



**JAYAWANT SHIKSHAN PRASARAK MANDAL's**  
**BHIVRABAI SAWANT POLYTECHNIC**

**Wagholi Pune - 412207**

**APPROVED BY AICTE, RECOGNIZED BY DTE MAHARASHTRA,  
AFFILIATED TO MSBTE MUMBAI**

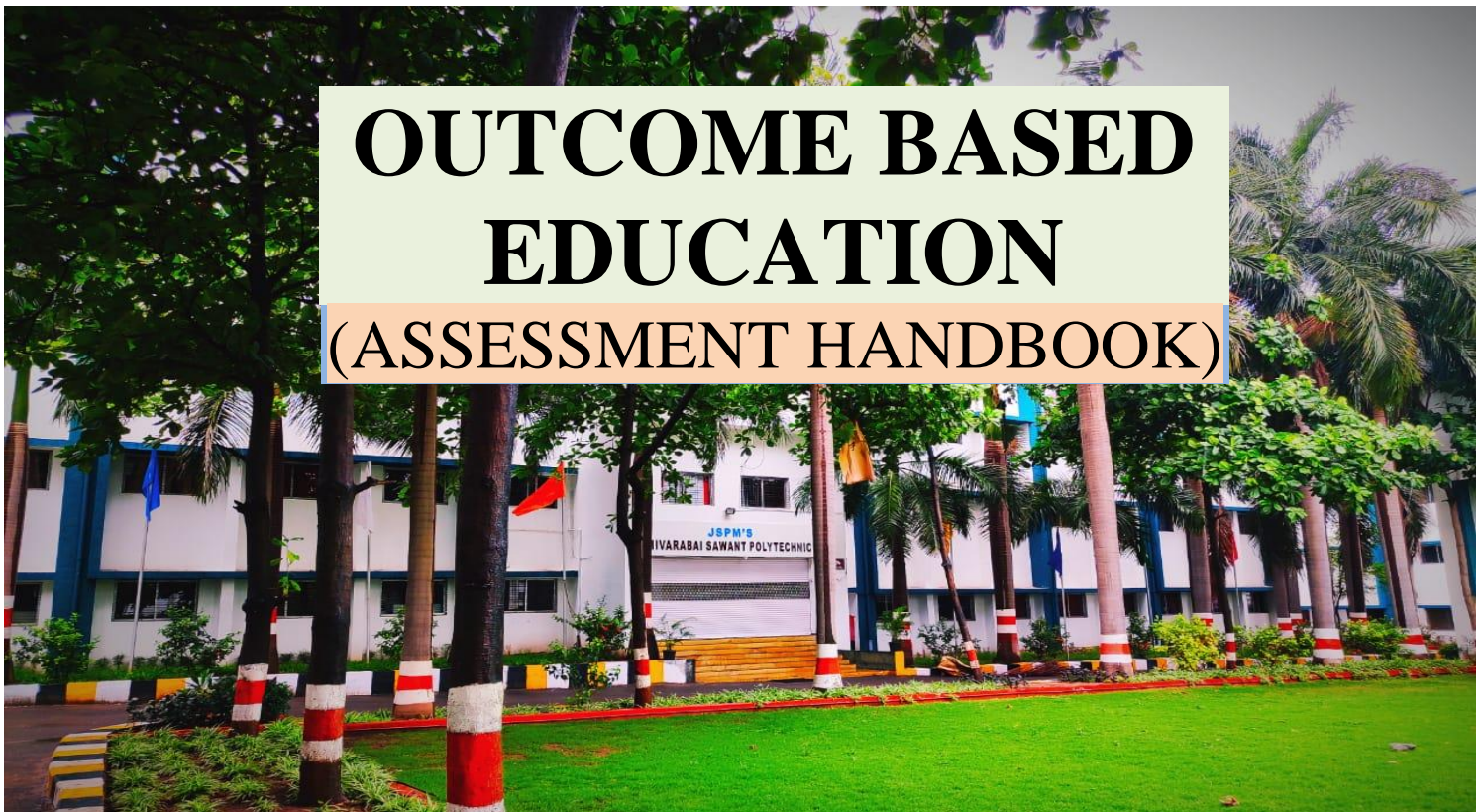


**Outcome Based Education  
(OBE)**



Jayawant Shikshan Prasarak Mandal's  
**BHIVRABAI SAWANT POLYTECHNIC**  
**WAGHOLI, PUNE**

**OUTCOME BASED  
EDUCATION**  
(ASSESSMENT HANDBOOK)



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## **1. About JSPM's BS Polytechnic**

Jayawant Shikshan Prasarak Mandal, Pune was established in 1998 under the able guidance of Prof. (Dr.) T. J. Sawant. Prof. (Dr.) T. J. Sawant is very ambitious person and has capacity to achieve the ambitions. In 1998, he initiated work with public charitable trust “Jayawant Shikshan Prasarak Mandal”, with a vision to establish quality educational institutes in Pune. JSPM group of institutes includes Engineering Colleges, Polytechnics, MBA Colleges, MCA Colleges, PGDM Courses, Pharmacy Colleges and English Medium Schools running CBSE Curriculum in and around Pune. JSPM group have a series of vibrant education and leadership strategies for gaining unbeatable competitive advantages from countrywide experts for a matchless growth beyond the ordinary. All colleges under JSPM group are committed to provide value based quality education, maintaining pace with changing technology to produce competent and skilled professionals ready to accept global challenges. All the JSPM colleges have well equipped infrastructure with all facilities to support students in their studies and give access to a wealth of materials, equipment and information. Our students are trained to understand the dynamics of the world. This helps them to lead with a successful career. The JSPM's nurturing methodology is unique and valuable for the students of 21st century. Our history reveals that our budding professionals have been placed in top MNC companies like TCS, IFOSYS, TECH MAHINDRA, IBM, ACCENTURE etc. Our management, dedicated placement team and quality faculty members are the three pillars for nurturing budding professionals. Today it has 78 institutes with more than 10,000 employees. It has been providing education from K.G. to Ph.D. and currently more than 50,000 students are studying under the umbrella of JSPM group.

JSPM's Bhivrabai Sawant Polytechnic, Wagholi, Pune was established in 2006. JSPM's Bhivrabai Sawant Polytechnic is affiliated to Maharashtra State Board of Technical Education (MSBTE), Mumbai; and conducts courses approved by the All India Council for Technical Education (AICTE), New Delhi. All the norms and standards set by AICTE as well as MSBTE are gratified by the institute. Bhivrabai Sawant Polytechnic was rendered the approval by AICTE vide their letter no. : F-22-2522/2006 dated 27 July 2006. In order to enrich the goal of JSPM, Bhivrabai Sawant Polytechnic provides, nurtures and maintains an environment of high academic excellence, industrial exposures and entrepreneurship for all aspiring students, which will prepare them to face global challenges maintaining high ethical and moral standards. JSPM's Bhivrabai Sawant Polytechnic caters to the need of students willing to pursue technical education after the Secondary School Examination. B.S. Polytechnic is having best infrastructure and facilities, supported by competent teaching faculties. Therefore, in combination of best infrastructure and competent faculties, it offers excellent academic environment to make a delightful learning experience. As mentioned in the mission statement, B.S. Polytechnic seeks responsibility of providing quality technical education for social and economic growth of the nation. To ensure this; management is committed to offer quality technical education and is persistently determined to improve its value by taking appropriate measures. All the courses offered by Bhivrabai Sawant Polytechnic are honored with excellent grade by MSBTE's external academic monitoring which is done to pinpoint the performance of the affiliated institutes focusing on the key performance indicators like Faculty Development, Curriculum Implementation, Continuous Assessment, Result Analysis, Library Facilities, and Laboratory Standards.

## **Vision and Mission of the Institute**

### **Vision:**

To develop globally competent technocrats by imparting quality technical education for socio-economic enhancement of the nation.

### **Mission:**

**M1:** To nurture and maintain an environment of high academic standard for diploma students, encouraging higher education and entrepreneurial abilities.

**M2:** To deliver quality education by imparting basic engineering knowledge, interpersonal skills, critical thinking and creativity.

**M3:** To equip students with technical skills, ethical and moral values to meet aspirations of the society and industry to contribute sustainable development of the nation

### **Quality Policy:**

We, at JSPM are committed to provide value-based quality education maintaining pace with changing technology to produce competent and skilled professionals ready to accept global challenges.

### **Quality Objectives:**

- i. To Inculcate the Motto "Excel and Prevail".
- ii. To Imbibe Quality Consciousness at All Levels of the Staff.
- iii. Strict No to Compromise to Quality.
- iv. Strive to Do Still Better.
- v. Discourage Short Cuts.

