



# NANDHA ENGINEERING COLLEGE

(Autonomous)

Approved By AICTE, New Delhi and  
Affiliated to Anna University, Chennai

## OUTCOME BASED EDUCATION (OBE)



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## 1. OUTCOME-BASED EDUCATION (OBE)

OBE is a student-centric teaching and learning methodology which focuses on what students know and can actually do, by restructuring of curriculum, pedagogy and assessment practices to reflect the achievement of high-order learning.

OBE is focusing on “what the students are capable of doing”. There is clarity on what is to be achieved and that achievement (outcome) is pre-determined. OBE goes beyond usual ‘structured tasks’. It demands the students to actively engaged in the learning process and demonstrate his/her skills through more challenging tasks and higher order of thinking. OBE provides a focus for assessment and help employers understand program benefits.

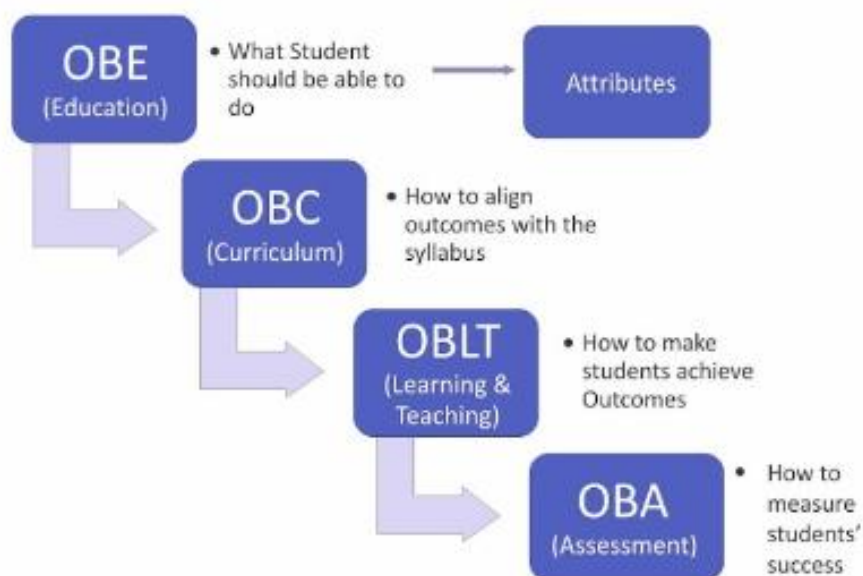


FIGURE 1.1 OUTCOME BASED EDUCATION

The implementation of an outcomes-based education adopts the OBE Framework which revolves around three important elements:

- OBE Curriculum
- OBE Teaching and Learning and
- OBE Assessment

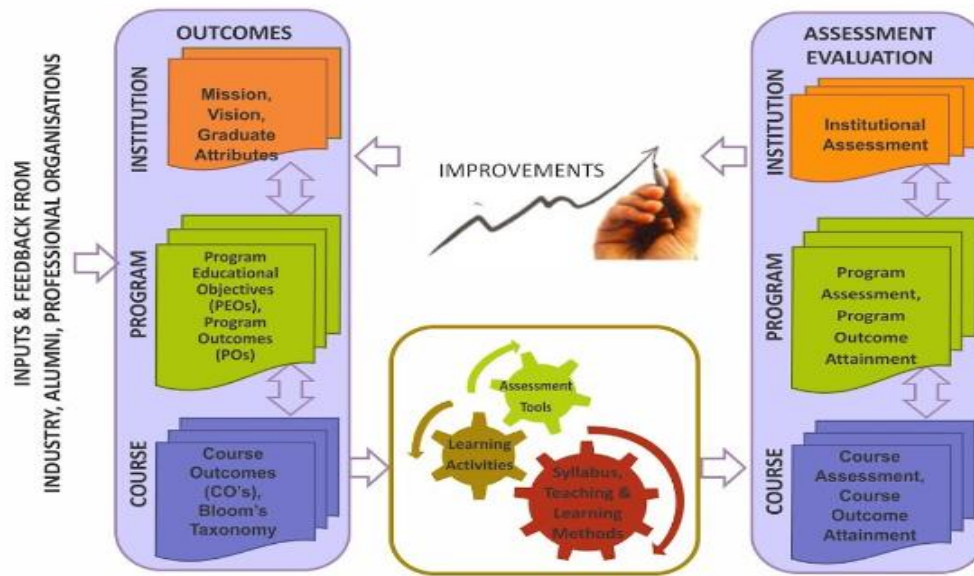


FIGURE 1.2 OUTCOME BASED EDUCATION FRAMEWORK

## 1.1 OUTCOME BASED CURRICULUM DEVELOPMENT (OBCD)

It focuses on the four distinct major components of the OBCD i.e. Curriculum Planning, Curriculum Designing, Curriculum Implementation and Curriculum Evaluation.

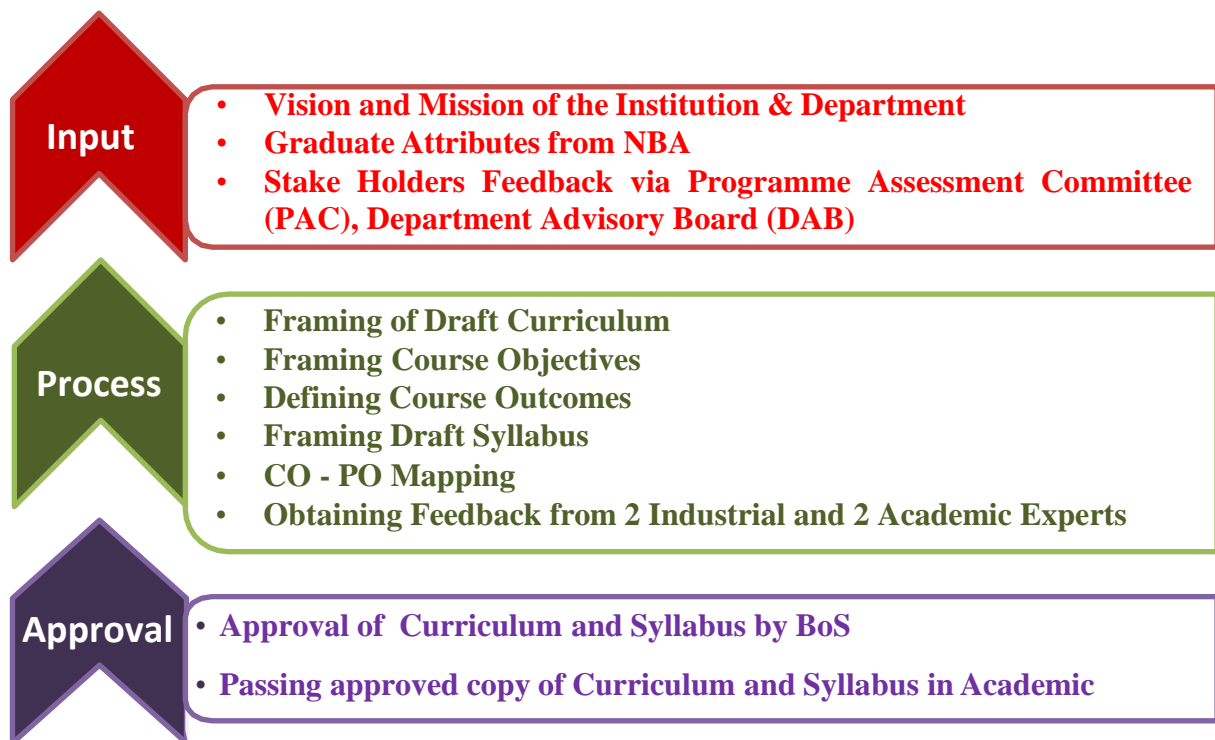


FIGURE 1.1.1 OUTCOME BASED CURRICULUM DEVELOPMENT

## 1.2 OUTCOME BASED TEACHING AND LEARNING (OBTL)

Outcome-based Teaching and Learning (OBTL) is a student-centered education approach where the programme's outcomes are explicitly defined for students to achieve. Teaching and learning activities are then designed to facilitate students to achieve these outcomes. The success of OBTL is based on evidences from the assessment results and student learning experience. Periodic reviews of these evidences will lead to continuous improvement of programme quality

