep understanding and ownership of the project	Good grasp of concepts and project scope	Basic understanding with some gaps	Limited understanding, needs guidance	No clear understanding of the project

Table 8.8: Rubrics for midterm evaluation

Rubrics for Final Evaluation (R2)

Report (20)	Level of Achievement				
Parameters	Excellent (5)	Good (4)	Satisfactory (3)	Needs improvement (2)	Poor (1)
Report format	Strict adherence to format with professional presentation	Mostly follows format with minor deviations	Acceptable format with noticeable issues	Poor formatting and structure	No adherence to format
References and citations	All references are relevant, properly cited, and well-organized	Most references are cited correctly	Some references cited, but inconsistently	Few references, poorly cited	No references or citations
Diagrams / Circuits / Flow charts	clear, relevant, and enhance understanding	mostly appropriate and neat	present but basic	unclear or irrelevant	No or poorly drawn
Contents	Chapters are well-written, logically structured, and formatted professionally	Mostly clear and structured chapters	Acceptable content with some formatting issues	Disorganized or unclear chapters	Poorly written or missing content

Table 8.9: Rubrics for end semester evaluation for Report

Presentation (20)	Level of Achievement				
Parameters	Excellent (5)	Good (4)	Satisfactory (3)	Needs improvement (2)	Poor (1)
Explanation and understanding of the project	Clear, confident explanation with deep understanding	Good explanation with sound understanding	Basic explanation with some gaps	Limited explanation and understanding	No clear explanation or understanding
Communication Skill	Highly articulate and confident delivery	Good communication with minor issues	Understandable but lacks confidence	Hesitant or unclear communication	Incoherent or no communication
Slides	Visually appealing slides with strong demos	Good slides with relevant visuals	Basic slides with limited visuals	Poorly constructed slides	No visuals or ineffective slides
Teamwork & coordination	Excellent coordination and shared responsibility	Good teamwork	Acceptable coordination	Limited collaboration	No teamwork

Table 8.10: Rubrics for end semester evaluation for Presentation

Design and Implementation (20)	Level of Achievement				
	Excellent (5)	Good (4)	Satisfactory (3)	Needs improvement (2)	Poor (1)
Execution	Complete Implementation as per plan	Partly implemented	Basic implementation with some issues	Incomplete or inefficient design	No working design
Demonstrations of Working Model	Excellent & Flawless	Clear & Effective	Partial but functional	Incomplete & unclear	Failed to demonstrate
Results	Results are well-validated and critically interpreted	Results are mostly accurate and analyzed	Basic results with limited analysis	Incomplete or poorly analyzed results	No results or analysis
Novelty & Innovation	Exceptional creativity and novel application	Good innovation and application	Some creativity evident	Minimal innovation	No creativity or innovation

Table 8.11: Rubrics for end semester evaluation for Design and Implementation

Rubrics for Internal Evaluation by Supervisor (R3)

Parameters	Level of Achievement				
	Excellent (5)	Good (4)	Satisfactory (3)	Needs improvement (2)	Poor (1)
Adapting new Ideas/ Technologies	Have passion for learning	Shows interest in learning	Willing to learn with guidance	Reluctant to explore new ideas	No interest in learning
Self-motivation and determination	Highly motivated and consistently driven	Good motivation and effort	Acceptable motivation	Needs encouragement	Lacks motivation
Regularity and consistency	Consistently reports progress and maintains steady work	Regular updates with minor lapses	Occasional reporting and work	Irregular reporting and inconsistent effort	No reporting or progress
Team Work	Excellent collaboration and communication	Good team interaction	Acceptable group work	Limited collaboration	Almost no teamwork

Table 8.12: Rubrics for internal evaluation by Supervisor

8.1.4 Curriculum Gap Filler Activities and Rubrics

S. No.	Activities	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
1	Professional Society Activities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Extension Activities						✓	✓	✓	✓	✓	✓			
3	Industrial Visit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
4	Internship / Industrial Training	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	Guest Lecture	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓
6	IIC & Entrepreneurship Development Activities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	Technical Events and Hackathon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	Skill Development Program	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
9	Value Added Courses / MOOCs	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
10	Placement Readiness Program	✓	✓	✓	✓	✓			✓	✓	✓		✓	✓	✓
11	Sports, Yoga, Cultural (Literary/Performing Arts/ Visual Arts/ Orators), and NSS Activities						✓	✓	✓	✓	✓	✓	✓		
12	Innovative Projects	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 8.13: Curriculum gap filler activities

Attainment values are calculated based on the activities conducted and weightage for PO5-PO12 is fixed as 50%.