## **The Vision and Mission of the Civil Engineering Department:**

### **Vision:**

To develop diploma Civil Engineers to meet ever-changing industry and societal requirements for socio-economic growth of the nation.

### **Mission:**

**M1:** To provide healthy learning environment for acquiring knowledge through Effective teaching learning process.

**M2:** To develop professional skills and critical thinking ability through co-curricular and extra- curricular activities.

**M3:** To impart technical knowledge with ethical and moral standards to resolve Industrial and societal issues.

### **The Vision and Mission of the Computer Engineering Department**

**Vision:**

To develop technical man power in the field of Computer Engineering to contribute the socio-industrial requirement.

**Mission:**

**M1-** To develop techno-savvy engineers by imparting comprehensive Computer Engineering knowledge by innovative teaching and learning process.

**M2-** To develop professional skills committed for lifelong learning through co-Curricular and extra-curricular activities.

**M3-** To impart Computer Engineering education in order to meet societal and Industry needs..

### **The Vision and Mission of the Electrical Engineering Department: Vision:**

To develop competent diploma Electrical Engineers by imparting sound technical Knowledge to serve the society.

**Mission:**

**M1:** To create conducive learning environment for gaining the knowledge of Electrical Engineering with its applications.

**M2:** To develop competent technocrats in Electrical Engineering by providing opportunities of problem base learning and internship.

**M3:** To inculcate technical skills in Electrical Engineering by providing facilities to serve the society.

**The Vision and Mission of the Mechanical Engineering Department:**

**Vision:**

To develop professionally skilled and socially responsible Mechanical Engineers.

**Mission:**

**M1-** To impart Mechanical Engineering knowledge to the students through effective teaching learning methods.

**M2-** To prepare the students for professional responsibilities through sustainable development following ethics and lifelong learning.

**M3-** To develop employability and entrepreneurship qualities in students through industry-institute association.

**The Vision and Mission of the Electronics and telecommunication Engineering Department:**

**VISION:-**

To develop Electronics & Telecommunication Engineers with sound technical knowledge focusing on social and industrial demands with professional ethics.

**MISSION:-**

**M1:** To create environment for imparting technical education through effective teaching- learning process.

**M2:** To develop industry driven & Entrepreneurial Skills through co- curricular and extra co-curricular activities.

**M3:** To provide value based education for socio-economic enhancement of nation.

## **2. Outcome Based Assessment Overview**

### **2.1 OBE Overview**

Outcome-based education is targeted at achieving desirable outcomes (in terms of knowledge, skills, attitudes and behavior) at the end of a program. Teaching with this awareness and making the associated effort constitutes outcome-based education. This entails a regular methodology for ascertaining the attainment of outcomes, and benchmarking these against the program outcomes consistent with the objectives of the program.

National Board of Accreditation aligned its methodology with international benchmarks and started accreditation on the basis of outcomes. It believes that educational quality must be measured by outcomes rather than inputs, because inputs do not necessarily correlate with quality outcomes. Outcomes are dependent not only on inputs but also on the processes followed by an institution to convert inputs into defined outcomes.

The purpose of the accreditation by NBA is to promote and recognize excellence in technical education in colleges and universities at both the undergraduate and postgraduate levels through accreditation. Institutions, students, employers, and the public at large all benefit from the external verification of quality provided through the NBA accreditation process. They also benefit from the process of continuous quality improvement that is encouraged by the NBA's developmental approach in promoting excellence in technical education.

Through accreditation, the following main purposes are served:

- Support and advise technical institutions in the maintenance and enhancement of their quality.
- Confidence and assurance on quality to various stakeholders including students.
- assurance of the good standing of an institution to government departments and other interested bodies; and
- Enabling an institution to state publicly that it has voluntarily accepted assessment of its systems and processes by NBA and has satisfied all the requirements for operation and maintenance of quality in education.

The process of accreditation helps in realizing several benefits, such as:

- Helps the institution to know its strengths, weaknesses, and opportunities.
- Initiates institutions into innovative and modern methods of pedagogy.
- Gives institutions a new sense of direction and identity.
- Provides society with reliable information on quality of education offered.
- Students studying in NBA accredited programs can be assured that they will receive education which is of high academic quality and professional relevance and that the needs of the corporate world are well integrated into programs, activities, and processes.
- Accreditation assures prospective employers that students come from a program where the content and quality have been evaluated, satisfying established standards. It also signifies that the students passing out have acquired competence based on well-established technical inputs; and
- Accreditation helps in gaining confidence of stakeholders and in giving a strong message that as a country, our technical manpower is of international standards and can be very useful in enhancing the global mobility of our technical manpower.



## 2.2 Cycle of OBE Assessment

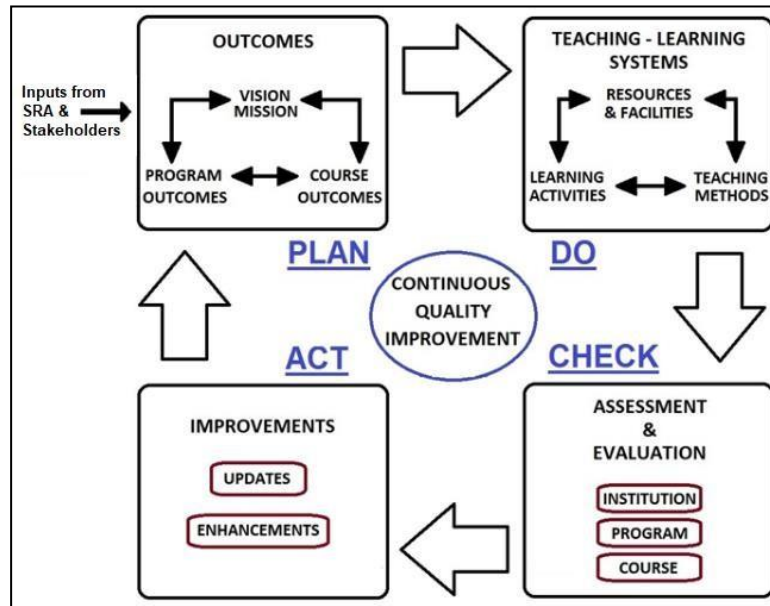


Fig. 2.1 OBE Process

Outcome-based education (OBE) is an educational theory that bases each part of an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences.

For the educational system to function effectively, OBE framework is identified. It guarantees that curriculum, teaching and learning strategies, and assessment tools are continuously enhanced through an evaluation process. The methodology P-D-C-A (plan-do-check-act) cycle has been applied for optimum effectiveness and efficiency. See Fig 2.1.

The framework adopts the OBTL implementation which revolves around three important elements: a) description of the students learning outcomes (COs, POs & PSOs) in the form of a verb (learning activity), its object (the content) and specification of the context and a standard the students are to attain; b) creating a learning environment using teaching/learning environment activities that address that verb and therefore are likely to bring about the intended outcome; and c) using assessment tools that also contain that verb, thus enabling the teacher to judge the attainment results.

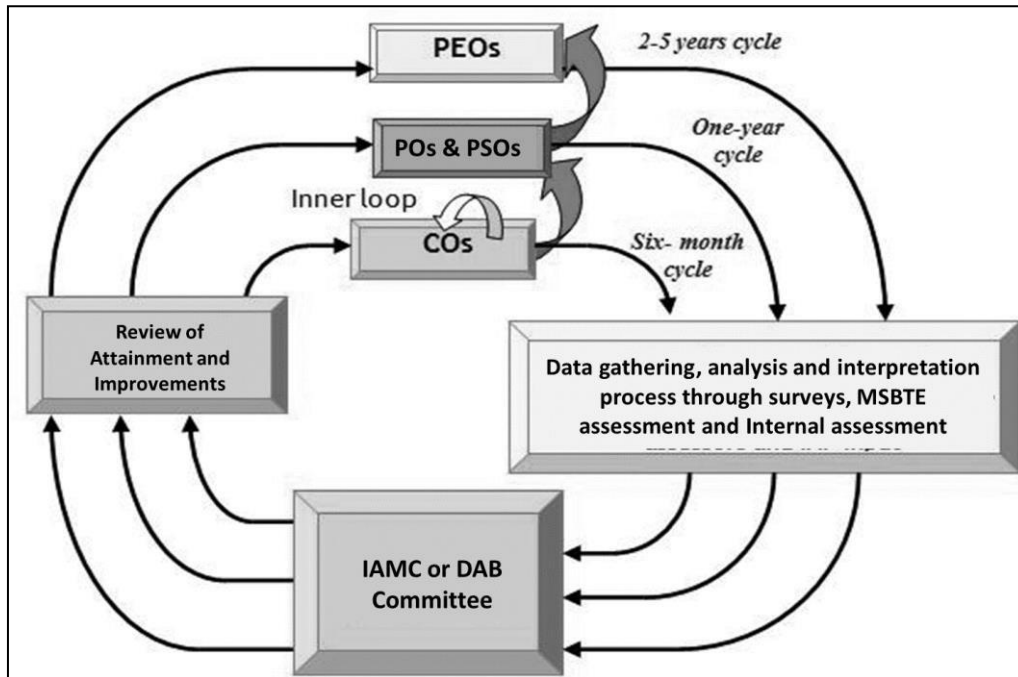


Fig. 2.2 OBE Cycle

As shown in Fig. 2.2, the student learning outcomes were assessed in three cycle. The assessment for Course level outcomes per each course of curriculum is the first inner cycle to evaluate. Next, the program level outcomes are assessed through correlation matrix of curriculum courses to program outcomes.