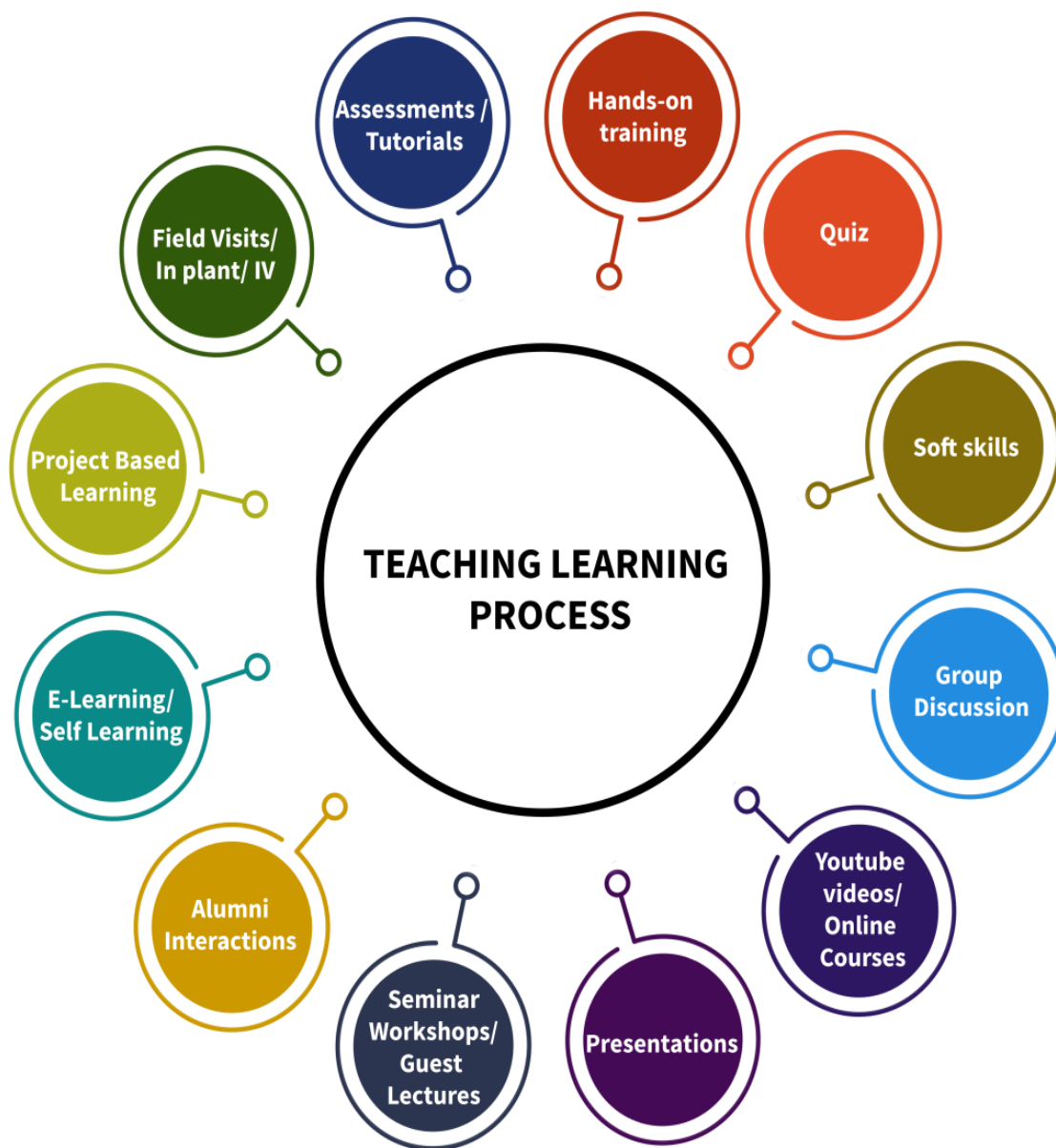


FIGURE 1.2.1 OUTCOME BASED TEACHING LEARNING PROCESS

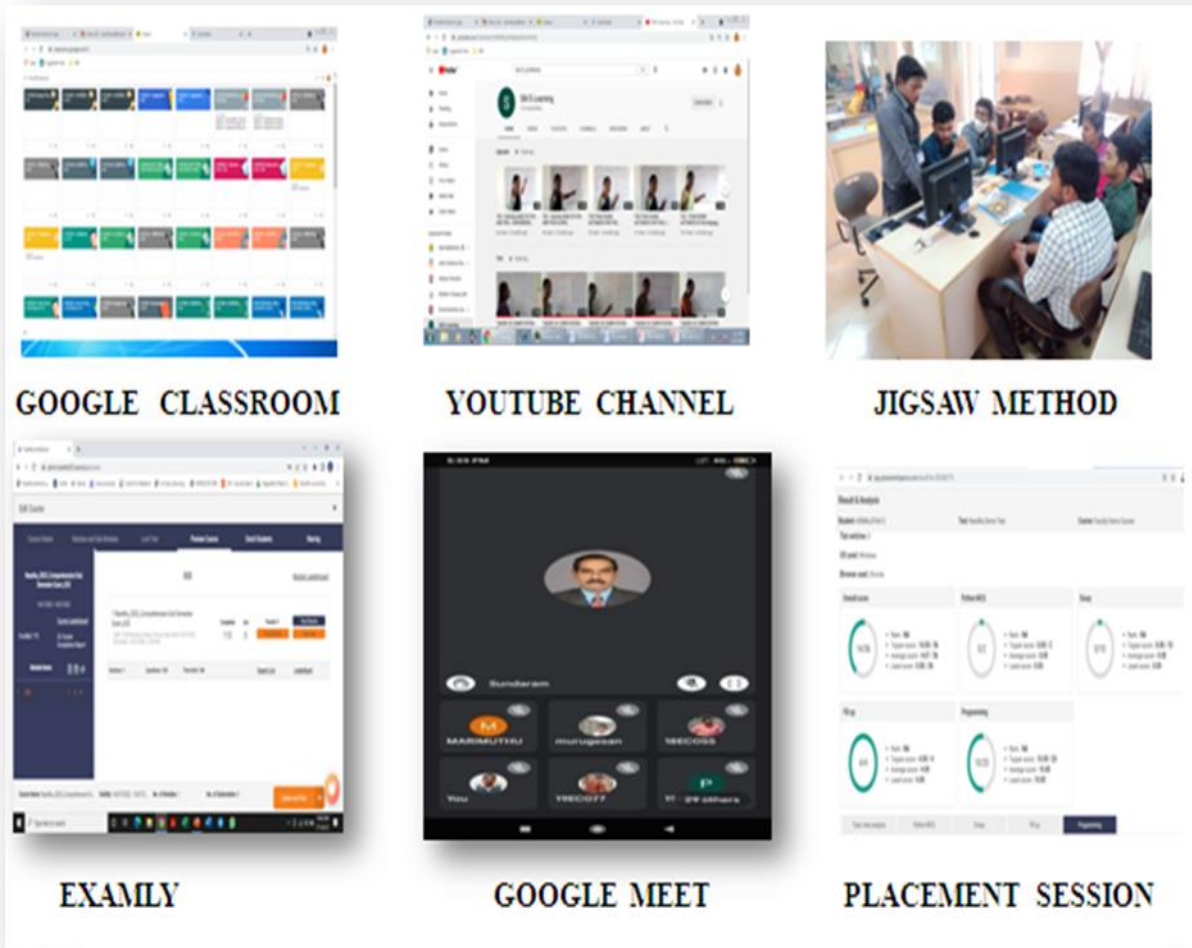
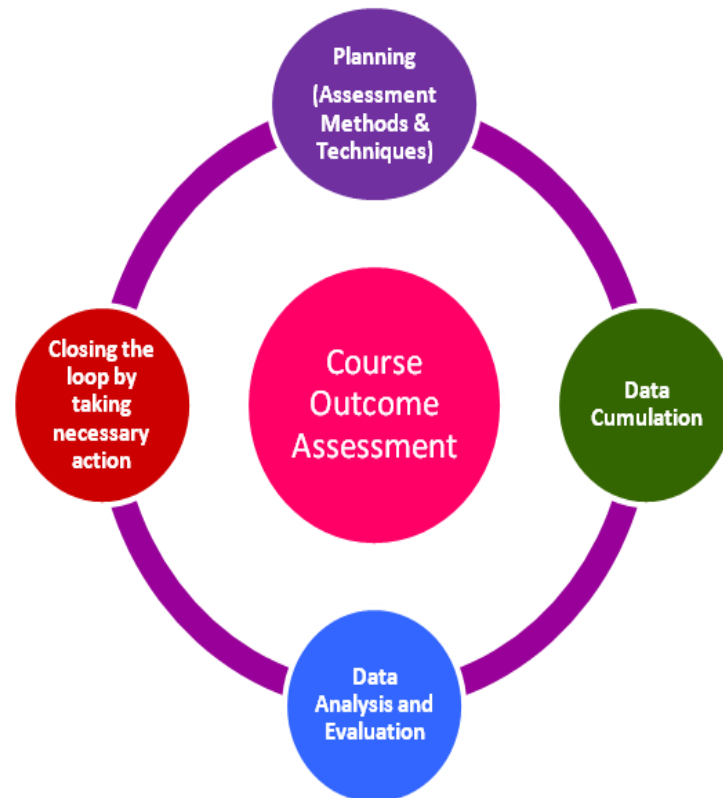


FIGURE 1.2.2 GLIMPSE OF INNOVATIVE TEACHING METHODOLOGIES

## 1.3 OUTCOME BASED ASSESSMENT (OBA)

Outcomes-based assessment is a process of gathering evidence on learning based on the number of learning outcomes achieved rather than the sum of marks on different assessment tasks.



**Figure 1.3.1 OUTCOME BASED ASSESSMENT**

## 2. VISION AND MISSION

### VISION OF THE INSTITUTE

To be an Institute of excellence providing quality Engineering, Technology and Management education to meet the ever changing needs of the society.

### MISSION OF THE INSTITUTE

- To provide quality education to produce ethical and competent professionals with social Responsibility
- To excel in the thrust areas of Engineering, Technology and Entrepreneurship by solving real- world problems.
- To create a learner centric environment and improve continually to meet the changing global needs.

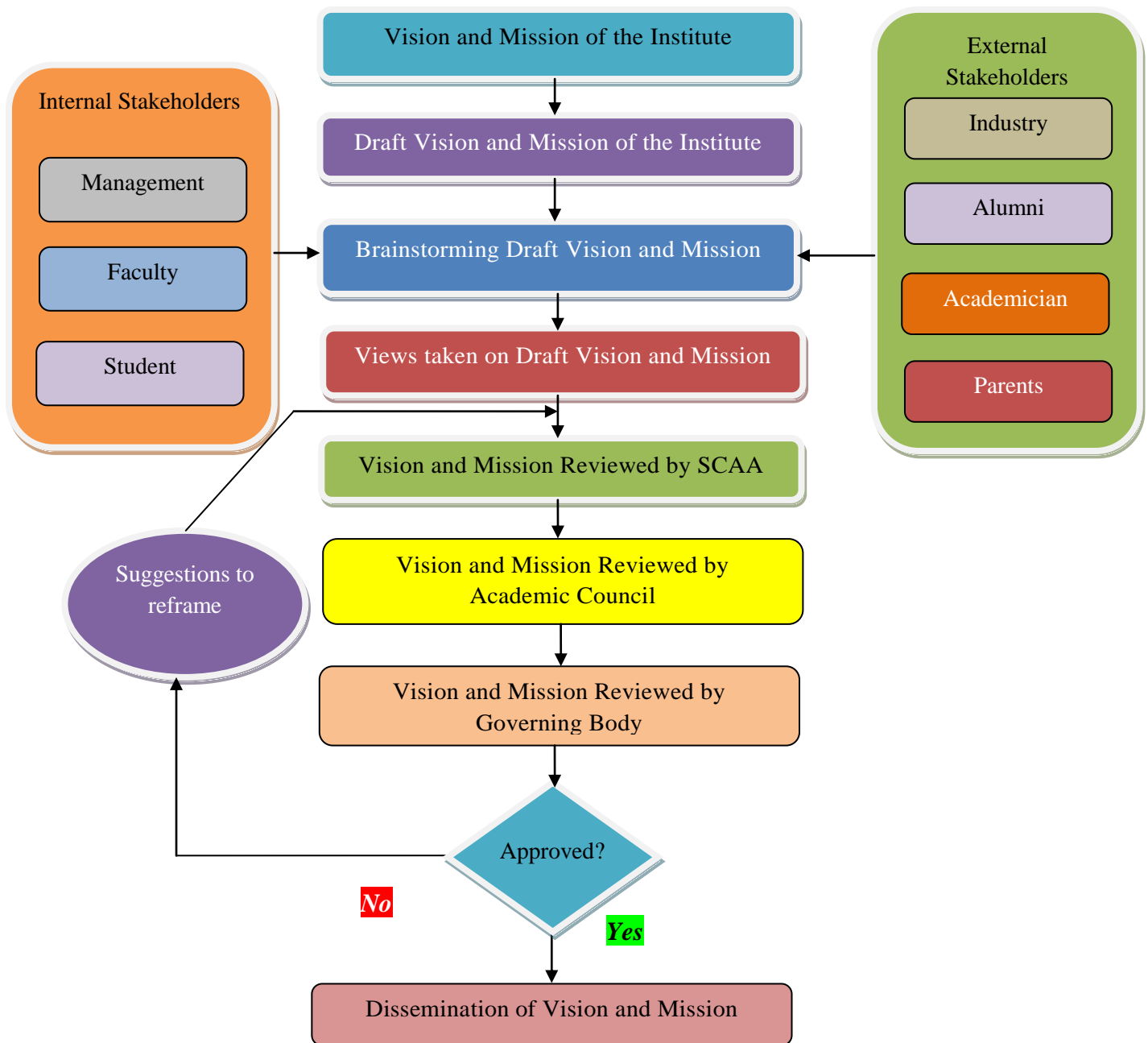


FIGURE 2.1 DEFINING THE VISION AND MISSION OF THE INSTITUTE

## 2.1 THE PROCESS FOR DEFINING THE VISION AND MISSION OF THE DEPARTMENT

The department defines the Vision and Mission statements by brainstorming with all the stakeholders, through Program Assessment Committee (PAC), Department Advisory Board (DAB), Board of Studies (BoS) and Academic Council (AC) based on the future scope of the department and the societal requirements.