Rubrics for Gap Filler Activities

S. No.	Activity	Organized/ Attended	Level 3	Level 2	Level 1
1	Professional Society Activities	Organized	More than 5	3 to 5	Less than 3
2	Extension Activities	Attended	More than 50% of students participation	30%- 50% of students participation	Less than 30% of students participation
3	Industrial Visit	Organized	More than 5	3 to 5	Less than 3
4	Internship / Industrial Training	Attended	More than 50% of students participation	30%- 50% of students participation	Less than 30% of students participation
5	Guest Lecture	Organized	More than 5	3 to 5	Less than 3
6	IIC & Entrepreneurship Development Activities	Organized	More than 5	3 to 5	Less than 3
7	Technical Events and Hackathon	Attended	More than 50% of students participation	30%- 50% of students participation	Less than 30% of students participation
8	Skill Development Program	Attended	More than 50% of students participation	30%- 50% of students participation	Less than 30% of students participation
9	Value Added Courses / MOOCs	Attended	More than 50% of students participation	30% to 50% of students participation	Less than 30% of students participation
10	Placement Readiness Program	Attended	More than 90% of students participation	75% to 90% of students participation	Less than 75% of students participation
11	Sports, Yoga, Cultural (Literary/Performing Arts/ Visual Arts/ Orators), and NSS Activities	Attended	More than 50% of students participation	30% to 50% of students participation	Less than 30% of students participation
12	Innovative Projects	Attended	More than 30% of students participation	20% to 30% of students participation	Less than 20% of students participation

Table 8.14: Rubrics for curriculum gap filler activities

8.2 Indirect Assessment

Indirect surveys allow for a more holistic evaluation of the accreditation process by capturing the perspectives of a diverse range of stakeholders including alumni, employers, parents, and outgoing students of the Institution. This feedback is essential for identifying strengths and weaknesses in the accreditation process from the perspective of the accredited Institutions.

Indirect surveys contribute to the continuous improvement of the Institution. Feedback from various stakeholders can highlight areas where the process can be refined, enhanced, or adapted to better meet the evolving needs of the industry and academia.

8.2.1 Exit Survey

Purpose: Exit survey is conducted to record the significant understanding of the students about their overall educational experience.

Target Audience: Graduating students.

Questions:

- To gather feedback about their perception on Program Outcomes, Program Specific Outcomes and the other aspects.
- To know their plans for future after graduation.

8.2.2 Alumni Survey

Purpose: This allows the Institute to gather insights into the career progression of alumni and assess the effectiveness of the education in the long term.

Survey collected from: Alumni of the institution.

Questions:

- Evaluate the impact of their education on their professional development.
- Assess the relevance of the programme to their careers.

8.2.3 Parent/Guardian Survey

Purpose: Gain valuable insights into various aspects of their operations, leading to informed

decision-making, targeted improvements, and the overall enhancement of the educational experience provided to students.

Survey collected from: Parents or guardians of the students.

Questions:

- To assess satisfaction with the educational quality of the programme of their wards.
- Identify any concerns or suggestions for improvement.

8.2.4 Employer Survey

Purpose: Conducted in fostering a positive workplace, improving organizational performance, and ensuring that the needs and expectations of employees are met.

Survey collected from: Employers of alumni and from all engineering and technology programs.

Questions:

- To gather feedback about their perception on Program Outcomes and Program Specific Outcomes, Program Educational Objectives, Vision and Mission of the Institute and the Department.
- Suggestions for Improvement.

