AISSMS

POLYTECHNIC
CENTER OF ACADEMIC EXCELLENCE

Approved by AICTE New Delhi, Recognized by the
Government of Maharashtra and Affiliated to MSBTE, Mumbai

Institute manual
Outcome Based Education (OBE)

Website: - www.aissmspoly.org.in

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Abbreviations:

OBE	Outcome Based Education	BTL	Bloom's Taxonomy Level
LOT	Lower Order Thinking	HOT	Higher Order Thinking
PEO	Program Educational Objectives	PO	Program Outcome
CO	Course Outcome	PSO	Program Specific Outcome
ESE	End Semester Examination	PA	Progressive Assessment
MSBTE	Maharashtra state board of Technical Education	TW	Term Work
TH	Theory	PR	Practical
TSI	Theory Score Index		

Important Definitions

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

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

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

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

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

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

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

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

Bloom's Taxonomy Level: There are six levels of cognitive learning according to the revised version of Bloom's Taxonomy. Each level is conceptually different. The six levels are remembering, understanding, applying, analyzing, evaluating, and creating.

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

Introduction

Outcome Based Education (OBE) is an educational model that forms the base of a quality education system. There are various styles of teaching or assessment in OBE. All educational activities carried out in OBE should support the students to achieve the set goals. The faculty may adapt the role of instructor, trainer, facilitator, and/or mentor, based on the outcomes targeted. OBE enhances the traditional methods and focuses on what the Institute provides to students. It shows the success by making or demonstrating outcomes using statements "able to do" in favor of students. OBE provides clear standards for observable and measurable outcomes.

Why OBE?

1. International recognition and global employment opportunities.
2. More employable and innovative diploma graduates with professional and soft skills, social responsibility and ethics.
3. Better visibility and reputation of the technical institution among stakeholders.
4. Improving the commitment and involvement of all the stakeholders.
5. Enabling diploma graduates to excel in their profession and accomplish greater heights in their careers.
6. Preparing diploma graduates for the leadership positions and challenging them and making them aware of the opportunities in the technology development.

Benefits of OBE

Clarity: The focus on outcome creates a clear expectation of what needs to be accomplished by the end of the course.

Flexibility: With a clear sense of what needs to be accomplished, instructors will be able to structure their lessons around the students' needs.

Comparison: OBE can be compared across the individual, class, batch, program and institute levels.

Involvement: Students are expected to do their own learning. Increased student involvement allows them to feel responsible for their own learning, and they should learn more through this individual learning.

India, OBE and Accreditation

From 13th June 2014, India has become the permanent signatory member of the Washington Accord. Implementation of OBE in higher technical education also started in India. The National

Assessment and Accreditation Council (NAAC) and National Board of Accreditation (NBA) are the autonomous bodies for promoting global quality standards for technical education in India. NBA has started accrediting only the programs running with OBE from 2013.

The National Board of Accreditation mandates establishing a culture of outcome-based education in institutions that offer Engineering, Pharmacy, Management program. Reports of outcome analysis help to find gaps and carryout continuous improvements in the education system of an Institute, which is very essential.

Features of OBE:

- OBE is an educational process that focuses on what students can do or the qualities they should develop after they are taught.
- It involves the restructuring of curriculum, assessment and reporting practices in education to reflect the achievement of higher order learning and mastery rather than accumulation of course credits.
- Both structures and curricula are designed to achieve those capabilities or qualities in OBE.
- It discourages traditional education approaches based on direct instruction of facts and standard methods.
- It requires that the students demonstrate that they have learnt the required skills and content.

Deficiencies in Traditional education

- Provides students with a learning environment with little attention to whether or not students ever learn the material.
- Students are given grades and rankings compared to each other – students become exam oriented or CGPA driven. Graduates are not completely prepared for the workforce.
- Lack of emphasis on soft skills needed in jobs e.g. communication skills, interpersonal skills, analytical skills, working attitude etc.

Expectations of students under OBE – the outcome

- Students are expected to be able to do more challenging tasks other than memorize and reproduce what was taught.
- Students should be able to: write project proposals, complete projects, analyze case studies, give presentations, show their abilities to think, question, research, and make decisions based on the findings.
- Be more creative, able to analyze and synthesize information.

- Able to plan and organize tasks, able to work in a team as a community or in entrepreneurial service teams to propose solutions to problems and market their solutions.
- Students should be enriched on three dimensional scales of knowledge, skill and attitude throughout the course.