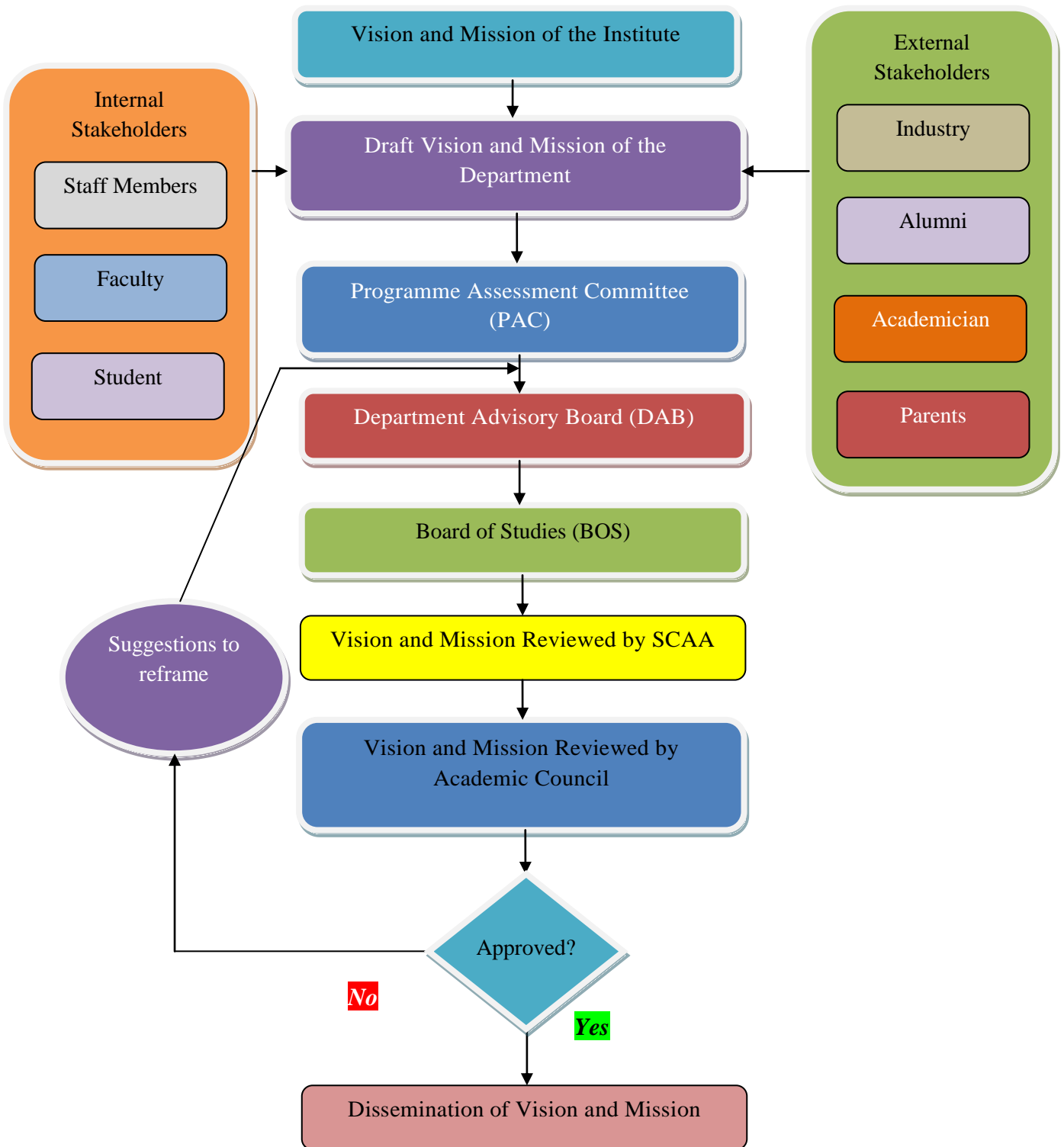


FIGURE 2.1.1 THE PROCESS FOR DEFINING THE VISION AND MISSION OF THE DEPARTMENT

## ➤ **Program Assessment Committee (PAC)**

Program Assessment Committee (PAC) comprises of Head of the Department (HoD) and all faculty members in the department.

The responsibilities of the PAC are as follows:

- To monitor and assess the COs, POs and PSOs.
- Planning the curricular and co-curricular activities in accordance with PEOs.
- Scheduling of the program activities during each semester.
- Implementation and control of the program activities for attainment of POs and PSOs.
- Formulation of drafted Vision, Mission and PEO statements of the department.

The PAC analyzes the direct and indirect survey reports of all the courses along with the feedback from the course coordinator concerned for finalizing the revision to be made in the course content.

## ➤ **Department Advisory Board (DAB)**

Department Advisory Board (DAB) consists of HoD, BoS Coordinator, Senior faculty members, Students, Alumni, Parents, Industry and Academic experts. The DAB supports in formulating the Vision, Mission, PEOs and PSOs. Based on the review of attainment of the POs and PSOs from PAC, necessary changes in curriculum with respect to course content, updating of syllabi, electives, practical components etc. are revised and forwarded to Board of Studies (BoS) for discussion. Suitable changes suggested by the BoS members are incorporated in the final curriculum and syllabi and submitted for the approval of the Academic Council through Standing Committee for Academic Affairs (SCAA).

## ➤ **Board of Studies (BoS)**

Board of Studies takes up planning of appropriate programs of study and the implementation of effective teaching.

The Board of Studies of a Department in the college

- Prepares syllabi for various courses keeping in view the objectives of the college, reviewing and updating syllabi from time to time, introducing new courses of study, determining details of continuous assessment with the interest of the stakeholders and national requirement for consideration and approval of

the Academic Council.

- Suggest methodologies for innovative teaching and evaluation techniques
- Suggest panel of Examiners to the Academic Council for appointment of examiners and
- Coordinate research, teaching, extension and other academic activities in the department/ college. Board of Studies meetings are conducted regularly.

Composition of Board of Studies:

- Head of the Department concerned (Chairman).
- The entire faculty of each specialization.
- Two subject experts from outside the Parent University to be nominated by the Academic Council.
- One expert to be nominated by the Vice-Chancellor from a panel of six recommended by the college Principal.
- One representative from industry/corporate sector/ allied area relating to placement.
- One postgraduate meritorious alumnus to be nominated by the Principal.

#### ➤ **Standing Committee for Academic Affairs (SCAA)**

The Standing Committee consolidates the inputs received from Board of Studies and submits to the Academic Council for its consideration and approval.

#### ➤ **Academic Council (AC)**

Academic Council scrutinizes and approves the proposals of the Boards of Studies with regard to courses of study, academic regulations, curricula, syllabi and modifications. The council involves faculty at all levels, experts from outside, including representatives of University and Government. Academic Council recommends to the Governing Body proposals for institution of new programmes of study.

Composition of Academic Council:

- The Principal (Chairman)
- All the Heads of Departments in the college
- Four teachers of the college representing different categories of teaching staff by rotation on the 11 basis of seniority of service in the college

- Not less than four experts/academicians from outside the college representing such areas as Industry, Commerce, Law, Education, Medicine, Engineering, Sciences etc., to be nominated by the Governing Body
- Three nominees of the university not less than Professors
- A faculty member nominated by the Principal (Member Secretary)

## ➤ **Governing Body (GB)**

The function of Governing Body is to decide on the overall development of the Institute which includes infrastructure, resource allocation, welfare measures, institute scholarship, medals, prizes and certificates on the recommendations of academic council and approval of new programs for the Institute.

NUMBER	CATEGORY	NATURE
5 Members	Management	Trust or Management as per the constitution or byelaws, with the chairman or the president/ Director as the chairperson
2 Members	Teachers of the College	Nominated by the Principal based on Seniority by rotation
1 Member	Educationalist or Industrialist	Nominated by the Management
1 Member	UGC Nominee	Nominated by the UGC
1 Member	State Government Nominee	Academician not below the rank of Professor or State Government Official of Directorate of Higher Education/ State Council of Higher Education
1 Member	University Nominee	Nominated by the University
1 Member	Principal of College	Ex- Officio

## 2.2 PROGRAM EDUCATIONAL OBJECTIVES, PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

### 2.2.1 PROCESS OF DEFINING PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Program Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

The Program Educational Objectives (PEOs) were formulated as a result of a series of meetings, comprising of faculty, Quality Improvement Committee (QIC), students, alumni and recruiters. Program Educational Objectives (PEOs) are reviewed through a consultative process involving the stakeholders including students, alumni, industry, employers, faculty and staff members.

The inputs from stakeholders typically the faculty, alumni, industry and professional bodies are collected to formulate our PEOs.

#### ➤ Faculty

The faculty members of the department are one of the key stakeholders empowered to evaluate the feedback received from all other stakeholders, proposing improvements in the curriculum, the outcomes and objectives, and in implementing any ratified changes. All changes in the curriculum are initiated by the faculty. Additionally, all the faculty members continually interact with all of the other stakeholders, allowing for the opportunities to receive, apart from formal, the informal feedback.