8.3 Rubrics for PO and PSO Attainment

Assessment Through					Total Attainment			
Direct Attainment	Course PO/PSO Attainment	Through Course Assessment	70%	100%	PO1-PO4, PSO1 & PSO2 100%	PO1-PO12, PSO1 & PSO2 100%	80%	Overall PO1-PO12, PSO1 & PSO2 100%
	Project Attainment	Through Project Assessment	30%		PO5-PO12 50%			
	Curriculum Gap Filler Attainment	Through Gap Filler Activities		100%	PO5-PO12 50%			
Indirect Attainment	Stakeholder Survey (Parent, Alumni, Employer, Exit Survey) [25% from each Survey]				PO1-PO12, PSO1 & PSO2 100%	20%		

Table 8.15: Rubrics for PO and PSO attainment

8.4 Process for Calculation of PO and PSO Attainment

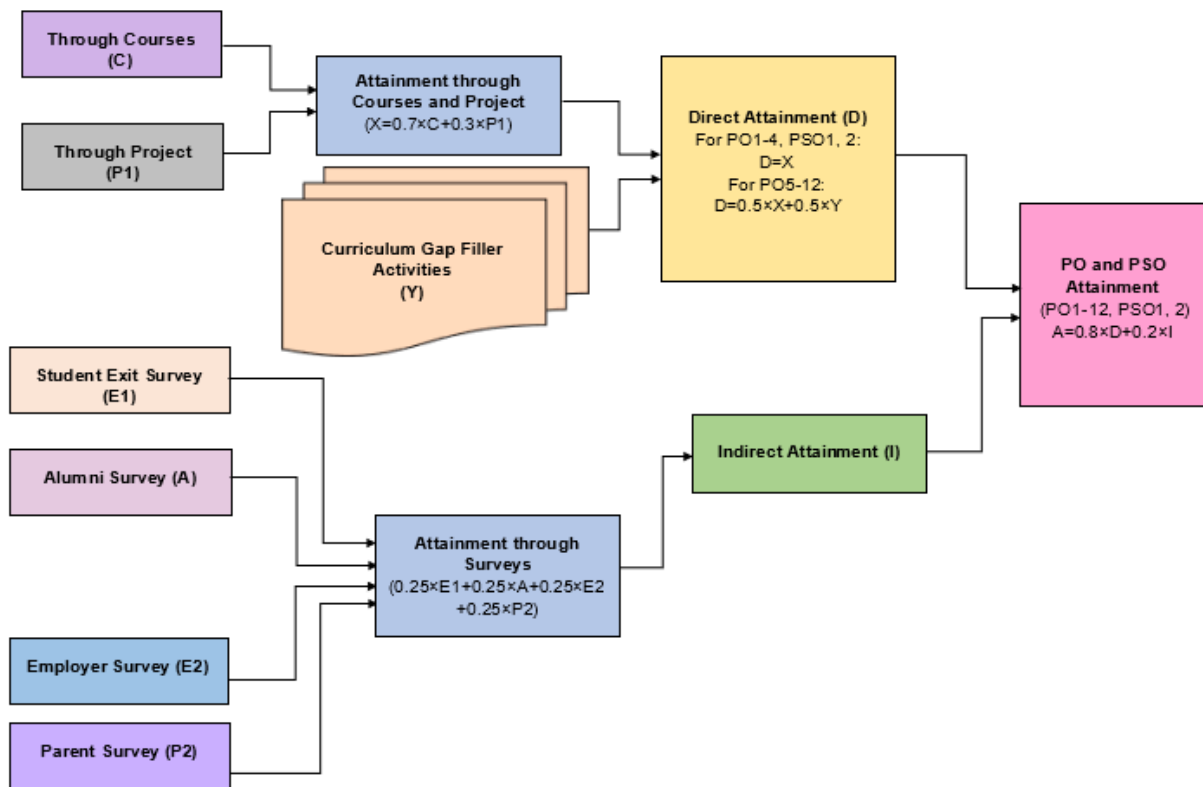


Fig 8.1: Calculation process of PO/PSO attainment

8.5 PO and PSO Attainment Calculation

Step 1: To calculate the attainment of PO and PSO first the PO and PSO mapping values from the syllabus for all the courses are tabulated.