The OBE model measures the progress of the graduate in three parameters
- Program Educational Objectives (PEO)
- Program Outcomes (PO)
- Course Outcomes (CO)
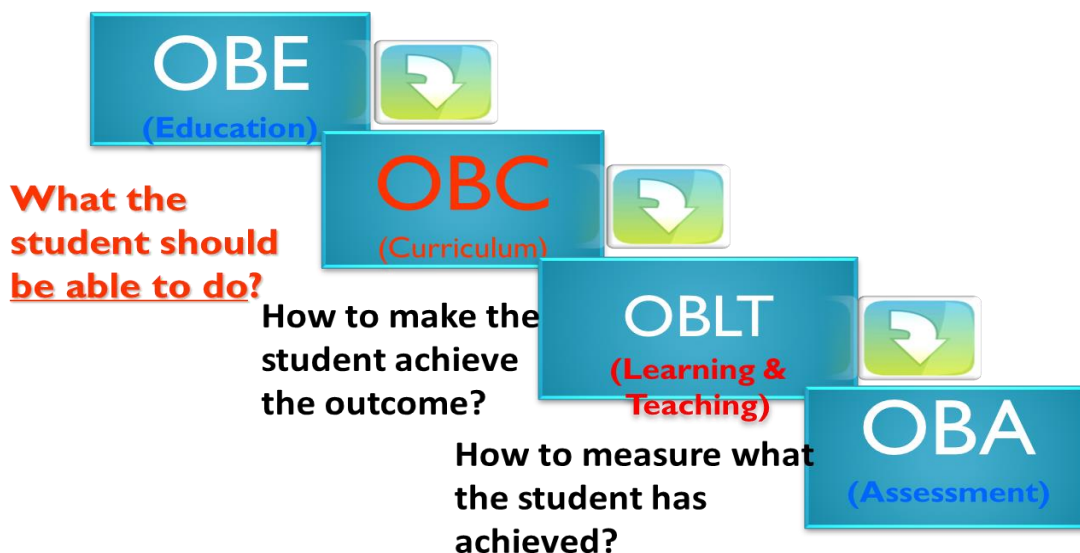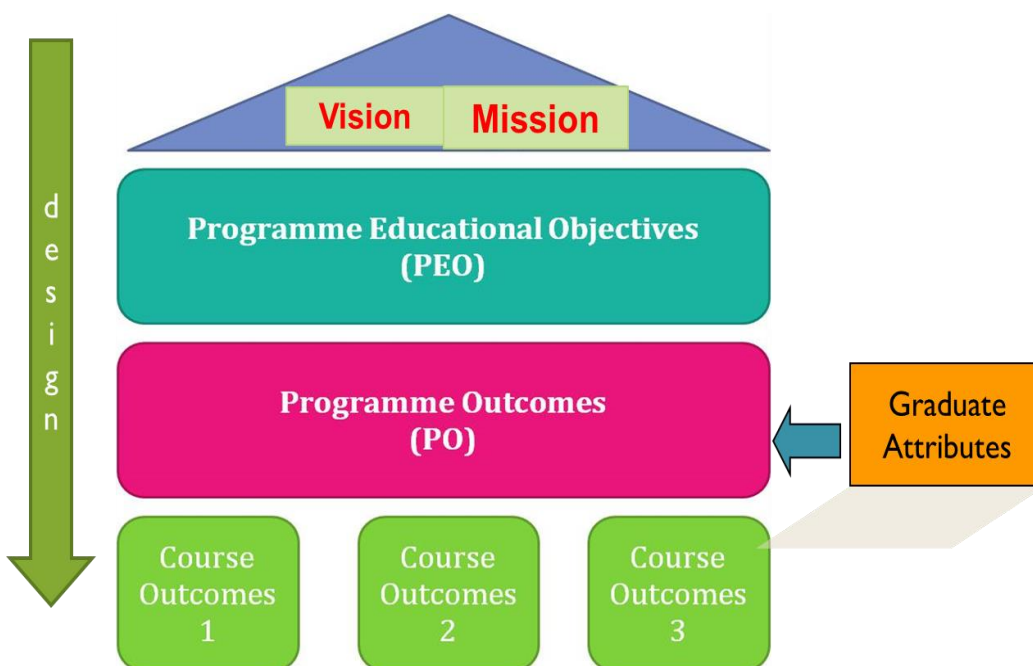
1) Vision, Mission, Objectives & Quality Policy

Vision

Achieve excellence in quality technical education by imparting knowledge, skills and abilities to build a better technocrat.