### 2.3 Program Level Student Learning Outcomes

#### Program Outcomes of Diploma as specified by NBA

Program Outcomes are statements that describe what students are expected to know and be able to do upon graduating from the program. These relate to the skills, knowledge, attitude and behavior that students acquire through the program. NBA has defined the Program Outcomes for Diploma Program as bellow:

PO1	Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
PO2	Problem analysis: Identify and analyze well-defined engineering problems using codified standard methods.
PO3	Design/development of solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
PO4	Engineering Tools, Experimentation and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
PO5	Engineering practices for society, sustainability and environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

PO6	Project Management: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
PO7	Life-long learning: Ability to analyze individual needs and engage in updating in the context of technological changes.

### **Program Educational Objectives of Diploma in Civil Engineering (I Scheme, MSBTE)**

Program Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. PEOs of Diploma Civil Engineering Program are specified by I Scheme Curriculum of MSBTE as Bellow:

PEO1	Provide socially responsible, environment friendly solutions to civil engineering related broad- based problem adopting professional ethics..
PEO2	Adopt state-of -the- art civil engineering broad based technologies to work in multi – disciplinary work environment
PEO3	Solve broad based problems individually and as a team member communicating effectively in the world of work.

### **Program Specific Outcomes of Diploma in Civil Engineering (I Scheme, MSBTE)**

Program Specific Outcomes are statements that describe what the graduates of a specific subject or program should be able to do. PSOs of Diploma Civil Engineering Program are specified by I Scheme Curriculum of MSBTE as Bellow:

PSO1	Perform optimal Civil engineering construction, planning and designing activity of desired quality at optima cost
PSO2	Execute Civil Engineering construction and maintaince using relevant materials and equipments

### **Program Educational Objectives of Diploma in Computer Engineering (I Scheme, MSBTE)**

Program Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. PEOs of Diploma Computer Engineering Program are specified by I Scheme Curriculum of MSBTE as Bellow:

PEO1	Provide socially responsible, environment friendly solutions to Computer engineering related broad-based problems adapting professional ethics.
PEO2	Adapt state-of-the-art Computer engineering broad-based technologies to work in multi-disciplinary work environments.
PEO3	Solve broad-based problems individually and as a team member communicating effectively in the world of work.

**Program Specific Outcomes of Diploma in Computer Engineering (I Scheme, MSBTE)**

Program Specific Outcomes are statements that describe what the graduates of a specific subject or program should be able to do. PSOs of Diploma Computer Engineering Program are specified by I Scheme Curriculum of MSBTE as Bellow:

PSO1	Computer Software and Hardware Usage: Use state-of-the-art technologies for operation and application of computer software and hardware.
PSO2	Computer Engineering Maintenance: Maintain computer engineering related software and hardware systems. PSO2. Computer Engineering Maintenance: Maintain computer engineering related software and hardware systems.

**Program Educational Objectives of Diploma Electrical Engineering (I Scheme, MSBTE)**

Program Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. PEOs of Diploma Electrical Engineering Program are specified by I Scheme Curriculum of MSBTE as Bellow:

PEO1	Provide socially responsible, environment friendly solutions to Electrical engineering related broad-based problems adapting professional ethics.
PEO2	Adapt state-of-the-art Electrical engineering broad-based technologies to work in multi-disciplinary work environments.
PEO3	Solve broad based problems individually and as a team member communicating effectively in the world of work .

**Program Specific Outcomes of Diploma in Electrical Engineering (I Scheme, MSBTE)**

Program Specific Outcomes are statements that describe what the graduates of a specific subject or program should be able to do. PSOs of Diploma Electrical Engineering Program are specified by I Scheme Curriculum of MSBTE as Bellow:

PSO1	Maintain various types of rotating and static electrical equipment's.
PSO2	Maintain different types of electric power system

**Program Educational Objectives of Diploma in Mechanical Engineering (I Scheme, MSBTE)**

Program Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. PEOs of Diploma Mechanical Engineering Program are specified by I Scheme Curriculum of MSBTE as Bellow:

PEO1	Provide socially responsible, environment friendly solutions to Mechanical engineering related broad-based problems adapting professional ethics.
PEO2	Adapt state-of-the-art Mechanical engineering broad-based technologies to work in multi-disciplinary work environment

PEO3	Solve broad-based problems individually and as a team member communicating Effectively in the world of work.
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**Program Specific Outcomes of Diploma in Mechanical Engineering (I Scheme, MSBTE)**

Program Specific Outcomes are statements that describe what the graduates of a specific subject or program should be able to do. PSOs of Diploma Mechanical Engineering Program are specified by I Scheme Curriculum of MSBTE as Bellow:

PSO1	Modern Software Usage: Use latest Mechanical engineering related software's for simple design, drafting, manufacturing, maintenance and documentation of mechanical engineering components and processes.
PSO2	2: Maintenance and selection of machines, equipment, instruments: Maintain and select appropriate machine, equipment and instrument in field of Mechanical Engineering..
PSO3	Manage Mechanical Process: Manage the mechanical process by selection and scheduling right type of machinery, equipment, substrates, quality control techniques, operational parameters and software for a particular mechanical process or job for economy of operations.

**Program Educational Objectives of Diploma in Electronics and Telecommunication Engineering (I Scheme, MSBTE)**

Program Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. PEOs of Diploma Electronics and Telecommunication Engineering Program are specified by I Scheme Curriculum of MSBTE as Bellow:

PEO1	Provide socially responsible, environment friendly solutions to Electronics and Telecommunication engineering related broad-based problems adapting professional ethics..
PEO2	Adapt state-of-the-art Mechanical engineering broad-based technologies to work in multi-disciplinary work environment
PEO3	Solve broad-based problems individually and as a team member communicating Effectively in the world of work.

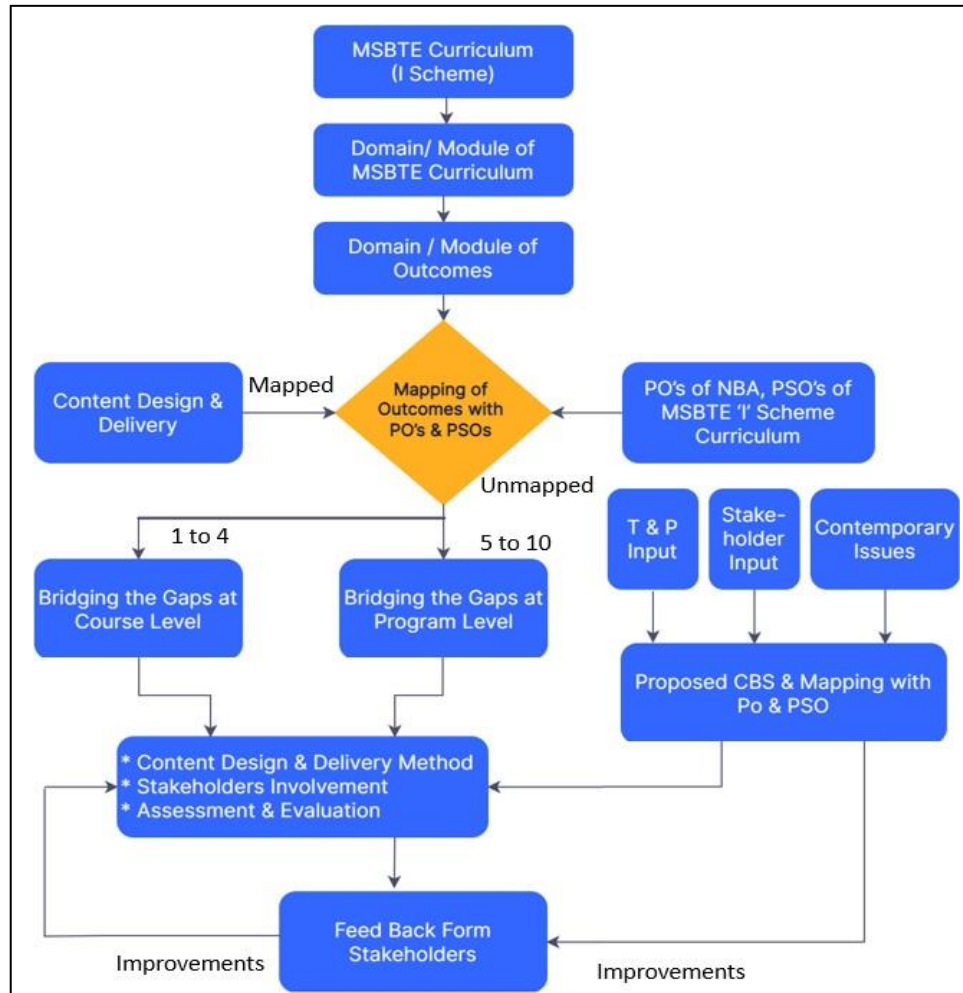
**Program Specific Outcomes of Diploma in Electronics and Telecommunication Engineering (I Scheme, MSBTE)**