S. No.	Course Index	Subject Name	Course Code	PO/PSO Values from CO-PO Mapping													
				PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
1	C101	Physics-I(Gr-A)	BS-PH101	2	2	1	1	-	-	-	-	-	-	-	-	1	-
2	C102	Mathematics –IA	BS-M101	3	2	1	2	-	-	-	1	-	-	-	-	2	1
3	C103	Basic Electrical Engineering	ES-EE101	3	2	2	2	-	-	-	1	1	1	-	-	1	1
4	C104	Physics-I Laboratory (Gr-A)	BS-PH191	3	2	1	2	-	-	-	3	2	1	-	-	-	-
5	C105	Basic Electrical Engineering Laboratory	ES-EE191	3	2	2	2	-	-	-	1	1	1	-	-	1	1
6	C106	Workshop/Manufacturing Practices (Gr-A)	ES-ME192	3	2	1	2	-	-	-	-	1	1	-	1	-	-
7	C107	Chemistry-I(Gr-A)	BS-CH201	3	2	1	1	-	-	-	1	-	-	-	-	-	-
8	C108	Mathematics –IIA	BS-M201	3	2	1	2	-	-	-	1	-	-	-	1	2	1
9	C109	Programming for Problem Solving	ES-CS201	3	2	1	2	-	-	-	1	-	-	-	-	2	2
10	C110	English	HM-HU201	2	2	1	1		1	1	1	-	3	-	-	1	1
11	C111	Chemistry-I Laboratory (Gr-A)	BS-CH291	3	2	1	1	-	-	-	1	1	1	-	-	-	-
12	C112	Programming for Problem Solving	ES-CS291	3	2	1	2	-	-	-	1	-	-	-	-	2	2
13	C113	Engineering Graphics & Design (Gr-A)	ES-ME291	3	2	1	2	3	-	-	-	-	1	-	1	-	-
14	C114	Language Laboratory	HM-HU291	3	2	1	2	-	-	-	-	3	3	-	-	1	1
15	C201	Analog & Digital Electronics	ESC-301	2	2	2	2	-	-	-	1	-	-	-	1	1	-
16	C202	Data Structure & Algorithm	PCC-CS301	3	2	1	2	-	-	-	1	-	-	-	-	2	2

Table 8.16: PO and PSO values for various courses

Step 2: The PO and PSO attainment for all courses are calculated from PO/PSO mapping of the syllabus and attained CO Values.

S. No	Course Index	Subject Name	Course Code	Attained CO Values	PO/PSO Attainment													
					PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
1	C101	Physics-I (Gr-A)	BS-PH101	2.95	1.97	1.97	0.98	0.98	-	-	-	-	-	-	-	-	0.98	-
2	C102	Mathematics –IA	BS-M101	2.96	2.96	1.98	0.99	1.97	-	-	-	0.99	-	-	-	-	1.97	0.99
3	C103	Basic Electrical Engineering	ES-EE101	2.88	2.54	1.59	1.59	1.59	-	-	-	0.95	0.95	0.95	-	-	0.95	0.95
4	C104	Physics-I Laboratory (Gr-A)	BS-PH191	2.93	2.94	1.96	0.98	1.96	-	-	-	2.94	1.96	0.98	-	-	-	-
5	C105	Basic Electrical Engineering Laboratory	ES-EE191	2.94	2.85	1.9	1.9	1.9	-	-	-	0.95	0.95	0.95	-	-	0.95	0.95
6	C106	Workshop/Manufacturing Practices (Gr-A)	ES-ME192	2.92	2.92	1.9	0.97	1.9	-	-	-	-	0.97	0.97	-	0.97	-	-
7	C107	Chemistry-I (Gr-A)	BS-CH201	2.94	2.94	1.96	0.98	0.98	-	-	-	0.98	-	-	-	-	-	-
8	C108	Mathematics –IIA	BS-M201	2.83	2.83	1.89	0.94	1.89	-	-	-	0.94	-	-	-	0.94	1.89	0.94
9	C109	Programming for Problem Solving	ES-CS201	2.83	2.45	1.88	0.94	1.88	-	-	-	0.94	-	-	-	-	1.88	1.88
10	C110	English	HM-HU201	2.96	1.75	1.75	0.85	0.85	-	0.85	0.85	0.85	-	2.5	-	-	0.85	0.85
11	C111	Chemistry-I Laboratory (Gr-A)	BS-CH291	2.94	2.94	1.96	0.98	0.98	-	-	-	0.98	0.98	0.98	-	-	-	-
12	C112	Programming for Problem Solving	ES-CS291	2.93	2.7	1.8	0.9	1.8	-	-	-	0.9	-	-	-	-	1.8	1.8
13	C113	Engineering Graphics & Design (Gr-A)	ES-ME291	2.92	2.9	1.93	0.97	1.93	2.9	-	-	-	-	0.97	-	0.97	-	-
14	C114	Language Laboratory	HM-HU291	2.93	2.5	1.7	0.85	1.7	-	-	-	-	2.5	2.5	-	-	0.85	0.85
15	C201	Analog & Digital Electronics	ESC-301	2.52	1.86	1.86	1.86	1.86	-	-	-	0.93	-	-	-	0.93	0.93	-
16	C202	Data Structure & Algorithm	PCC-CS301	2.8	2.42	1.67	0.81	1.67	-	-	-	0.81	-	-	-	-	1.67	1.67