#### ➤ Alumni

Alumni provide vital inputs for drafting and to review our PEOs. The inquiry includes opinion on the current courses, its shortfall, suggestive changes to be considered in revising curriculum, their success in career and suitability of preparation attributed to the curriculum they were tutored in, any advice they have to give to current students, and what they have to do for succeeding in their career. Regular inputs from alumni are obtained via following interactions:

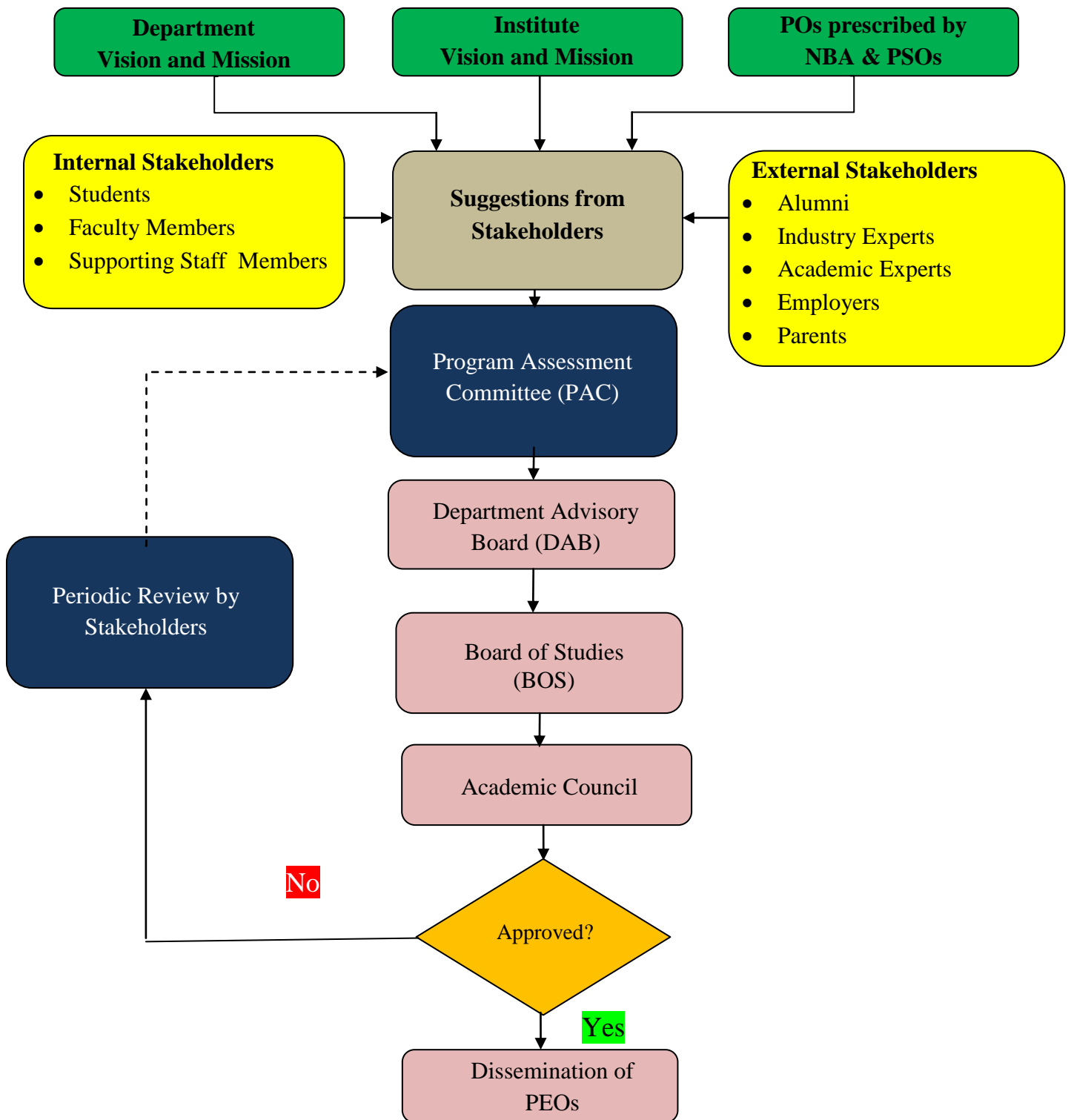


FIGURE 2.2.1.1 THE PROCESS FOR DEFINING THE PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- **Alumni Survey:** Formatted Survey data is utilized to gather comprehensive information for scrutiny and analysis.
- **Alumni visits:** Formal and informal visits by alumni give scope for direct personal interaction, discussions and also give an opportunity to collect and record information required for improving the program based on their professional experiences.
- **Alumni faculty interaction:** Alumni will be regularly interacting with some of the faculty with whom they are more conversant and they share their experiences, feelings, problems, etc., which will be more useful in redesigning the program.

## ➤ **Employers**

Input from employers plays a vital role in the formulation and review of the PEOs which reflect on the success and relevance of the designed courses. Employers are at the forefront of the practice of the profession; hence their feedback is important. They give us early indications of changing or new trends in the profession. The information is gathered from employers using both formal surveys and various informal interactions. In such interactions, employers are inquired about their views on the needs and direction of growth of the domain and correspondingly what the goals should be in educating the students. Regular input from employers is obtained via the following interactions:

- **Surveys:** Industry is directly or indirectly interacting with the Institution, during their institutional visits for guest lectures, workshops, seminars, placement drives or for any other informal interaction and the opportunity is utilized to fill in the Survey Form designed for formulating the PEOs.
- **Industrial Visits:** The department regularly arranges visit to industries as part of their education process. Discussions with the industries and the visiting faculty help to gain additional information on the current needs of industry with regard to our graduates, and thereby contribute to the understanding needed to formulate or revise the PEOs.

## 2.2.2 PROGRAM OUTCOMES (POs)

Program Outcomes describe what student are expected to know and would be able to do by the time of graduation. These are resulted to the Knowledge, Skills, and Attitude of the students acquire as they progress through the program.

Program outcomes can be defined as the objectives achieved at the end of any specialization or discipline. These attributes are mapped while a student is doing graduation and determined when they get a degree. POs are adopted from the graduate attributes (GA) lay down by the National Board of Accreditation (NBA).

The Vision, Mission and PEOs of the Department along with the 12 Graduate Attributes given by NBA are used in defining the POs:

GRADUATE ATTRIBUTES	PO No.	PROGRAMME OUTCOMES
<b>Engineering Knowledge</b>	<b>PO1</b>	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>Problem Analysis</b>	<b>PO2</b>	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
<b>Design and Development of Solutions</b>	<b>PO3</b>	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.
<b>Investigation of Complex Problems</b>	<b>PO4</b>	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.



<b>Modern Tool Usage</b>	<b>PO5</b>	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
<b>The Engineer and Society</b>	<b>PO6</b>	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.
<b>Environment and Sustainability</b>	<b>PO7</b>	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>Ethics</b>	<b>PO8</b>	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>Individual and Team Work.</b>	<b>PO9</b>	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>Communication</b>	<b>PO10</b>	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.
<b>Project Management and Finance</b>	<b>PO11</b>	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.
<b>Lifelong Learning</b>	<b>PO12</b>	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.

# OUTCOME BASED EDUCATION (OBE)

Outcome-Based Education (OBE) is a student-centric teaching and learning methodology which focuses on what students know and can actually do, by restructuring of curriculum, pedagogy and assessment practices to reflect the achievement of high-order learning.



Program Outcomes (POs) & Program Specific Outcomes (PSOs)



Programme Educational Objectives (PEOs)



FIGURE 2.2.2.1 OUTCOME BASED EDUCATION PROCESS

## 2.2.3 PROGRAM SPECIFIC OUTCOMES (PSOs)

Program Specific Outcomes are statements that describe what students are expected to know and be able to do in a specialized area of discipline upon graduation from a program.

Program may specify 2- 4 Program Specific Outcomes (PSO), if required. These are the statements, which are specific to the particular program. They are in addition to POs. Program Curriculum and other activities during the program must help in the achievement of PSOs along with POs.

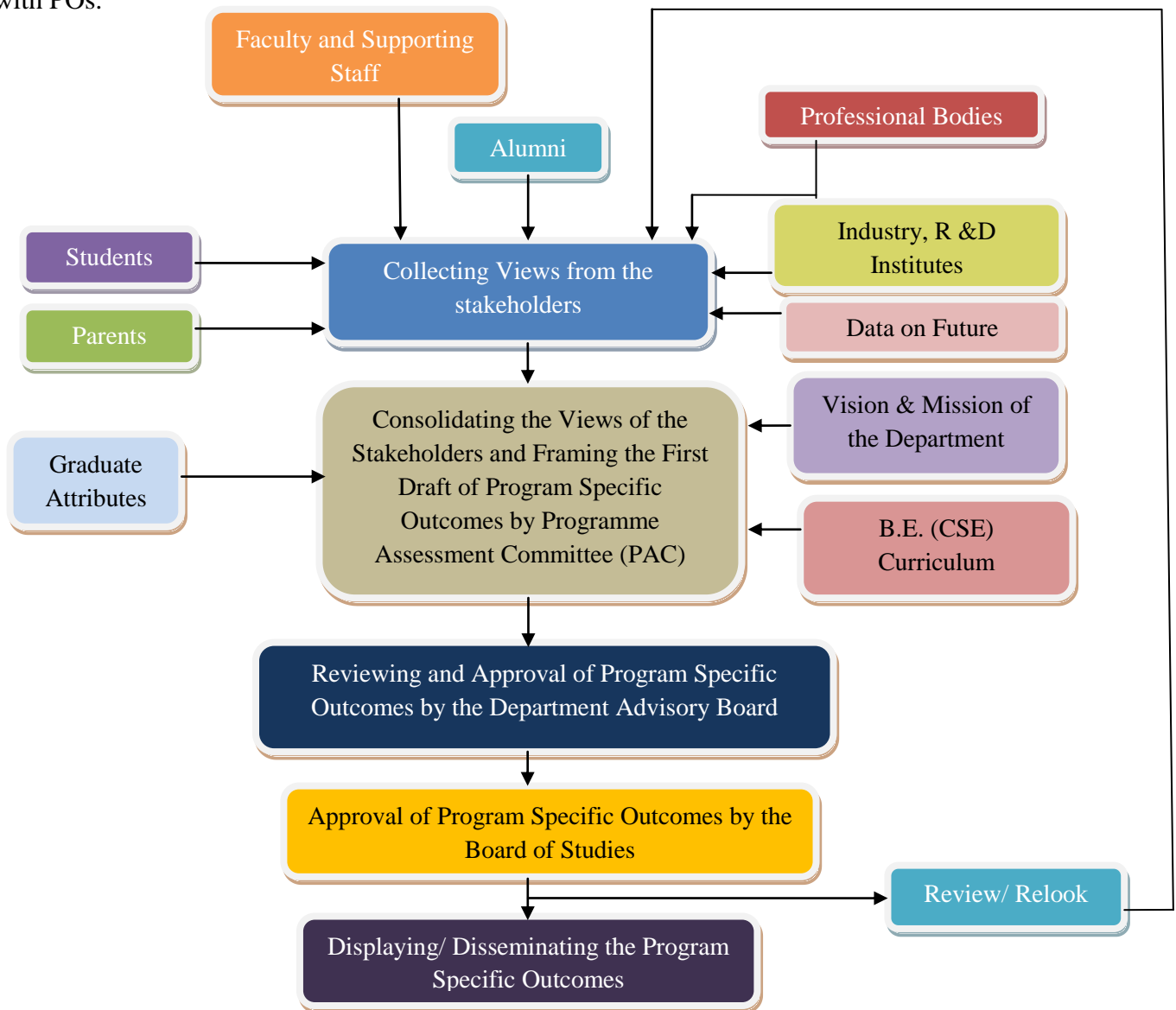


FIGURE 2.2.3.1 PROCESS FOR DEFINING PROGRAMME SPECIFIC OUTCOME

Design of curriculum was carried out during the years 2013, 2015 and 2017 to meet the evolutionary requirements in the industry and business sectors in compliance with the POs and PSOs in line with the recommendations of PAC through DAB and BoS.