Mission

M1: Empower the students by inculcating various technical and soft skills.

M2: Upgrade teaching-learning process and industry-institute interaction continuously.

Objectives

To inculcate learning habits in students by project based learning.

To strengthen all the departments by encouraging faculty development.

To motivate students for personality development, career guidance and encourage the spirit of team work.

To strengthen industry – institute interaction and develop entrepreneurship skills.

Quality Policy of the institute:

- The AISSMS Polytechnic is committed to empower our students to meet global challenges in technical industry through technical education.
- Our highly qualified and committed faculty is constantly exploring newer frontiers of knowledge with the intention to build quality technocrats.
- We believe in grooming the overall persona of our students through excellence in academics, co-curricular and extracurricular activities.
- We strive to develop a sense of social obligation and discipline among our students to be a better human being.

2) Program Educational Objectives (PEOs)

Program Educational Objectives (PEOs) should be defined by the Head of the Department in consultation with the faculty members. PEOs are a promise by the department to the aspiring students about what they will achieve once they join the programme. PEO assessment is not made compulsory by NBA as it is quite difficult to measure in Indian context. NBA assessors usually do not ask for PEO assessment but they emphasize on the process of formation of PEOs and its dissemination. PEOs are about professional and career accomplishment after 4 to 5 years of graduation. PEOs can be written from different perspectives like Career, Technical Competency and Behavior. While writing the PEOs do not use the technical terms as it will be read by prospective students who wants to join the programme. Two- five PEOs are recommended.

PEOs Of various programs in the institute are as follows

After completing the diploma engineering program students will be able to

1. Computer engineering

PEO 1: Provide socially responsible, environment friendly solutions to Computer engineering related broad-based problems adapting professional ethics.

PEO 2: Adapt state-of-the-art Computer engineering broad-based technologies to work in multidisciplinary work environments.

PEO 3: Solve broad-based problems individually and as a team member communicating effectively in the world of work.

2. Civil Engineering

PEO1: Improve learning habits in the students.

PEO2: Improve the spirits of team work in the students.

PEO3: Develop entrepreneurship skills.

PEO4: Be constantly in contact with the industry experts

PEO5: Conduct faculty development program to strengthen the program.

3. Mechanical Engineering

PEO1: Apply fundamentals of mechanical engineering to solve real life Problems.

PEO2: Achieve successful employment in a broad range of Industries.

PEO3: Become a successful entrepreneur.

PEO4: Develop professional ethics and responsibilities towards socio-economical activities.

4. Electronics and Telecommunication Engineering

PEO1: Enable students to apply specific technical knowledge for solving electronics and telecommunication engineering problems.

PEO2: Develop entrepreneurship skills to cater needs of society

PEO3: Inculcate professional ethics by curricular activities and extra-curricular activities.

PEO4: Nurture social and interpersonal skills.

5. Information Technology

PEO1: Analyze, formulate and solve the problems associated with IT field.

PEO2: Adapt soft skills for a diverse career path.

PEO3: Aware about ethical and societal responsibilities to become an IT professional.

6. Automobile Engineering

PEO1: Provide socially responsible, environment friendly solutions to Automobile engineering related broad-based problems adapting professional ethics.

PEO2: Adapt state-of-the-art Automobile engineering broad-based technologies to work multi-disciplinary work environments.

PEO3: Solve broad-based problems individually and as a team member communicating effectively in the world of work.

7. Artificial Intelligence and Machine Learning

PEO1: Develop artificial intelligence and machine learning based application.

PEO2: Pursue Higher education in the field of artificial intelligence and machine learning.

PEO3: Implement interdisciplinary projects with help of artificial intelligence and machine learning.

PEO4: Commit to strong ethics and develop entrepreneurship skills.

These objectives are quite broad by intention, as diploma graduates may seek further education or work in diverse areas. To make these objectives meaningful, they may be demonstrated by performance, actions, or achievements.