Table 8.17: PO and PSO attainment for various courses

Step 3: After calculating the PO & PSO attainment value for all courses, the average PO & PSO values are calculated which is considered as PO & PSO Attainment from the syllabus.

Semester	Sl. No.	Subject Name	Course Code	Subject Code	Attended CO Values	PO/PSO Attainment													
						PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
7	50	Cloud Computing	PEC-CS701B	C402	2.89	2.31	1.92	0.96	1.35	0.00	0.00	0.00	0.96	0.00	0.00	0.00	0.00	1.54	0.96
	51	Cyber Security	PEC-CS702E	C410	2.92	2.33	1.94	0.97	1.36	0.00	0.00	0.00	0.97	0.00	0.00	0.00	0.00	1.55	1.75
	52	Operation Research	OEC-CS701A	C411	2.94	2.94	2.35	1.37	1.96	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.98	0.98	0.98
	53	Introduction to Philosophical Thoughts	OEC-CS701C	C413	2.93	0.97	2.14	1.17	1.95	0.97	0.00	0.00	0.97	0.00	0.00	0.00	0.97	1.95	1.95
	54	Project Management and Entrepreneurship	HSMC 701	C414	2.83	2.26	2.07	1.13	1.31	0.00	0.00	0.00	0.94	0.00	0.00	0.00	0.94	1.88	1.88
8	55	Cryptography and Network Security	PEC-CS801B	C417	2.88	2.49	2.30	1.34	1.73	0.00	0.00	0.00	0.96	0.00	0.00	0.00	0.96	0.96	1.92
	56	Softskill and Interpersonal Comm	OEC-CS801E	C425	2.95	2.36	1.97	0.98	1.38	0.00	0.98	0.00	1.97	0.00	2.95	0.00	0.00	0.00	0.98
	57	E-Commerce & ERP:	OEC-CS802A	C426	2.88	2.11	1.92	0.96	1.15	0.00	0.00	0.00	0.96	0.00	0.00	0.00	0.00	0.96	2.88
					2.43	2.11	1.45	1.66	0.27	0.12	0.09	1.17	0.47	0.59	0.21	0.61	1.38	1.24	
					Mapped Courses	57	57	57	56	8	6	4	52	19	23	7	28	49	48
					Sum of Pos	138.71	120.09	82.79	94.55	15.63	7.05	4.87	66.41	26.52	33.86	11.75	34.67	78.78	69.47
					Average	2.43	2.11	1.45	1.69	1.95	1.18	1.22	1.28	1.40	1.47	1.68	1.24	1.61	1.45

Table 8.18: PO and PSO attainment from the Syllabus

Step 4: PO & PSO attainment from Project is calculated.

S. No.	Project Title	Name of the Student	Project Mark in %	PO												PSO	
				1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	Title 1	S1	100	3	2	2	1	2	2	1	2	3	3	3	3	2	2
		S2	100	3	2	2	1	2	2	1	2	3	3	3	3	2	2
		S3	100	3	2	2	1	2	2	1	2	3	3	3	3	2	2
2	Title2	S1	100	3	2	3	2	2	2	2	2	3	3	3	3	2	2
		S2	100	3	2	3	2	2	2	2	2	3	3	3	3	2	2
		S3	100	3	2	3	2	2	2	2	2	3	3	3	3	2	2
3	Title 3	S1	100	3	2	2	1	2	2	1	2	3	3	3	3	2	1
		S2	90	2.7	1.8	1.8	0.9	1.8	1.8	0.9	1.8	2.7	2.7	2.7	2.7	1.8	0.9
		S3	90	2.7	1.8	1.8	0.9	1.8	1.8	0.9	1.8	2.7	2.7	2.7	2.7	1.8	0.9

Table 8.19: PO and PSO attainment from the Project

Step 5: PO1-PO12, PSO1 and PSO2 attainment values are calculated from curriculum gap filler activities.