- To identify the extent of compliance of the curriculum for attaining the POs and PSOs different processes or methods are adopted through direct and indirect methods
- To identify the shortcomings and to satisfy the compliance of POs and PSOs feedback analysis is adopted through the following methods:
  - i. Direct assessment is done by processes of analyzing performance of students by
    - Continuous Assessment Test
    - Assignment
    - Online Test
    - End Semester Examinations
  - ii. Indirect assessment is done by conducting
    - Alumni survey
    - Employer survey
    - Student exit survey
    - Course end survey
    - Evaluation of the quality of projects

Suggestions for improvement of teaching and learning process are collected during the survey.

The course coordinators periodically monitors the attainment levels of COs, POs and PSOs.

The graduates of the department will attain:

**PSO 1: Analytical expertise:** Ability to demonstrate knowledge in mathematical models, algorithms and hardware/software development methodologies

**PSO 2: Technical Competency:** Ability to develop practical competency in programming languages and will be able to apply emerging technologies to find optimal solutions for complex problems.

**PSO 3: Vocation dexterity:** Ability to have a foundation for research, entrepreneurship, lifelong learning and cultivate necessary skills for a successful career.

## 3. BLOOM'S TAXONOMY

Bloom's Taxonomy was created in 1956 under the leadership of educational psychologist Dr Benjamin Bloom in order to promote higher forms of thinking in education, such as analyzing and evaluating concepts, processes, procedures, and principles, rather than just remembering facts. It is most often used when designing educational, training, and learning processes. Lower Order Thinking and Higher Order Thinking of Bloom's Taxonomy is shown in Figure 3.1.

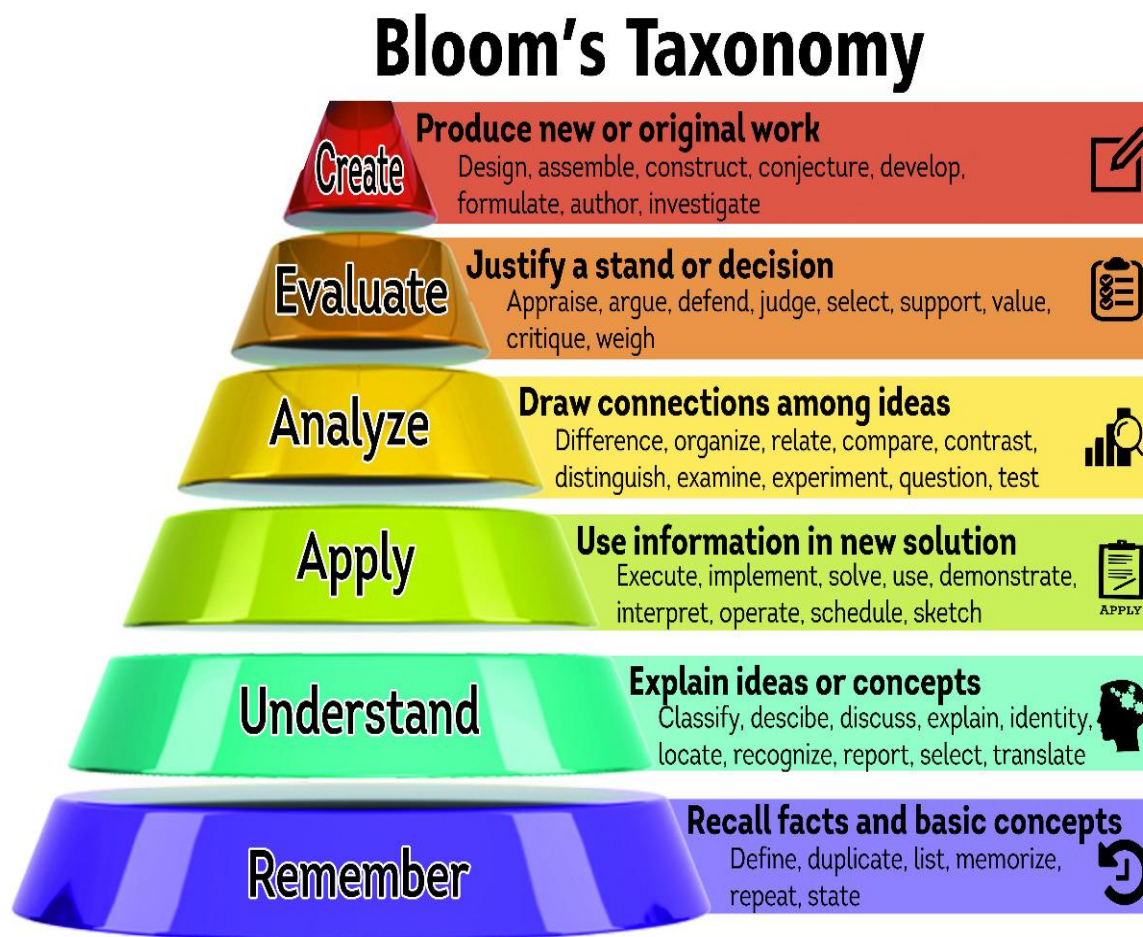


FIGURE 3.1 PICTORIAL REPRESENTATION OF BLOOM'S TAXONOMY

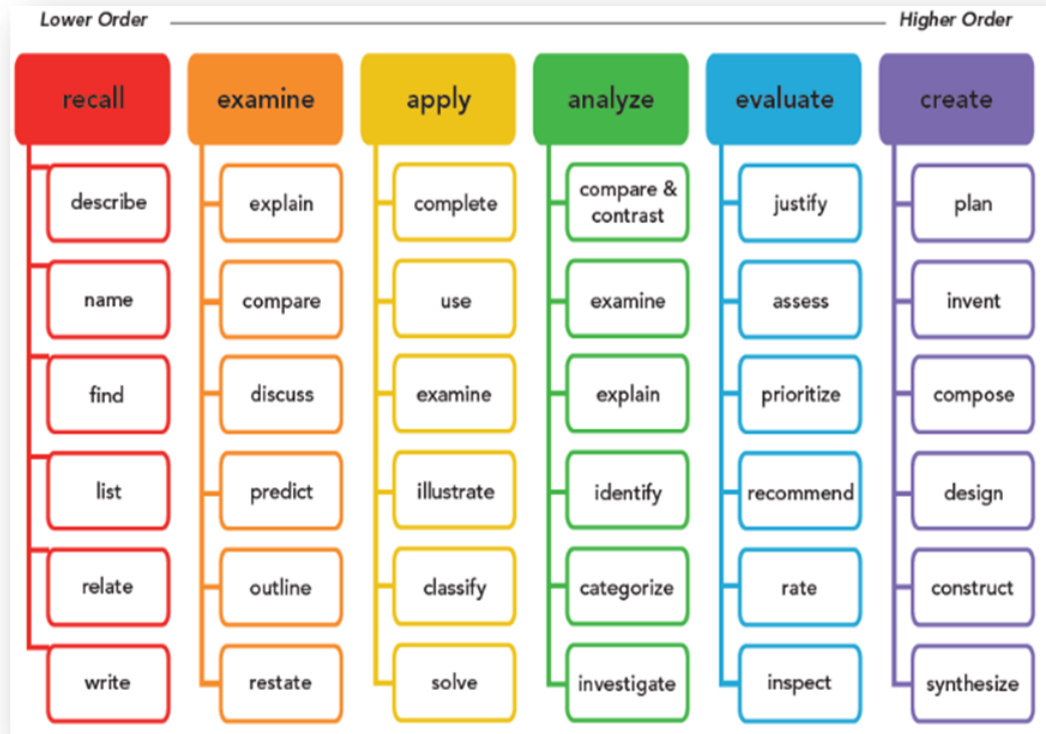


FIGURE 3.2 REVISED BLOOM'S TAXONOMY ACTION VERBS

## 4. COURSE OUTCOME

Course Outcomes are the statements that help the learners to understand the reason for pursuing the course and helps him to identify what he will be able to do at the end of the course.

### 4.1 SAMPLE COURSE OUTCOMES

CO	17CSC16 PRINCIPLES OF COMPILER DESIGN
CO1	The students will be able to describe different phases of a Compiler and its applications
CO2	The students will be able to build parsers for syntax analysis using context free grammars.
CO3	The students will be able to create intermediate code for programming constructs.

CO4	The students will be able to develop the optimized intermediate code.
CO5	The students will be able to analyze and optimize the code to design a compiler.

The Course Outcomes developed will be S.M.A.R.T – Specific, Measurable, Achievable, Relevant and Time Bounded.

- **Specific** - Students should be able to understand that it's mapped to which unit of that particular course.
- **Measurable** - After the completion of the unit, if the faculty is able to assess the understanding of the course content by using various assessment tools, then the CO becomes measurable.
- **Achievable** - When the student is able to express the verb given in the CO, then it becomes achievable.
- **Relevant** - Here it refers “How far” the Course Outcome is correlated with the Course Content.
- **Time Bounded** - Specific time bound should be given to each course outcome. The course content has to be designed accordingly.

➤ Considering the CO1 from the above table,

CO	17CSC16 PRINCIPLES OF COMPILER DESIGN
CO1	The students will be able to describe different phases of a Compiler and its applications

All the five characteristics are considered in developing the Course Outcomes.