With a view to challenge ourselves and to nurture diverse capabilities for professional and intellectual growth for our students it is important for the institute to define objectives in generalized and broad format. Adherence to these objectives is proposed to be demonstrated through actions or achievements. The institute through programs/departments periodically reviews these objectives and as part of this review process, encourages comments from all interested parties including current students, alumni, prospective students, faculty, teaching assistants and members of related professional organizations, and colleagues from other educational institutions.

3) Program Outcomes (POs)

POs are to be in line with the graduate attributes as specified in the Washington Accord. POs are to be specific, measurable and achievable. NBA has well-defined 7 POs and it is common for all the institutions in India. In the curriculum given to students, there should be clear mention of course objectives and course outcomes along with CO-PO course articulation matrix for all the courses.

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 analyse 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.

4) Program Specific Outcomes (PSOs)

Program Specific Outcomes (PSOs) are statements that describe what the diploma graduates of a specific engineering program should be able to do. A list of PSOs written by various programs in the institute is given below.

1. Computer engineering

PSO 1: Use state-of-the-art technologies for operation and application of computer software and hardware.

PSO 2: Maintain computer engineering related software and hardware systems.

2. Civil Engineering

PSO1: Knowledge from expertise: Enriching the students with Knowledge through expertise ranging from town planning to structures.

PSO2: Quality Assurance: Increasing awareness among the students about cost, time and quality issues in construction to develop social and leadership skills.

3. Mechanical Engineering

PSO 1: Empowered with the knowledge of mechanical engineering activities with Scientific approach.

PSO 2: Developed with Technical skills for adapting Industrial atmosphere and Entrepreneurship qualities.

4. Electronics and Telecommunication Engineering

Program Specific Outcomes (PSOs):-

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.

5. Information Technology

PSO1: Use fundamental concepts of hardware and software systems.

PSO2: Identify various career opportunities in IT field

6. Automobile Engineering

PSO1: Automobile Maintenance: Use state-of-the-art technologies in maintenance of automobiles.

PSO2: Automobile Manufacturing Processes: Use relevant machinery, materials, equipment and processes to manufacture automobile components.

7. Artificial Intelligence and Machine Learning

PSO1: Use advanced technologies for application of computer software and hardware

PSO2: Maintain the AI & ML based system

OBE Framework of the Institute

Before Start of Semester	During Semester
MSBTE Curriculum document and Teaching-Examination scheme	Implement MSBTE curriculum & Refine Course file/Plan
Course Allotment by HOD (Based on Teaching-Examination scheme)	Updating & Tracking of course File
Subject confirmation by Faculty and prepare Teaching plan and Lab plan	Identifying student competency & Action taken
Follow MSBTE curriculum & Maintain coursefile as per the IAMC norms	Execution of all other Activities

End of Semester

Implementation & Verification of Coursefile through Internal academic audit (IAMC)

Assessment & evaluation of CO-PO Attainment

Submit Attainment analysis and course file to Processowner/HOD

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5) Relation between the Program Educational Objectives and the POs

Broad relationship between the program objectives and the program outcomes is placed in matrix form by each program/department. (Key: 3 = High; 2 = Medium; 1= Low). Details can be seen under each program.

6) Relation between the Program Specific Outcomes and the Program Educational Objectives:

Broad relationship between the program specific objectives and the program educational objectives is placed in matrix form by each program/department. (Key: 3 = High; 2 = Medium; 1= Low) Details can be seen under each program.

Note:

• The assessment process of POs and PSOs can be direct or indirect.

• The direct assessment will be done through interim assessment by conducting continuous internal exam and end semester exams.

• The indirect assessment on the other hand could be done through student's programme exit questionnaire, alumni survey and employment survey.

7) Blooms Taxonomy

Bloom's taxonomy is considered as the global language for education. Bloom's Taxonomy is frequently used by teachers in writing the course outcomes as it provides a readymade structure and list of action verbs. First students need to simply remember information provided to them—but reciting something doesn't demonstrate learning, but only memorization. With understanding comes the ability to explain the ideas and concepts to others. The students are then challenged to apply the information and use it in new ways, helping to gain a deeper understanding of previously covered material and demonstrating it further. Questioning information is a vital part of learning, and both analysis and evaluation do just this. Analyzing asks a student to examine the information in a new way, and evaluation demands the student appraise the material in a way that lets them defend or argue against it as they determine. The final step in the revised taxonomy is creating, which involves a developing new product or point of view. By utilizing Bloom's Taxonomy, students would remember the information as the class ends - rather, they retain and apply the information as they continue to grow as a student and in their careers, staying one step ahead of the competition.