Program Specific Outcomes are statements that describe what the graduates of a specific subject or program should be able to do. PSOs of Diploma Electronics and Telecommunication Engineering Program are specified by I Scheme Curriculum of MSBTE as Bellow:

PSO1	Electronics and Telecommunication Systems: Maintain various types of Electronics and Telecommunication systems..
PSO2	EDA Tools Usage: Use EDA tools to develop simple Electronics and Telecommunication engineering related circuits.

## 2.4 Compliance of Curriculum to Program Level Outcomes

The process applied for compliance of curriculum with POs and PSOs and to identify curriculum gaps is illustrated in Fig 2.3.



**Fig. 2.3 Compliance of Curriculum with POs and PSOs.**

- The curriculum is sub-grouped into modules (grouping of like courses) and the module outcomes were defined based on the COs of the courses in the module.
- Check the compliance of module outcomes with each PO and PSO based on action verb, content and the context of application/performance.
- Identify the curriculum gap for PO / PSO attainment at course level (POs and PSOs relating to knowledge and skill) and at program level (POs relating to attitude or behavioural).
- Besides the curriculum gap, the content beyond syllabus shall be proposed and designed by academic monitoring committee and DAC based on stake holder and contemporary issues.

- The mapping of POs and PSOs to activities related to curriculum gap and content beyond syllabi
- Feedback on bridging the curriculum gap and delivery of content beyond syllabi is collected from students.

## 2.5 Course Level Outcomes

Course Outcomes are narrower statements that describe what students are expected to know and are able to do at the end of each course. These relate to the skills, knowledge, and behavior that students acquire in their progress through the course.

Course Outcomes (COs) are central to your course's curriculum. They articulate to students, faculty, and other stakeholders what students will achieve in each course and how their learning will be measured. A Course Outcome (CO) is a measurable, observable, and specific statement that clearly indicates what a student should know and be able to do as a result of learning. The course outcomes must be specific and attainable within the duration of course.

Well-written course outcomes involve the following parts:

- Action verb
- Subject content
- Level of achievement
- Condition of performance (if applicable)

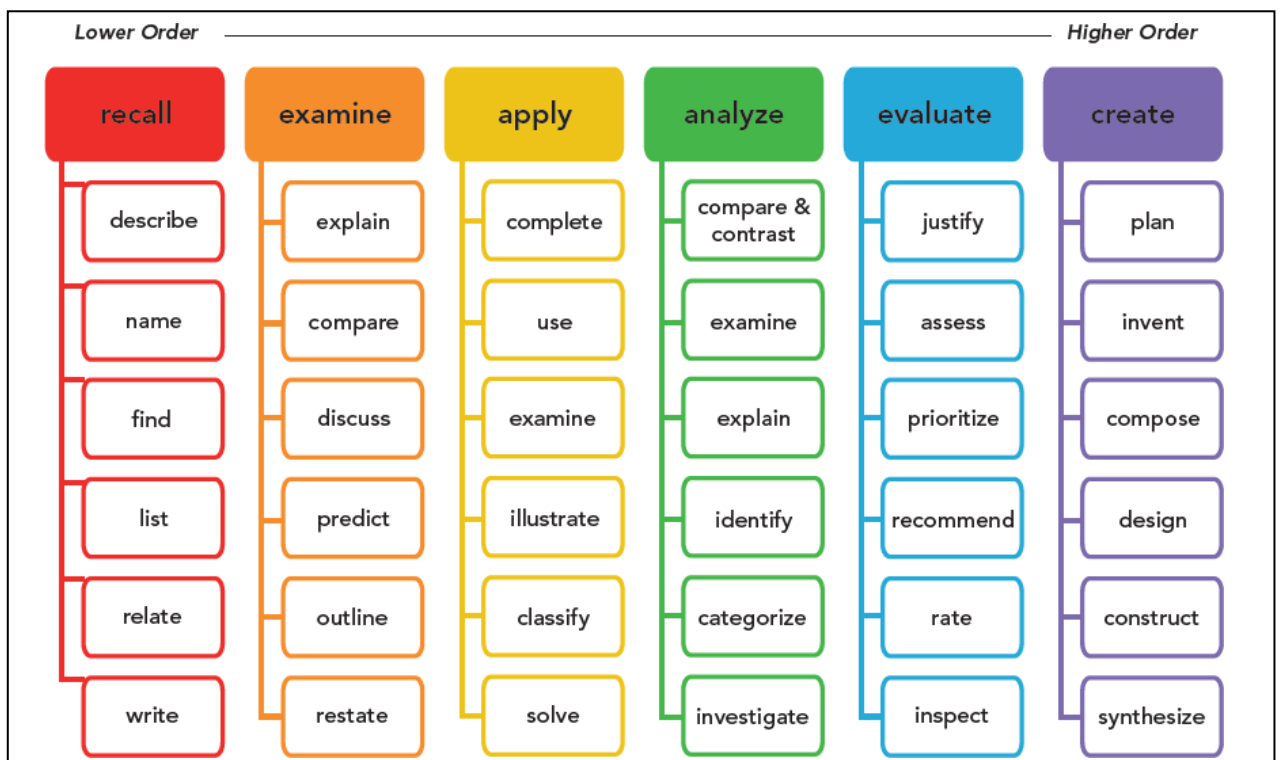
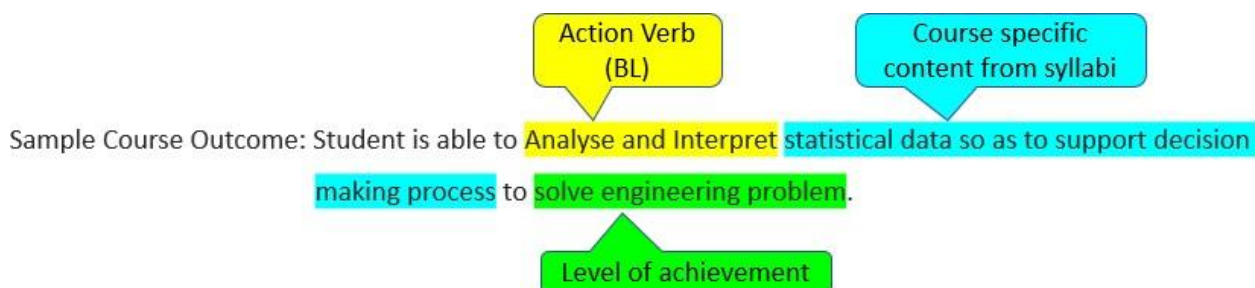


Fig. 2.4 Generating Course Outcome using Bloom's Taxonomy

Fig 2.4 shows the action verbs as per Bloom's Taxonomy from lower to higher order thinking skills. Following is the example course outcome showing three main components that must have in place.



## 2.6 CO – PO/PSO Mapping Matrix

The fundamental criterion of Outcome Based Education is to ensure the attainment of POs and PSOs by the students of the program through the process that involves the delivery of curriculum effectively. Thus, mapping of courses and activities involved in curriculum with POs and PSOs is essential. The COs of each course shall be mapped to POs and PSOs along with its correlation strength mentioned in three levels (slight-1, moderate-2 and substantial-3)

The correlation strength of CO-PO/PSO mapping is based on mapping of parts/components of an outcome, as shown below

Outcome	Action verb (BT level)	Content	Level of achievement	Co-relation strength (1/2/3)
*PO/PSO statement				*Strength is defined and justified on the basis of mapping
*CO statement				

CO-PO mapping matrix is prepared for all courses and mention average value of co-relation strength for each PO/PSO hence, to get Course-PO/PSO mapping matrix.