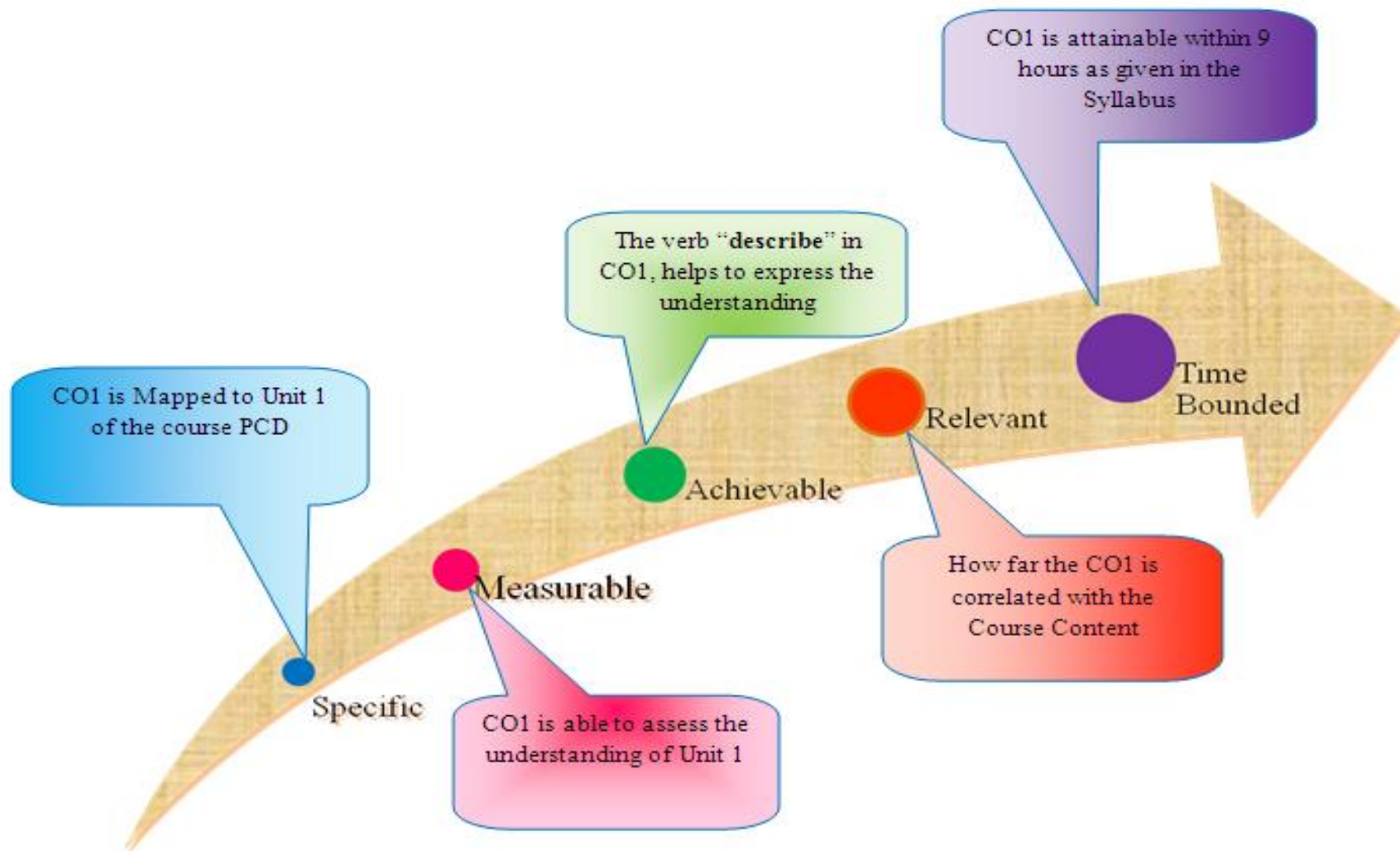


FIGURE 4.1 S.M.A.R.T COURSE OUTCOMES



## 4.2 CO – PO/ CO - PSO MAPPING OF COURSE

All the courses together must cover all the POs and PSOs. For a course, we map the COs to POs through the CO-PO matrix and to PSOs through the CO-PSO matrix as shown below. The various correlation levels are:

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation

“-” indicates there is no correlation

## 4.3 SAMPLE CO-PO AND CO-PSO MAPPING

CO-PO-PSO Articulation Matrix																
CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
1	3	2	3	2	3	-	-	1	1	3	3	3	3	3	3	3
2	3	2	3	2	3	-	-	1	1	3	3	3	3	3	3	3
3	3	3	3	2	3	-	-	1	1	3	3	3	3	3	3	3
4	3	3	3	2	3	-	-	1	2	3	3	3	3	3	3	3
5	3	3	3	2	3	-	-	1	2	3	3	3	3	3	3	3
<b>AVERAGE OUT OF 3</b>	<b>3.00</b>	<b>2.60</b>	<b>3.00</b>	<b>2.00</b>	<b>3.00</b>	<b>0.00</b>	<b>0.00</b>	<b>1.00</b>	<b>1.40</b>	<b>3.00</b>	<b>3.00</b>	<b>3.00</b>	<b>3.00</b>	<b>3.00</b>	<b>3.00</b>	<b>3.00</b>

## 4.4 SAMPLE QUESTION PAPER

R17

Register No.

NANDHA ENGINEERING COLLEGE, ERODE - 52 (An Autonomous Institution, Affiliated to Anna University, Chennai)		
B.E	Continuous Assessment Test - II	JULY 22
Year : 03	Semester: 5	CSE
17CSC16 – PRINCIPLES OF COMPILER DESIGN		
Time : 90 minutes		Maximum Marks : 50
QUESTION PATTERN TYPE-III		
Bloom's Taxonomy levels		
R- Remembering (K1)	U- Understanding (K2)	Ap-Applying (K3)
An- Analysing (K4)	E- Evaluating (K5)	C- Creating (K6)
<b>COURSE OUTCOMES :</b>		
CO1	The students will be able to describe different phases of a compiler and its applications.	
CO2	The students will be able to build parsers for syntax analysis using context free grammars.	
CO3	The students will be able to create intermediate code for programming constructs.	
CO4	The students will be able to develop the optimized intermediate code	
CO5	The students will be able to analyze and optimize the code to design a compiler.	

Part – A (Answer All the Questions)-5 X 2 = 10 Marks		CO	Marks	BTL
A1	Give the triple representation of a ternary operation <code>x:=y[i]</code>	3	2	K4
A2	What are the applications of DAG?	4	2	K2
A3	How would you calculate the cost of an instruction?	4	2	K3
A4	Mention the criteria for code improving transformations.	5	2	K1
A5	How do you find leader in Basic block?	5	2	K3
Part – B (Answer Any Four Questions)-4 X 4 = 16 Marks		CO	Marks	BTL
B1	Generate intermediate code for the following code segment. <code>int a,b; float c; a=10; switch(a) {   case 10:c=1;   case 20:c=2; }</code>	3	4	K4
B2	Write the grammar for flow-of-control statements.	3	4	K3
B3	Identify the issues in the design of code generator.	4	4	K3
B4	Define Common sub-expression elimination with example.	4	4	K2

B5	Construct an algorithm for natural loop of a back edge.	5	4	K1
B6	Explain different methods of parameter passing	5	4	K3
Part – C (Answer Any Two Questions)-2 X 12 = 24 Marks		CO	Marks	BTL
C1	What are the three address codes? How it is implemented?	3	12	K3
C2	Generate DAG representation for the following code and list out the applications of DAG representation. <code>i=1;S=0; while(i&lt;=10)   S=S+a[i][i];   i=i+1;</code>	4	12	K3
C3	Briefly discuss about basic blocks and flow graphs.	4	12	K1
C4	Describe about peephole optimization methods used in code optimization.	5	12	K1

Prepared by

Approved by

## 4.5 LEVEL OF OUTCOMES

There are four levels of outcome such as Course Outcome (CO), Program Outcome (PO), Program Specific Outcome (PSO) and Program Educational Objective (PEO). Course Outcomes are the statements that declare what students should be able to do at the end of a course. POs are defined by Accreditation Agencies of the country (NBA in India), which are the statements about the Knowledge, Skills and Attitudes, Graduate Attributes of a formal engineering program should have. Graduates Attributes (GAs) are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. GAs form a set of individually assessable outcomes of the programme. The NBA laid down the GAs relating to POs and is to be derived by program.

The Program Outcomes reflect the ability of graduates to demonstrate knowledge in fundamentals of Basic Sciences, Humanities and Societal Sciences, Engineering Sciences and apply these principles in understanding and practically apply the knowledge in professional core subjects, electives and projects which enables the graduates to be competent at the time of graduation. The graduates must adhere to professional and ethical responsibilities in the pursuit of their careers and also for the benefit of the society.

These outcomes also enable the graduates to pursue higher studies and engage in R&D for a successful professional career. The proper definition and the attainment of POs contribute to the attainment of Program Educational Objectives which will help the graduate to perform his/her duties, professional responsibilities, design, development, production and testing of novel products, ability to deal with finances and project management during his/her early professional career of 3 to 4 years.

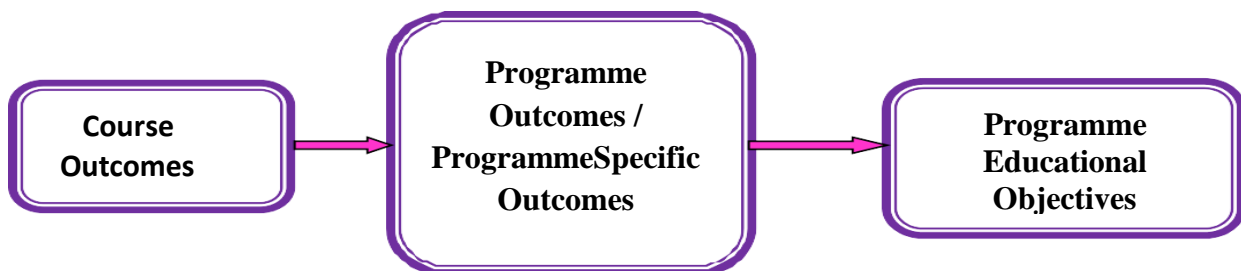


FIGURE 4.5.1 RELATING THE OUTCOMES (CO-PO/ PSO-PEO)

Program Specific Outcomes are the statements that assert what the graduates of a specific engineering program should do what they can able to do. Program Educational Objectives are the broad statements which describe in detail about the career and professional accomplishments after significant years of graduation that the program prepare the grandaunts to achieve.

Figure 4.5.1 shows the building block of CO-PO/PSO-PEO relationship. After CO statements are developed by the respective course in-charge, CO-PO/PSO matrix will be derived with each CO that will map with possible POs/PSOs based on the relationship exist between them. But the POs that are not necessarily mapped with any CO may be leftblank. It is mandatory that all COs should be mapped with any one of the POs and PSOs and these POs and PSOs are mapped with PEO which is specified in the program.