7.1) Incorporating Critical Thinking Skills into Course Outcome Statements

Many faculty members choose to incorporate words that reflect critical or higher-order thinking into their learning outcome statements. Bloom (1956) developed a taxonomy outlining the different

types of thinking skills people use in the learning process. Bloom argued that people use different levels of thinking skills to process different types of information and situations. Some of these are basic cognitive skills (such as memorization) while others are complex skills (such as creating new ways to apply information). These skills are often referred to as critical thinking skills or higher-order thinking skills. Bloom proposed the following taxonomy of thinking skills. All levels of Bloom's taxonomy of thinking skills can be incorporated into expected learning outcome statements. Recently, Anderson and Krathwohl (2001) adapted Bloom's model to include language that is oriented towards the language used in expected learning outcome statements. A summary of Anderson and Krathwohl's revised version of Bloom's taxonomy of critical thinking is provided in Figure below.

Bloom's Taxonomy

Create — Produce new or original work
Design, assemble, construct, conjecture, develop, formulate, author, investigate

Evaluate — Justify a stand or decision
Appraise, argue, defend, judge, select, support, value, critique, weigh

Analyze — Draw connections among ideas
Differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test

Apply — Use information in new situations
Execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch

Understand — Explain ideas or concepts
Classify, describe, discuss, explain, identify, locate, recognize, report, select, translate

Remember — Recall facts and basic concepts
Define, duplicate, list, memorize, repeat, state

Revised Bloom's Taxonomy

7.2) Definitions of the different levels of thinking skills in Bloom's taxonomy:

1. **Remember** –recalling relevant terminology, specific facts, or different procedures related to information and/or course topics. At this level, a student can remember something, but may not really understand it.

2. **Understand** –the ability to grasp the meaning of information (facts, definitions, concepts, etc.) that has been presented.

3. **Apply** –being able to use previously learned information in different situations or in problem solving.

4. **Analyze** –the ability to break information down into its component parts. Analysis also refers to the process of examining information in order to make conclusions regarding cause and effect, interpreting motives, making inferences, or finding evidence to support statements/arguments.

5. **Evaluate** –being able to judge the value of information and/or sources of information based on personal values or opinions.

6. **Create** –the ability to creatively or uniquely apply prior knowledge and/or skills to produce new

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and original thoughts, ideas, processes, etc. At this level, students are involved in creating their own thoughts and ideas.

7.3) List of Action Words Related to Critical Thinking Skills

The list of action words listed below can be used when creating the expected student learning outcomes related to critical thinking skills in a course. These terms are organized according to the different levels of higher-order thinking skills contained in Anderson and Krathwohl's (2001) revised version of Bloom's taxonomy.

Here is the revised Bloom's document with action verbs, which we frequently refer to while writing COs for our courses.

The cognitive process dimensions- categories:

Lower Order Thinking (LOT)			Higher Order Thinking (HOT)		
Remember	**Understand**	**Apply**	**Analyse**	**Evaluate**	**Create**
Recognizing (identifying) Recalling (retrieving)	Interpreting Illustrating Classifying Summarizing Inferring (concluding) Comparing Explaining	Executing Implementing	Differentiating Organizing Attributing	Checking (coordinating, detecting, testing, monitoring) Critiquing (judging)	Planning Generating Producing (constructing)

Action Verbs for Course Outcomes

Lower Order Thinking(LOT)			Higher Order Thinking (HOT)		
Remember	**Understand**	**Apply**	**Analyse**	**Evaluate**	**Create**
Define	Explain	Solve	Analyse	Reframe	Design
Describe	Describe	Apply	Compare	Criticize	Create
List	Interpret	Illustrate	Classify	Judge	Plan
State	Summarize	Calculate	Distinguish	Recommend	Formulate
Match	Compare	Sketch	Explain	Grade	Invent
Tabulate	Discuss	Prepare	Differentiate	Measure	Develop
Record	Estimate	Chart	Appraise	Test	Organize
Label	Express	Choose	Conclude	Evaluate	Produce

Guidelines for writing Course Outcome Statements

Well-written course outcomes involve the following parts:

1. Action verb

2. Subject content

3. Level of achievement as per BTL

4. Modes of performing task (if applicable)

For Example:

Students are able to

1. State four applications of viscosity.---------Action verb (underlined)

2. Determine Young's modulus of given steel wire.---------Subject content.

3. Use structural analysis software to a competent Level -------- Level of achievement

4. Present seminar on real life problems.------------------- Modes of performing task

While writing Cos the following questions/points must be addressed properly

Specific	Is there a description of precise behavior and the situation it will be performed in ?
	Is it concrete, detailed, focused and defined?
Measurable	Can the performance of the outcome be observed and measured?
Achievable	With a reasonable amount of efforts and application can the outcome be achieved?
	Are you attempting too much?
Relevant	Is the outcome important or worthwhile to the learner or stakeholder?
	Is it possible to achieve this outcome?
Time-Bound	Is there a time limit, rate, number, percentage or frequency clearly stated?
	When will this outcome be accomplished?

Note: If Laboratory is given as separate course (with course code) then there should be separate course outcomes for Laboratory or as stated in the MSBTE curriculum document.

Process of Course outcome formulation and finalization:

Course outcomes are specified in the MSBTE I-scheme curriculum. They are considered as it is for CO-PO mapping.
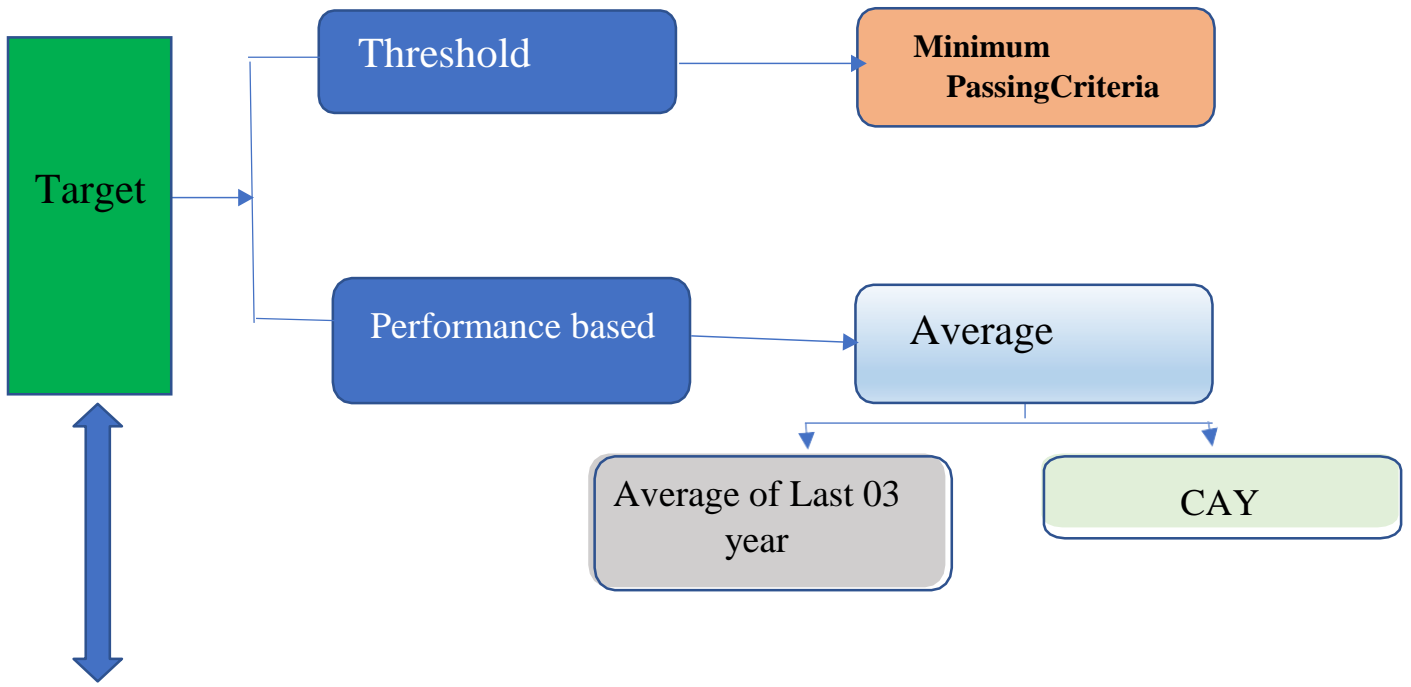
Steps followed for CO-PO-PSO mapping:

1. Arrange matrix of CO-PO-PSO (COs are to be taken row wise and Pos and PSOs are to be taken Column wise).
2. Highlight major/important words from each CO, PO and PSO.
3. Determine the percentage similarity between major/important words from each CO and PO-PSO.
4. Use following criteria for mapping or correlating CO-PO-PSO

% similarity between major/important words from each CO and PO-PSO	Mapping Level (CO-PO-PSO correlation level)
>70%	3 (Strong/High)
50-70%	2 (Moderate/medium)
30-49%	1 (Slight/low)
< 30%	- (Indirect/very low)

5. Prepare CO-PO-PSO mapping sheet

6. Write justification of CO-PO mapping/correlation in the following format.
7. Validate your CO-PO-PSO mapping by the validation committee (Course Faculty, Programme Coordinator, Domain Coordinator).

Target/Attainment

```
        ┌──────────────┐        ┌──────────────────┐
        │  Threshold   │───────▶│    Minimum       │
        │              │        │  PassingCriteria │
        └──────────────┘        └──────────────────┘
Target
        ┌──────────────────┐     ┌──────────────┐
        │ Performance based│────▶│   Average    │
        └──────────────────┘     └──────────────┘
                              ┌──────────────┐   ┌──────────┐
                              │Average of    │   │   CAY    │
                              │Last 03 year  │   │          │
                              └──────────────┘   └──────────┘
```

Threshold % for attainment	40
Degree of Attainment	
3 ≥ 70% students	High
2 ≥ 60% students	Med
1 ≥ 50% students	Low

Student competency

Strategies for Slow, Average and Advanced Learners for Slow learners

- Document/record of remedial classes with timetable & attendance
- Specially designed assignment/ task
- Student study group for peer-to-peer learning
- Individual Mentoring (Mentor Guardian)

For Average Learners

- Additional assignment/ task
- Encouraging for timely and effective completion of work
- Conduction of quiz, orals etc.
- Solving previous year MSBTE question papers and test papers

- Presentation on technical topics/ case studies/mini projects

For Advanced Learners

- Encouraging to present & publish papers in journals/conferences/competitions

- Guidance for Aptitude test / competitive Examination

- Encouraging to participate in professional activities.

- Specially designed activities to improve the portfolio of students.

- Individual guidance for career building

Rubrics for Assessment:

1. Rubrics Used for Evaluation of a Micro Project

Sr. No	Characteristic to be assessed	Indicators for different Levels of Performance (Evaluation Scale: 1-10)			
		Poor (1-3)	Average (4-5)	Good (6-8)	Excellent (9-10)
1	Relevance to the course	Related to vary few LOs	Related to some Los	Addressed at-least one CO	Addressed more than one CO
2	Literature review/ information collected	Not more than two sources (Primary and secondary), very old references	At least five relevant sources, at least 2 latest	At least 7 relevant sources, most latest	About 10 relevant sources, most latest
3	Completion of target as per project proposal	Completed less than 50%	Completed 50 to 60%	Completed 60 to 80 %	Completed more than 80 %
4	Analysis of data and representation	Sample size small, data neither organized nor presented well	Sufficient and appropriate sample, enough data generated but not organized and not presented well. No or poor interference drawn.	Sufficient and appropriate sample, enough data generated which is organized and presented well but poor interference drawn.	Enough data collected by sufficient and appropriate sample size. Proper interference drawn by organizing and presenting data through tables, charts and graphs.
5	Quality of prototype/Model	Incomplete fabrication/ assembly	Just assembled/ fabricated and parts are not functioning well. Not in proper shape, dimensions beyond tolerance limit. Appearance/ finish shabby.	Well assembled / fabricated with proper functioning parts. In proper shape, with in tolerance dimensions and good finish. But no creativity in design and use of material.	Well assembled/ fabricated with proper functioning parts. In proper shape, with intolerance dimensions and good appearance/ finish. Creativity in design and use of material.
6	Report Preparation	Very short, poor quality sketches, details about methods, material, precaution and conclusions omitted, some details wrong	Nearly sufficient and correct details about methods, material, precautions and conclusion, but clarity is not there in presentation. But not enough graphic description.	Detailed, correct and clear description of methods, materials, precautions and conclusions. Sufficient graphical description.	Very Detailed, correct and clear description of methods, materials, precautions and conclusions. Enough tables, charts and sketches.