## 2.7 Attainment Levels and Setting of Targets

Based on percentage of CO attainment, the three levels of attainments are as below

Attainment Level 1 = less than 60% of students meet the set threshold

Attainment Level 2 = Greater than or equal to 60% and less than 80% of students meet the set threshold

Attainment Level 3 = Greater than or equal to 80% of students meet the set threshold

PO/PSO attainment is explained in section 4. The target for PO/PSO attainment is set as below

Target for PO/PSO attainment = (80% of average mapping value of Course-PO/PSO matrix) + (20% of 3)

The program committee may decide the percentage of above value at initial stages.



## 2.8 Assessment Management Software

The institute has developed an in house Assessment Management Software for the purpose of collecting data of assessment and calculating the levels of CO and PO/PSO Attainment.

This software developed in MS Excel base is adaptable to all the types of courses administered by the program. Some glimpses of the software dashboards are as follows:

JSPM's Bhivrabai Sawant Polytechnic, Pune																	
Measuring CO attainment through MSBTE Examination (SEE)																	
Program	Academic Year		Semester														
Course	Code		Name of Staff														
Pattern			PR (ESE) Marks		Course Outcome										Total		
PR (ESE)	70%				PR (ESE)										0		
PR (PA)	30%		PR (PA) Marks												Enter here no. of experiments performed (Lab Manual)		
Roll No.	Name of Student	PR (ESE)	PR (PA)			#VALUE!	M/N	#VALUE!	M/N	#VALUE!	M/N	#VALUE!	M/N	#VALUE!	M/N	#VALUE!	M/N
	Marks	0	0														
1																	
2																	
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20																	

Fig. 2.8.1 SEE tools assessment dashboard

JSPM's Bhivrabai Sawant Polytechnic, Pune																	
Measuring CO attainment through MSBTE Examination (SEE)																	
Program	Academic Year		Semester														
Course	Code		Name of Staff														
Pattern			TH (ESE)		Course Outcome										Total		
TH (ESE)	70%				TH (ESE)										0		
TH (PA)	30%		TH (PA)												Enter here weightage of particular CO		
Roll No.	Name of Student	TH (ESE)	TH (PA)			#VALUE!	M/N	#VALUE!	M/N	#VALUE!	M/N	#VALUE!	M/N	#VALUE!	M/N	#VALUE!	M/N
	Marks	70	30														
1																	
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Fig. 2.8.2 CIE tools assessment dashboard

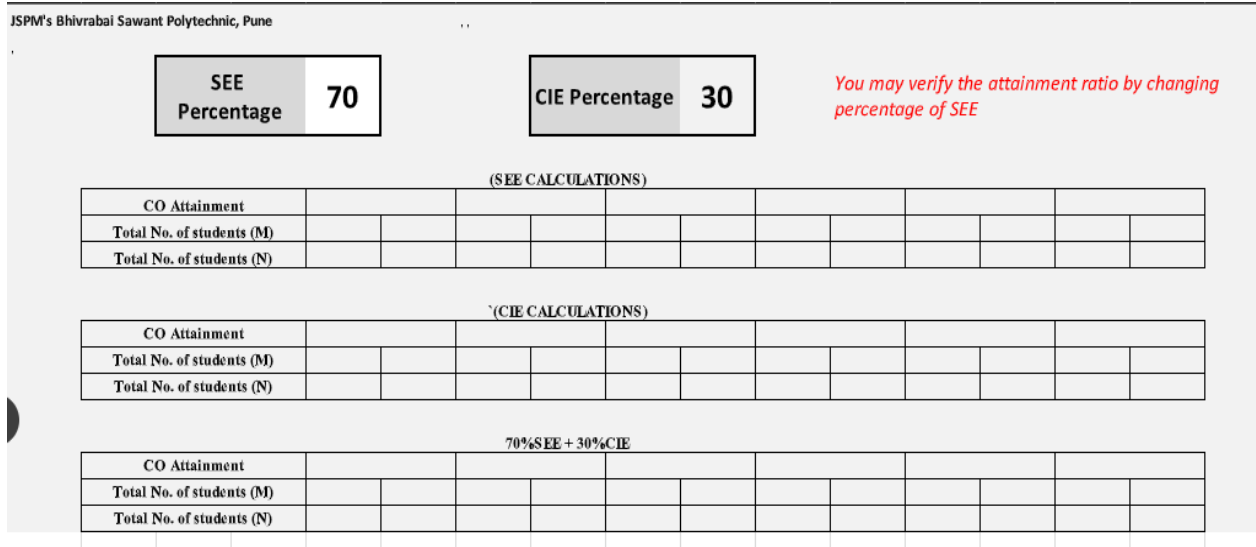


Fig. 2.8.3 CO Attainment dashboard

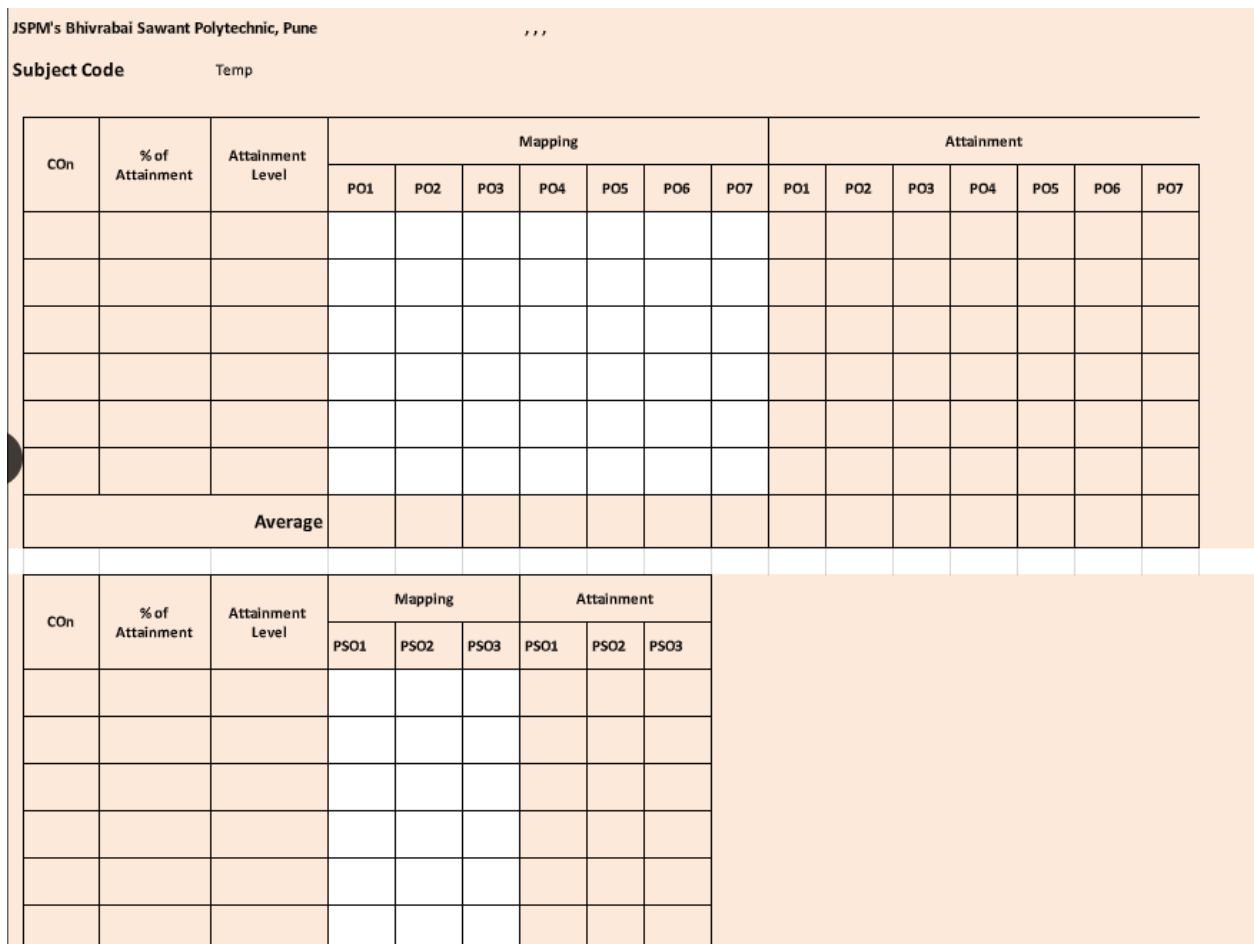
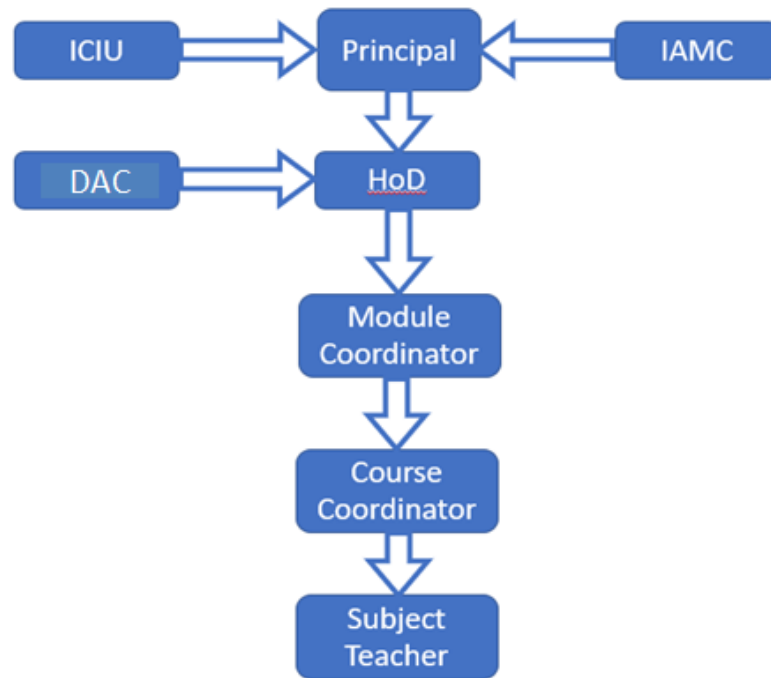