S. No.	Activity	Mapping with POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	Professional Society Activities	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	Extension Activities	PO6, PO7, PO8, PO9, PO10, PO11						3	3	3	3	3	3			
3	Industrial visit	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO10, PO12, PSO1, PSO2	2	2	2	2	2		2	2	2	2		2	2	2
4	Internship / Industrial Training	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
5	Guest Lecture	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO10, PO12, PSO1, PSO2	3	3	3	3	3	3	3	3		3		3	3	3
6	IIC & Entrepreneurship Development activities	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
7	Technical Events and Hackathon	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
8	Skill Development Program	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2	3	3	3	3	3		3	3	3	3	3	3	3	3
9	Value Added Courses / MOOCs	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2	3	3	3	3	3		3	3	3	3	3	3	3	3
10	Placement readiness Program	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO12, PSO1, PSO2	3	3	3	3	3			3	3	3		3	3	3
11	Sports	PO8, PO9, PO10, PO12								3	3	3		3		
12	Yoga	PO7, PO8, PO9, PO10, PO12							3	3	3	3		3		
13	Cultural activities (Literary/Performing Arts/ Visual Arts/ Orators)	PO7, PO8, PO9, PO10, PO11, PO12							3	3	3	3	3	3		
14	NSS activity	PO6, PO7, PO8, PO9, PO10, PO11, PO12						3	3	3	3	3	3	3		
15	Innovative Projects	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Average			2.6	2.6	2.6	2.6	2.6	2.63	2.69	2.73	2.71	2.73	2.7	2.71	2.6	2.6

Table 8.20: PO and PSO attainment from the Curriculum Gap Filler Activities

Step 6: The Indirect Attainment values are obtained from Exit, Alumni, Parents and Employers survey.

PO Attainment Table

PO Attainment Attributes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Course PO Attainment	2.43	2.11	1.45	1.69	1.95	1.18	1.22	1.28	1.40	1.47	1.68	1.24	1.61	1.45
Project PO Attainment	2.26	2.43	2.57	2.05	2.43	2.13	2.03	1.85	2.58	1.81	1.80	2.10	2.22	2.30
(70% of Course PO Attainment+30% of Project)	2.38	2.20	1.79	1.80	2.10	1.46	1.46	1.45	1.75	1.57	1.71	1.50	1.79	1.70
Curriculum Gap Fillers					2.6	2.63	2.69	2.73	2.71	2.73	2.7	2.71		
Direct PO Attainment (Course & Curriculum Gap Fillers) For PO1-4, PSO1, 2, Direct Attainment is 100% of (Course + Project) For PO5-12, Direct Attainment is 50% of (Course + Project) and 50% of Curriculum Gap Fillers	2.38	2.20	1.79	1.80	2.35	2.05	2.08	2.09	2.23	2.15	2.21	2.11	1.79	1.70

Table 8.21: Direct PO and PSO attainment

Total PO and PSO Attainment (Direct and Indirect)