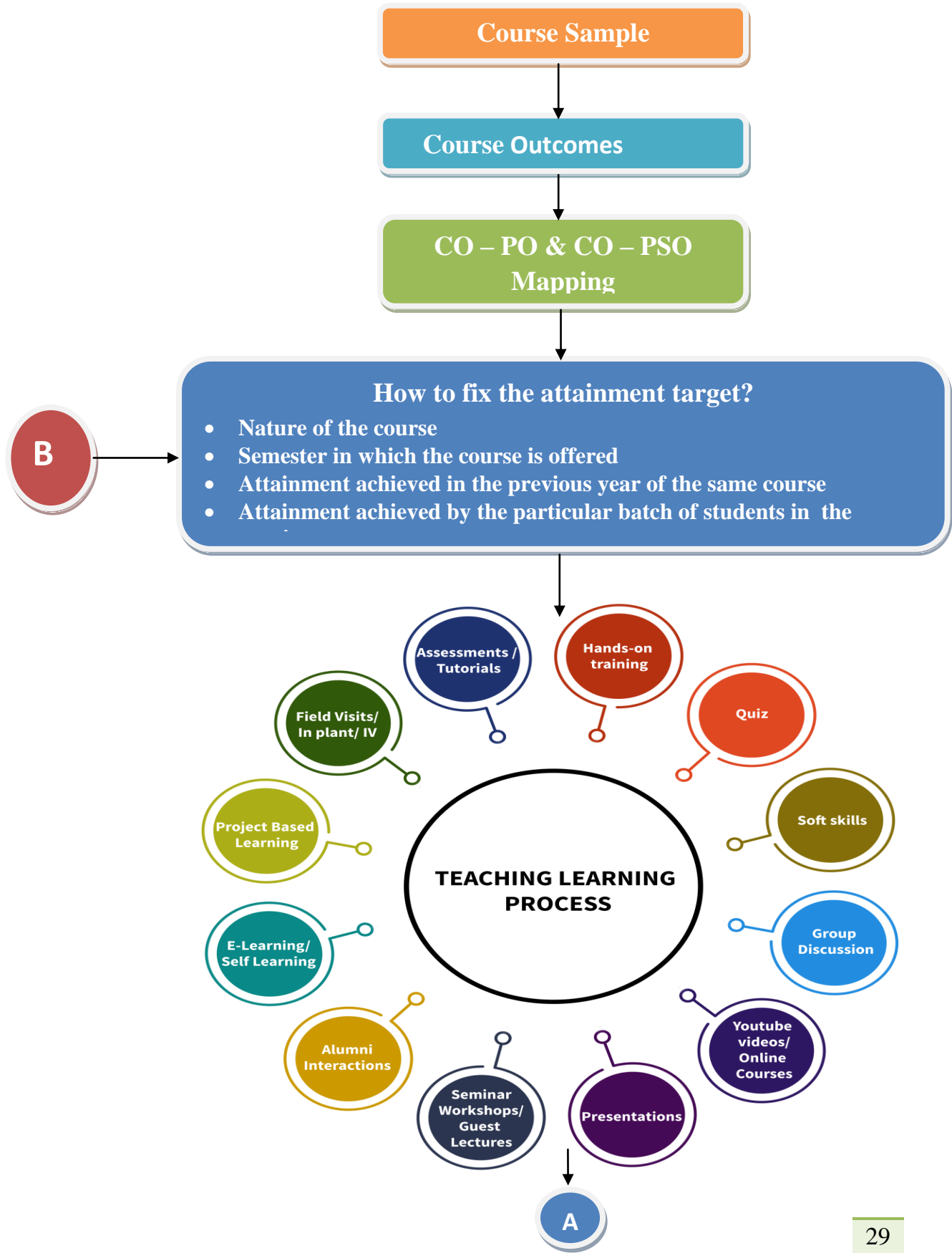
## 5. ASSESSMENT PROCESS

The Assessment of course outcome for theory subjects are based on

- Continuous Assessment Tests
- Assignments
- Online Tests
- End Semester Examinations

Laboratory courses' outcomes are evaluated based on the student's performance in regular Laboratory Classes, Model Examination and End Semester Examination performance. The course outcomes for project work I and II are evaluated based on the presentations in Project Reviews and End Semester Viva Voce Examinations.

Course Outcomes are assessed based on the performance of the students in Continuous Assessment Test and Semester End Examinations. The weightage for Internal Assessment is taken as 40% and the weightage for End Semester Examination is taken as 60%.



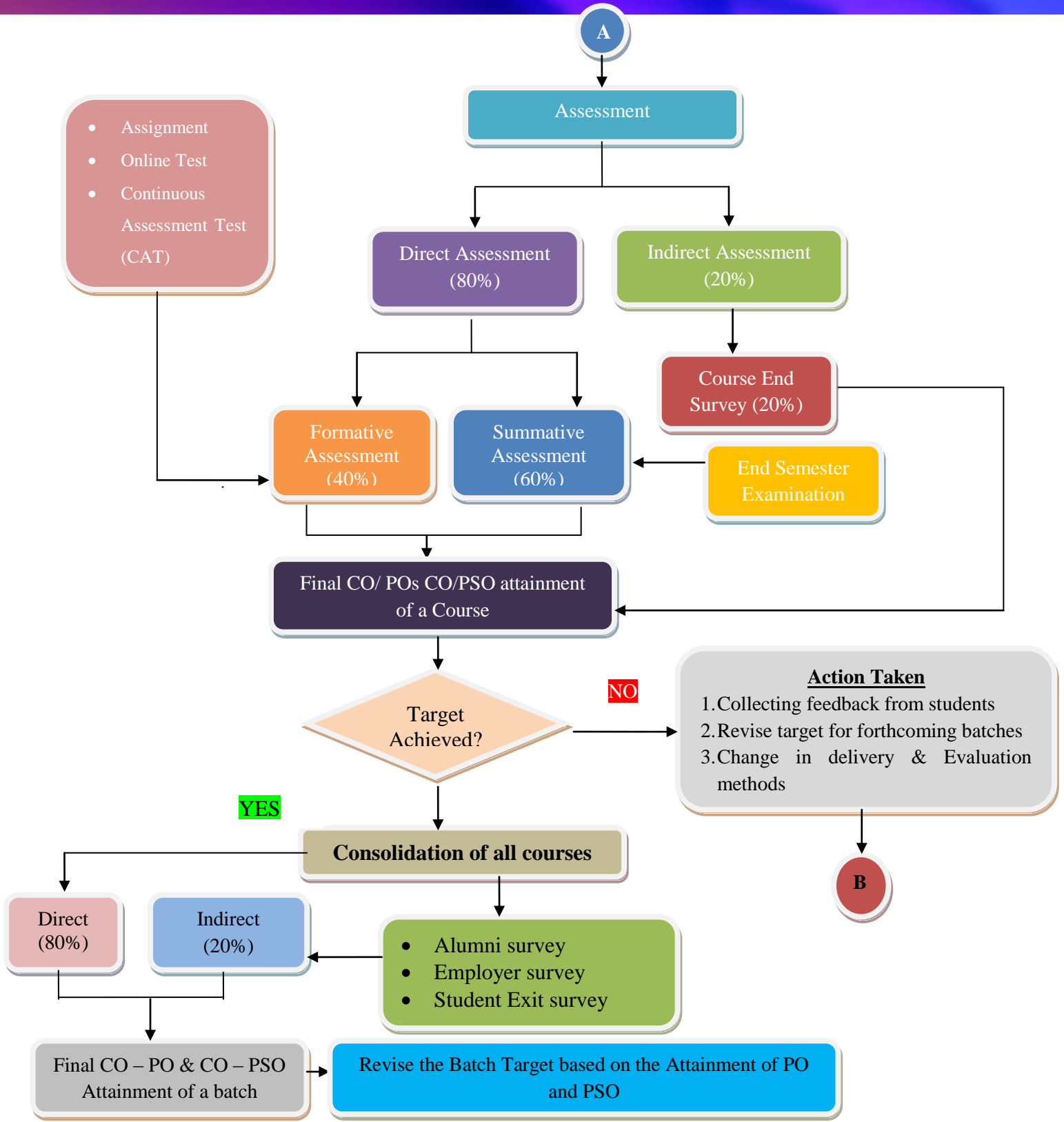


FIGURE 5.1 PROCESS OF ATTAINMENT CALCULATION

## 5.1 PROCESS OF CO ASSESSMENT AND ATTAINMENT

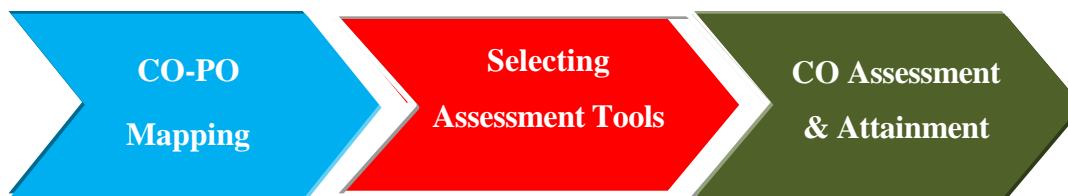


Figure 5.1 PROCESS OF CO ASSESSMENT AND ATTAINMENT

## 5.2 SAMPLE ATTAINMENT CALCULATION OF CO VIA CAT

NANDHA ENGINEERING COLLEGE, PERUNDURAI, ERODE-638052																	
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING																	
TEST-1 ANALYSIS																	
COURSE NAME & CODE :17CSC16 - PRINCIPLES OF COMPILER DESIGN																	
FACULTY NAME: Dr.S.K.MAHALINGAM,ASP/CSE Ms.D.VINOPARKAVI,AP/CSE																	
Each question Expected Level of attainment - 70%																	
TOTAL STRENGTH = 128																	
ROLL NO	A1(2)	A2(2)	A3(2)	A4(2)	A5(2)	B1(4)	B2(4)	B3(4)	B4(4)	B5(4)	B6(4)	D1(8)	D1(4)	D2(12)	D3(12)	D4(12)	TEST SCORE
<b>Expected Marks to attainment</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>2.8</b>	<b>2.8</b>	<b>2.8</b>	<b>2.8</b>	<b>2.8</b>	<b>2.8</b>	<b>5.6</b>	<b>2.8</b>	<b>8.4</b>	<b>8.4</b>	<b>8.4</b>	
19CS001	2	2	2	2	2	3		4	4		4				12	10	47
19CS002	2	1	1	2	1	2	1		3	1				9	11		34
19CS003	2	2	2	2	2	4	3	4	4					10	12		47
19CS004		1	1	1	2	2	2		4		2	8				10	33
19CS005	1	2			2	2	1		1			8					29
19CS011	2	2	0	2	2				4						12	12	36
19CS012	2	2	1	1	2	3	1		2	3		8	1		12		38
19CS013	2	2	0	2	2	3			4			7	3			11	36
19CSOL14	2	1	1	1	2			1	3					7	7		25
19CSOL15	2	2	2	0	2	4		1	4		3			10		9	39
19CSOL17	2	2	2	1	0	4		4	4		3			11		12	45
19CSOL18	2	1	0	1	0	2	1		2						9	10	28
<b>Nu of students securing upto expected level (70%)</b>	<b>93</b>	<b>87</b>	<b>41</b>	<b>78</b>	<b>112</b>	<b>81</b>	<b>19</b>	<b>42</b>	<b>104</b>	<b>10</b>	<b>50</b>	<b>27</b>	<b>5</b>	<b>39</b>	<b>80</b>	<b>68</b>	
<b>% of securing above the attainment level</b>	<b>72.7</b>	<b>68</b>	<b>32</b>	<b>60.9</b>	<b>87.5</b>	<b>63.3</b>	<b>14.8</b>	<b>32.8</b>	<b>81.3</b>	<b>7.81</b>	<b>39.1</b>	<b>21.1</b>	<b>3.91</b>	<b>30.5</b>	<b>62.5</b>	<b>53.1</b>	
<b>2. Course Outcome attainment level indicator</b>																	
<b>3</b>																	
<b>2</b>																	
<b>1</b>																	
<b>Range of attainment</b>																	
<b>&gt;70</b>																	
<b>50-70</b>																	
<b>&lt;50</b>																	
<b>Mapping with CO</b>	<b>C01</b>	<b>C01</b>	<b>C01</b>	<b>C02</b>	<b>C02</b>	<b>C01</b>	<b>C02</b>	<b>C02</b>	<b>C02</b>	<b>C02</b>	<b>C02</b>	<b>C02</b>	<b>C02</b>	<b>C02</b>	<b>C01</b>	<b>C02</b>	<b>C02</b>
<b>Attainment level of each CO</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	
<b>ATTAINMENT LEVEL OF ALL CO</b>	<b>C01</b>	<b>C02</b>															
	<b>1.80</b>	<b>1.64</b>															
<b>Mapping with PO</b>	<b>1,2,3,4,12</b>	<b>1,2,3,4,12</b>															