Fig. 2.8.4 PO-PSO Attainment dashboard

## 2.9 Support and Structure of Administrative Setup for Assessment



**Fig. 2.9 Administrative Setup for OBE**

There exists a systematic administrative setup for effective implementation of OBE. Different Committees are established with specific mandate to cater to curriculum design, implementation, and improvement as well as assessment. The roles and responsibilities of the various organs of the setup are as follows:

1. ICIU (Institute Level Curriculum Implementation Unit):
  - Constituted as per the guidelines of Maharashtra State Board of Technical Education (MSBTE).
  - It consists of internal and external stakeholders.
  - Primary objective of the ICIU is effective implementation of the curriculum at the institute level.
  - The objective is achieved through curriculum implementation plan, guidance for curriculum delivery and assessment, ensuring adherence to statutes.
  
2. IAMC (Internal Academic Monitoring Committee)
  - Also constituted as per the guidelines of Maharashtra State Board of Technical Education (MSSBTE), it consists of internal stakeholders.
  - The primary objective is to monitor the academic practices of the institute.
  - The IAMC strengthens the academics through ensuring higher learning outcomes and fulfillment of Program Outcomes.
  - It also aids the faculty members to enhance their pedagogy skills, and in development of appropriate teaching learning practices and evaluation processes.
  - The IAMC has wide range of functions ranging from academic planning, adherence to norms, audit of teaching learning practices, monitoring effectiveness of processes,

enhancement of practices such as ICT (Moodle LMS) audit, promoting self-learning etc.

- Since the institute is affiliated to the MSBTE, the IAMC plays a strong role in extending the ambit of the programs from affiliation to accreditation.

3. Department Advisory Committee (DAC)

- The DAC that is a comprehensive department level advisory board that consists of external and internal stakeholders at the program level.
- The objective of DAC is to ensure holistic and effective OBE implementation in the program.
- The functions of DAC start from drafting the department vision and mission, PEOs, OBE philosophy for the program, evaluation and improvement in attainment of program outcomes.

4. Internal Stakeholders for OBE implementation and their roles are as follows:

- Principal: Administrative head of the institute.
- Head of the Department: Administrative head of the department
- Module Co-ordinator: Co-ordinating between the courses under the respective modules from OBE perspective.
- Course Co-ordinator: Curriculum implementation from OBE perspective e.g. Mapping of Course Outcomes with POs and PSOs, Design of tools for assessment of outcomes, evaluation of PO and PSO Attainment at course level and related actions.

### 3. Attainment of Course Level Outcomes

#### 3.1 Assessment Management Plan

For each course, the assessment management plan is prepared, based on the MSBTE marking scheme and internal assessment tools. The marks per CO for MSBTE suggested progressive/continuous assessment tools and semester end examination tools are taken as per MSBTE marking scheme. Similarly, the marks per CO for internal assessment tools are also mentioned in following tabular format:

Course Outcome		Progressive/Continuous Evaluation CIE Tools				Semester End Evaluation SEE Tools	
		Workbook/ Class Test	Assignment	Sessional Test (PA)	Lab (PA)	TH(ESE)	PR(ESE)
CO1							
CO2							
CO3							
.....							
.....							

#### 3.2 Proforma for Continuous Assessment

The assessment norms and Proforma for continuous assessment of various tools shall be followed as per the Article 5.1.1 of the *Manual for Curriculum Implementation and Assessment Norms (CIAAN 2017)* and refer article 2.6 for assessment of minor and major projects.