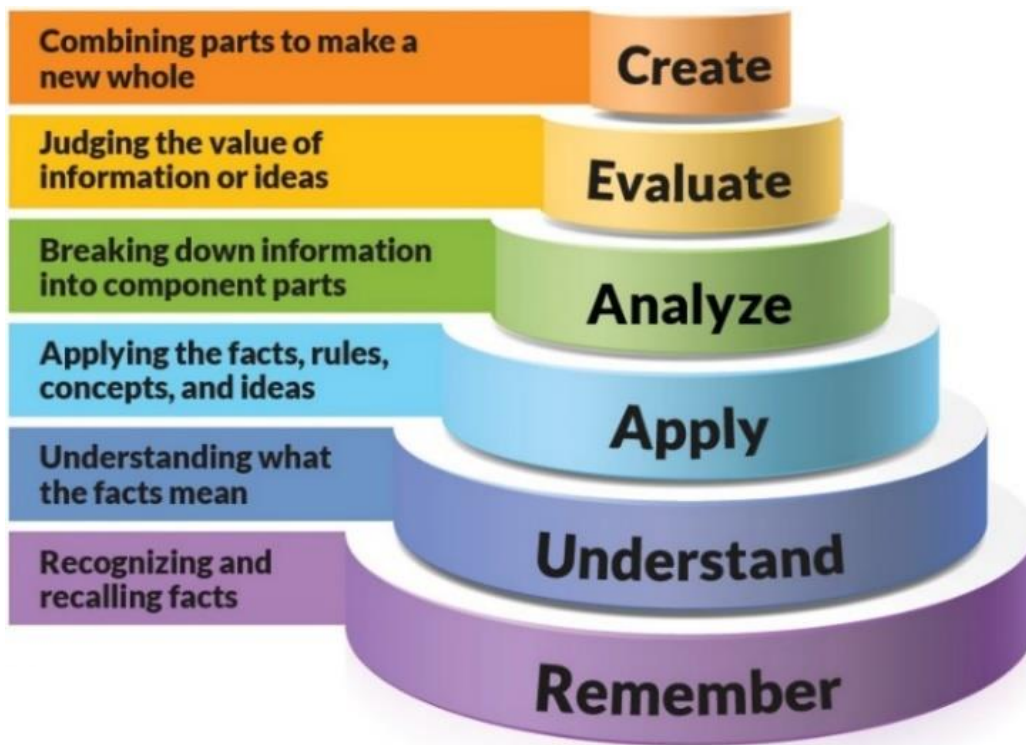
PO Attainment Attributes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
PO Attainment (Direct Attainment)	2.38	2.20	1.79	1.80	2.35	2.05	2.08	2.09	2.23	2.15	2.21	2.11	1.79	1.70
PO Attainment from Stakeholder Survey (Indirect Attainment)	2.70	2.80	2.95	2.90	2.90	2.70	2.60	2.80	2.85	2.90	2.70	2.60	2.60	2.60
Total PO Attainment (80% of Direct Attainment+20% of Indirect Attainment)	2.44	2.32	2.02	2.02	2.46	2.18	2.18	2.23	2.35	2.30	2.31	2.21	1.95	1.88

Table 8.22: Total PO and PSO attainment (direct and indirect)

8.6 Target Fix for POs and PSOs

- The Target for POs/PSOs is fixed as 1.8 (60% with respect to 3 scale) for new syllabus (2018-2022 batch).
- If 50% or more of the POs & PSOs (7 or more POs & PSOs) met the target value, then for the next academic batch of students the target is increased by 10%.

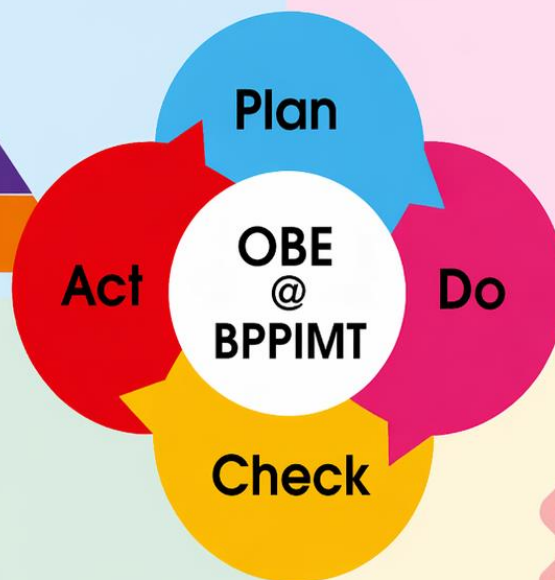
- If 25% or more of the POs & PSOs (3 to 6 POs & PSOs) met the target value, then for the next academic batch of students the target is increased by 5%.
- If less than 25% of the POs & PSOs (less than 3 POs & PSOs) met the target value, then next year's target remains the same.
- If any POs or PSOs failed to meet the target, appropriate actions are taken in the next academic year to reach the target. If the targets are achieved, to sustain that, actions are taken as a part of continuous improvement process.



Outcomes



Teaching and Learning Process



Learning outcomes

Learning activities

Learning assessment



Continuous Improvement

Assessment