## 5.3 SAMPLE ATTAINMENT CALCULATION OF CO VIA ASSIGNMENT

NANDHA ENGINEERING COLLEGE, PERUNDURAI, ERODE-638052				
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING				
ASSIGNMENT II ANALYSIS				
COURSE NAME & CODE : 17CSC16 - PRINCIPLES OF COMPILER DESIGN				
FACULTY NAME: Dr. S.K.MAHALINGAM, ASP/CSE Ms. D. VINOPARKAVI, AP/CSE				
Each question Expected Level of attainment - 70%				
TOTAL STRENGTH =				128
ROLL NO	A1(5)	A2(10)	A3(10)	TEST SCORE
<b>Expected Marks to attainment</b>	<b>3.5</b>	<b>3.5</b>	<b>3.5</b>	
19CS001	5	10	10	25
19CS002	5	10	10	25
19CS003	5	10	10	25
19CS004	5	10	10	25
19CS0L14	5	10	10	25
19CS0L15	5	10	10	25
19CS0L17	5	10	10	25
19CS0L18	5	10	9	24
<b>No of students scores upto expected level (70%)</b>	<b>127</b>	<b>127</b>	<b>127</b>	
<b>% of scoring above the attainment level</b>	<b>99.22</b>	<b>99.22</b>	<b>99.22</b>	
2. Course Outcome attainment level indicator				
		3	2	1
<b>Range of attainment</b>		<b>&gt;70</b>	<b>50-70</b>	<b>&lt;50</b>
<b>Mapping with CO</b>	<b>CO5</b>	<b>CO4</b>	<b>CO3</b>	
<b>Attainment level of each CO</b>	<b>3</b>	<b>3</b>	<b>3</b>	
<b>ATTAINMENT LEVEL OF ALL CO</b>	<b>CO5</b>	<b>CO4</b>	<b>CO3</b>	
	<b>3.00</b>	<b>3.00</b>	<b>3.00</b>	
<b>Mapping with PO</b>	<b>1,2,3,4,12</b>	<b>1,2,3,4,12</b>	<b>1,2,3,4,12</b>	



The direct assessment tools used to assess the student's knowledge, skills and attitudes for the specific domain through Theory and laboratory course.

- **CONTINUOUS ASSESSMENT TEST**

Continuous assessment test is carried out twice in a semester. Faculty member prepares two sets of question paper based on Bloom's Taxonomy covering the prescribed syllabus and each question will be mapped to the concern course outcomes. Any one set of question paper will be chosen by Exam Cell Coordinator by checking the knowledge levels and Bloom's Taxonomy. Then the question paper will be finalized and chosen for conducting the test. This method of assessment is used to monitor students' progression and learning across pre-defined periods of time. Results are used to assess desired course outcomes, identify the areas of skill deficiency in students and to track the improvement of the students.

- **ASSIGNMENT**

Assignment is a formative assessment tool designed to assess students' knowledge in a particular topic. The assignment question will also be mapped to knowledge levels and Bloom's Taxonomy. Students' are assessed based on their performance.

- **RUBRICS**

A rubric explains the criteria where the students' work will be judged with the "scoring rules". Scoring rubrics are typically grids that outline identified criteria for successfully completing the task and establishing levels for meeting the levels of these criteria. Thus Rubrics produce a global score for performance.

- **END SEMESTER EXAMINATION (ESE)**

The purpose of End Semester Examination is to make a final review of the topics covered and assessment of each students' knowledge of the course. End Semester Examination is a metric for assessing all the Course outcomes. This examination is more focused on descriptive type of questions which has a combination of higher order thinking level and lower order thinking level questionnaires.

## 5.4 SAMPLE PO & PSO ATTAINMENT CALCULATION OF A BATCH

NANDHA ENGINEERING COLLEGE (AUTONOMOUS), ERODE - 638052																
DEPARTMENT OF CSE																
OVERALL ATTAINMENT OF CO - PO & CO - PSO																
BATCH : 2017 - 2021																
Courses (All courses from I	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
C101	0	0	0	0	0	2	0	0	3	3	0	3	0	0	0	1
C102	2	1	2	3	3	2	0	0	3	0	2	2	0	1	0	1
C112	1	2	2	3	3	0	0	0	3	3	2	2	1	1	2	1
C402	3	2	3	0	0	0	0	0	0	3	3	0	3	3	3	3
C407	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
C408	3	0	0	3	3	3	3	3	3	3	0	3	3	3	3	3
C409	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3
SUM	131	124	122	115	116	79	65	58	122	121	113	125	119	114	112	113
DIRECT ATTAINMENT OUT OF 3	2.30	2.18	2.14	2.02	2.04	1.39	1.14	1.02	2.14	2.12	1.98	2.19	2.09	2.00	1.96	1.98
% of DIRECT ATTAINMENT	76.61	72.51	71.35	67.25	67.84	46.20	38.01	33.92	71.35	70.76	66.08	73.10	69.59	66.67	65.50	66.08
ALUMNI SURVEY	2.52	2.56	2.34	2.77	2.45	2.35	2.12	2.15	2.37	2.34	2.55	2.33	2.82	2.84	2.76	2.95
EMPLOYER SURVEY	2.31	2.55	2.64	2.35	2.33	2.23	2.11	2.17	2.34	2.22	2.79	2.35	2.75	2.66	2.63	2.92
STUDENT EXIT SURVEY	2.23	2.18	2.13	2.32	2.33	2.28	2.30	2.32	2.46	2.37	2.34	2.28	2.29	2.17	2.46	2.17
INDIRECT ATTAINMENT	2.35	2.43	2.37	2.48	2.37	2.29	2.18	2.21	2.39	2.31	2.56	2.32	2.62	2.56	2.62	2.68
OVER ALL ATTAINMENT	2.31	2.23	2.19	2.11	2.10	1.57	1.35	1.26	2.19	2.16	2.10	2.22	2.19	2.11	2.10	2.12
% OVER ALL ATTAINMENT	76.98	74.21	72.88	70.33	70.07	52.20	44.92	41.89	73.01	72.01	69.93	73.95	73.14	70.38	69.84	70.73

## 6. ASSESSMENT PROCESS & ATTAINMENT PROCEDURE FOR PROGRAM EDUCATIONAL OBJECTIVES

Program Educational Objectives are the broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. Each department has its own PEOs aligned with the keywords like Core Competency, Innovative Skill, Continuous Learning and Interdisciplinary Skill. To assess whether the educational practices prepare our students for reaching the intended Program Educational Objectives, the first step is to examine how the POs and PSOs are mapped to the PEOs. By measuring the success level of each outcome, we can show that our students are well-prepared and will meet the intended Program Educational Objectives. The success level is measured by considering placement, higher studies, entrepreneurship, scientists, technocrats and administrator statistics of the batch after 4 to 5 years of graduation.

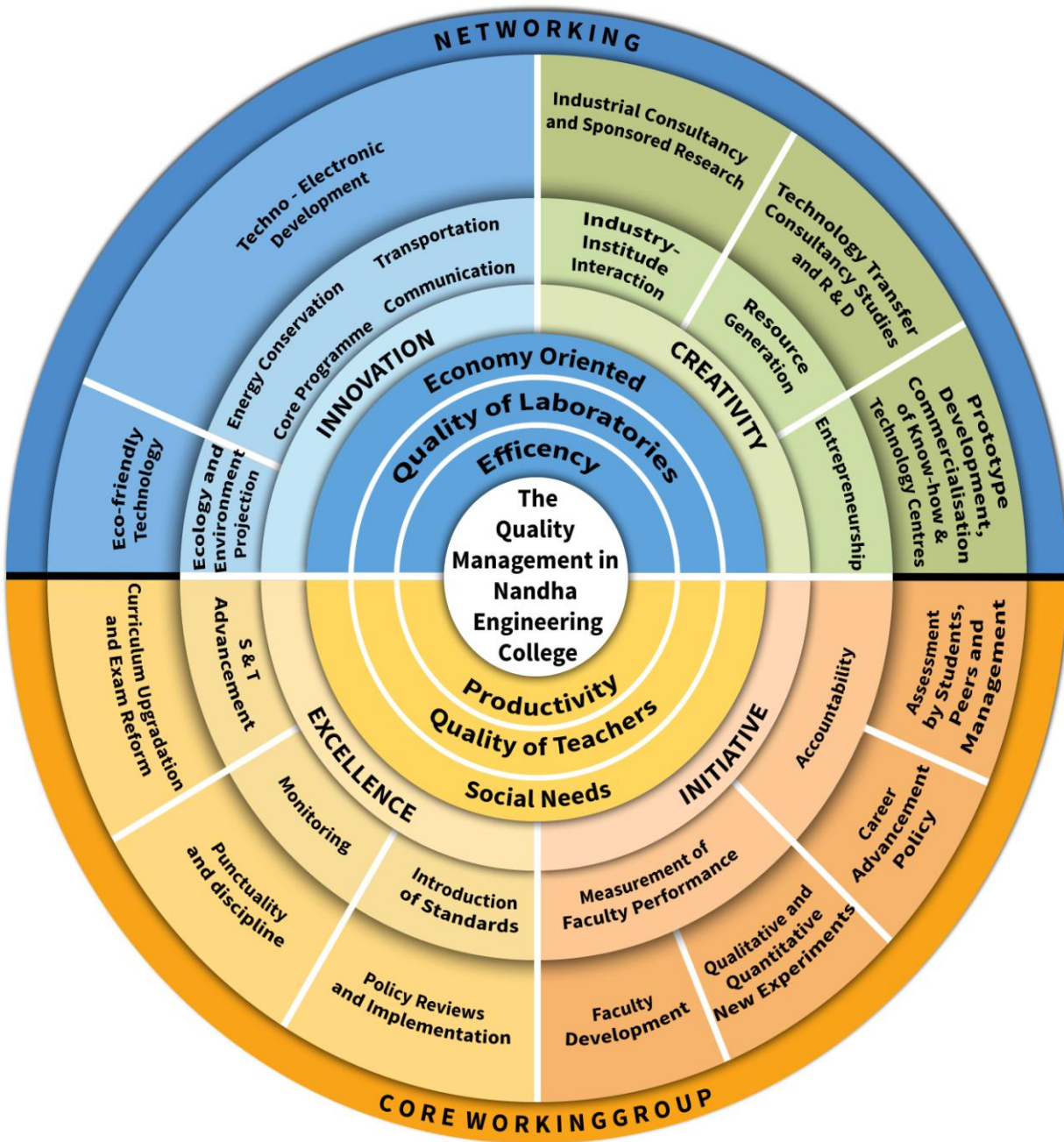


FIGURE 6.1 PROCESS OF QUALITY MANAGEMENT

IN

NANDHA ENGINEERING COLLEGE