#### 3.3 Data Collection Methodology

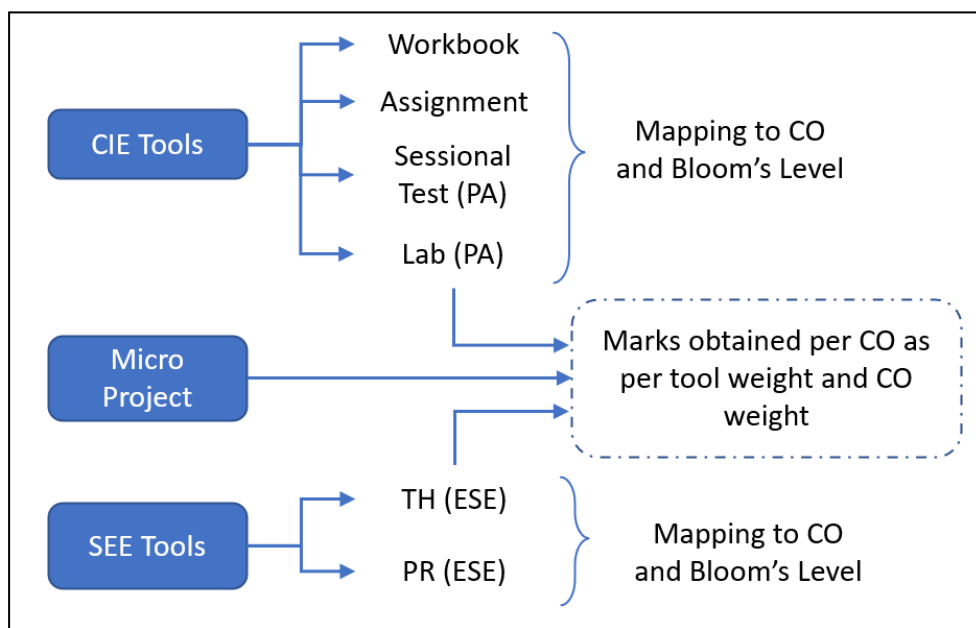


Fig. 3.3a

Collection Methodology

Data

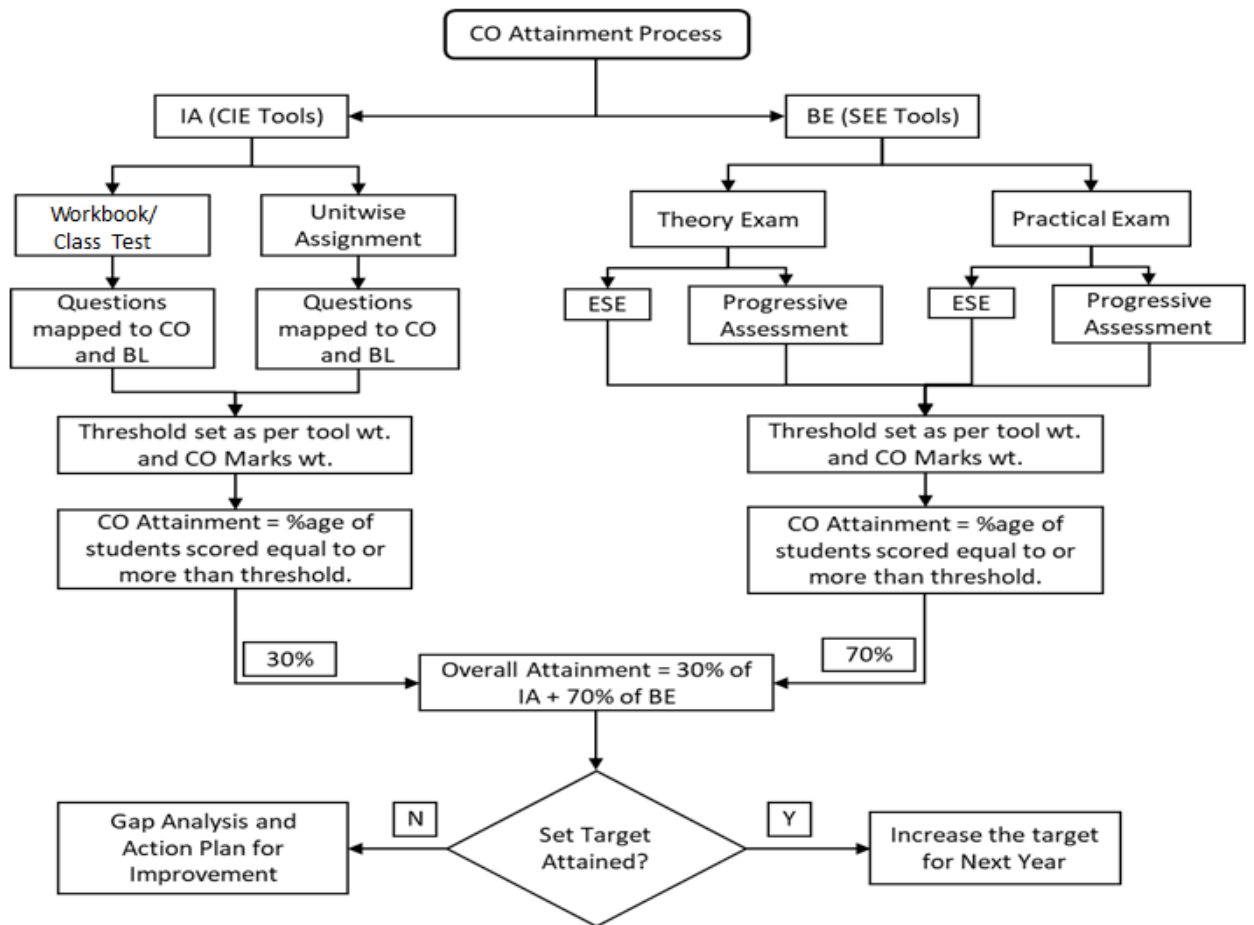


Fig. 3.3b CO Attainment Process

### 3.4 Course Outcome Attainment through CIE

Internal assessment includes workbook assessment and unit wise assignment. Individual faculty members have carried out the exercise for calculating CO attainment through IA with the prior guidelines described as:

- For workbook assessment each question is mapped with particular CO. If student score more than threshold marks, (Threshold marks is calculated based on tool weight and CO wise marks weight) will be considered as 'M' student (i.e. student who meet CO attainment) for respective CO; same process is followed for all remaining Cos in the workbook assessment. (Threshold Marks =  $\sum [\text{Max. Marks} \times \text{CO wise mark weight}]$ ).
- For each CO, assignments were taken. The CO attainment through assignment is also worked out by similar principle.
- Thus CO attainment obtain through internal assessment (IA) includes data gathered from workbook and assignments.



MSBTE theory examinations and online examinations are held at the end of every semester as per academic calendar of MSBTE. Individual faculty members have carried out the exercise for calculating CO attainment through BE with the prior guidelines described as:

- In Board Examination (BE), Percentage of total marks obtained in MSBTE Theory Exam (TH-ESE, TH-PA), Practical (PR-PA), Oral/ Practical Exam (PR-ESE) is calculated. Parameters (viz. TH-ESE, TH-PA, PR-ESE, PR-PA) selected for course for CO attainment through BE are based on MSBTE teaching scheme.
- Percentage obtained is then split amongst each CO depending upon the weightage.
- Students who score equal to or more than threshold level are considered as 'M' students which give CO attainment obtained through BE.

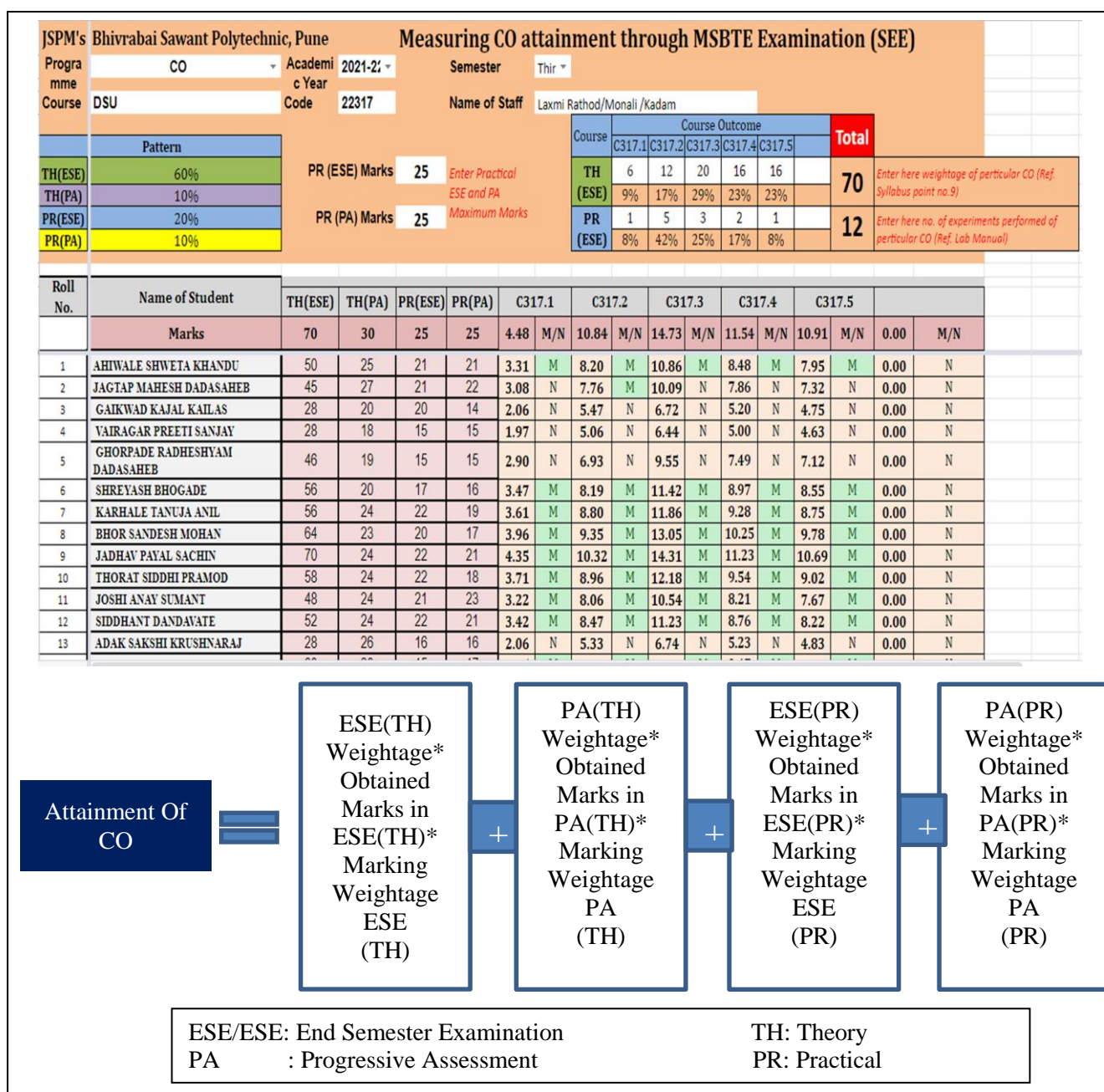


Fig. 3.5 Course Outcome Attainment through SEE



### 3.6 Overall CO Attainment

Combining IA and BE for overall CO Attainment:

Individual faculty members have carried out the exercise for calculating total CO attainment by Combining IA and BE with the prior guidelines described as:

- Assessment tools are categorized into two methods to assess the course outcomes as: Internal Assessment (IA) and Board Examination (BE) as described above.
- For total CO attainment, 30% of IA and 70% of BE is considered.
- Percentage range for CO attainment levels is set by, IAMC and DAC which are equal to, less than 60% for attainment level 1, 60% to 80% for attainment level 2 and more than 80% is attainment level 3. Attainment level as per set percentage for level 1, level 2 and level 3 for respective course is determined.
- The target for CO attainment shall be based on the earlier assessment result in board examination of respective year.
- If set target is achieved, then increase the target percentage for each level, if not; keep same target percentage for respective level for next year.

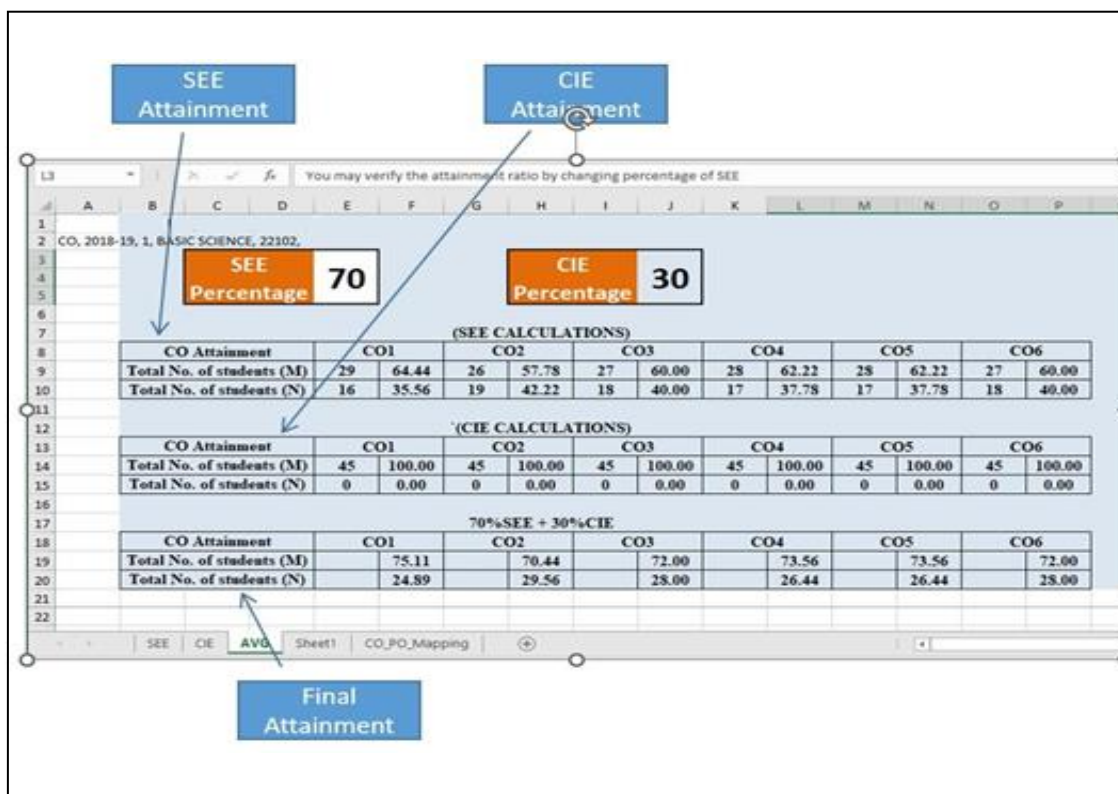


Fig. 3.6 Overall CO Attainment

## 4. Attainment of Program Level Outcomes

### 4.1 Process of Attainment

In order to assess the program outcomes and program specific outcomes, two methods are employed namely Direct Attainment and Indirect Attainment. Direct Attainment is obtained through the CO-PO/PSO articulation matrix and is evidence based. For Indirect Attainment, the results of survey/feedback from stakeholders is considered.

Following figure shows assessment processes for PO and PSO Attainment:

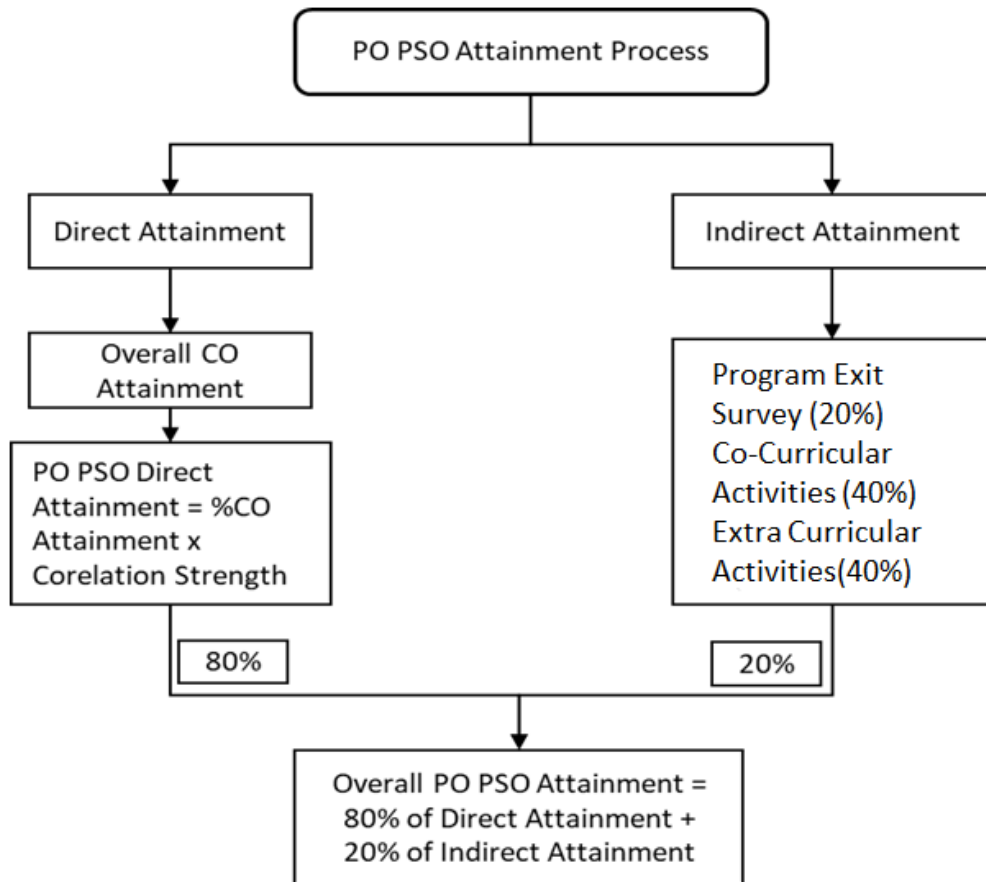


Fig. 4.1 Process of Attainment

### 4.2 Direct Attainment

The Direct PO PSO attainment is obtained through the administration of courses and assessment of course outcomes. The CO attainment is obtained as a percentage as per the formula described in section 3. The PO PSO attainment through one course is obtained by multiplying the percentage attainment of a particular CO with the respective CO-PO/PSO correlation level as given in the CO-PO/PSO articulation matrix. The average of all PO-PSO attainment through Course Outcomes is taken for the entire program. The Attainment values thus obtained from the Direct PO-PSO Attainment for a particular batch of the program.

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Subject Code		Temp													
CO <sub>n</sub>	% of Attainment	Attainment Level	Mapping							Attainment					
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO1	PO2	PO3	PO4	PO5	PO6
Average															

CO <sub>n</sub>	% of Attainment	Attainment Level	Mapping			Attainment		
			PSO1	PSO2	PSO3	PSO1	PSO2	PSO3

Fig. 4.2 Direct Attainment

### 4.3 Indirect Attainment

Indirect PO attainment is a result of surveys and includes following assessment tools:

- Employer survey and exit survey that reflect the employers/student’s opinion which evaluates the indirect PO attainment.
- Co-curricular and extra-curricular activities feedbacks are also considered in indirect PO attainment evaluation. Co-curricular activities include expert lectures, educational visits, technical events, training, or workshops. Extra-curricular activities include various social and cultural activities. PO attainment from co-curricular activities and extra-curricular activities is done by assessment through program outcome-based student’s feedback.

Total indirect attainment is calculated by considering 25% weightage for employer survey, 25% weightage for activity feedback and 50% weightage for exit survey as mentioned above.

### 4.4 Overall Attainment

Total PO attainment can be calculated by referring direct and indirect PO attainment with the prior guidelines described as:

- For overall PO attainment, 80% of direct attainment and 20% of indirect attainment is considered.
- The target for overall PO attainment shall be taken as average value of course- PO/PSO co relation articulation matrix.
- If set target PO/PSO is achieved, then the higher values of target for CO attainment are set.

## **5. Setting up Action Plan for Improvements**

The attainment values for a particular batch are evaluated as per the processes stated. These values are then compared with the set attainment levels for a particular batch. If the Target Attainment level for a particular PO or PSO is not reached, then as per the policy, specific improvements are initiated.

Observations are recorded regarding the attainment of each PO/PSO against set target. The Action Plan for improvements depends on the POs as follows:

- For POs in the Knowledge domain, namely PO1 and PO2, the action plan includes focus on improving the students' knowledge through lectures, tutorials, pre-requisite courses, numerical practice, and extra tests and so on.
- For POs in the Skill Domain namely PO3 to PO6, the action plan includes more focus on laboratories, including experiments, industrial training on equipment and software etc.
- For POs in the Attitude domain, i.e., PO1 to PO7 the improvement actions include expert lectures, industrial visits and industrial training, enhanced capstone projects, focus on extension activities along with co-curricular and extra-curricular activities, internships, encouragement to participate in and organize technical events and competitions.

The action plan forms the roadmap for continuous improvement addressing the essence of OBE.