7	Presentation of the micro project	Major information is not included, information is not well organized.	Includes major information but not well organized and not presented well.	Includes major information well organized but not presented well.	Well organized , includes major information, well presented
8	Viva	Could not reply to considerable number of question	Replied to considerable number of questions but not properly	Replied properly to considerable number of question	Replied most of the questions properly.

Assessment of micro project based on rubrics for performance in group activity :(Marks to be given out of 6)

Assessment of performance in individual presentation/Viva of micro project:

(Marks to be given out of 4)

Scale used for assessment: Poor (1-3), Average (4-5), Good (6-8), Excellent (9-10)

A) Process and Product Assessment (A):

Rubric No.	Characteristics to be assessed	Marks Obtained out of 10
1	Relevance to course	
2	Literature review/information collection	
3	Completion of target as per project proposal	
4	Analysis of data and representation	
5	Quality of prototype/model	
6	Report Preparation	
	Total Out of (60)	
	Process and Product Assessment (A): Total Out of (06)	

B) Individual Presentation/Viva(B)

Roll No.	Enrollment No.	Name of Student	Rubric 7 Individual Presentation	Rubric 8 Individual Viva	Individual Presentation/Viva (Addition of marks in Rubric 7 to 8)	Individual Presentation/ Viva (Convert out of 08 marks into out of 4) (B)	Total (A+B)
			Marks out of 10	Marks out of 10	Marks out of 20	Marks out of 04	Marks out of 10

2. Rubrics Used for Evaluation of a Laboratory experiments

In the practical Pros (Practical outcomes) are developed as sub-components of Cos. These are used in the assessment of students competency. The "product" and "process" related Pros are assessed as follows.

S. No.	Performance Indicator	Weightage %
1	Preparation of experimental set up	20
2	Setting and operation	20
3	Safety measures	10
4	Observations and Recording	10
5	Interpretation of results and conclusion	20
6	Answer to sample questions	10
7	Submission of report in time	10
	Total	100

Example :

Title of experiment: Chloride content of water sample

	Performance indicators	Weightage %
Process related: 15 Marks		**60**
1	Cleaning and filling burette	10
2	Measurement of water sample	10
3	Burette reading when potassium chromate changes color	20
4	Working in team	20
Product related: 10 Marks		**40**
5	Chloride content (Cl-)	20
6	Answer to sample questions	10
7	Submission of report in time	10
	Total	**100**

CO assessment and attainment process

Course outcomes (COs) are assessed using assessment tools as follows

Course outcome assessment and attainment		
Direct Assessment and attainment		Indirect Assessment and attainment
External Assessment Tools (80 % weightage)	Internal Assessment Tools (For Theory courses) (20% weightage)	Internal assessment Tool
MSBTE End semester Examination (ESE) (TH, PR, OR)	Class Test (TH-PA) Progressive assessment (PR-PA) Microproject (TH-PA) Optional: Preliminary/Mock/Mid-semester exam/Assignments/ Practice Test	Course-end survey

Indirect internal Attainment: (For Theory Course and Non-Theory course)

1. Prepare objective questionnaire based on course outcomes.

2. Conduct course end survey based on above questionnaire for minimum 50 % of the class strength.

3. Go to the Semiautomatic excel sheet and refer the sheet "Course End survey"

4. Fill the feedback score given by the students.

5. The attainment level is calculated from feedback given by the students. Here the target is set to 60%.

Final CO-attainment process:

| Course outcome assessment and attainment		
Direct Assessment and attainment		Indirect Assessment and attainment
External Assessment Tools (80 % weightage)	Internal Assessment Tools (20% weightage)	Internal assessment Tool
MSBTE End semester Examination (ESE) (TH, PR. OR)	Class Test (TH-PA) Progressive assessment (PR-PA) Microproject (TH-PA) Optional: Preliminary/Mock/Mid-semester exam/Assignments/ Practice Test	Course-end survey
[A] Find 80% of overall attainment External and place that value here	[B] Find 20% of overall attainment Internal and place that value here	[C] Find levels attained through Course end survey and place that value here
[D] CO Direct Attainment Level= [A] + [B]		[E] CO Indirect Attainment Level = [C]
[F] Find 80% of [D]		[G]Find 20 % of [E]
Overall CO attainment = [F]+[G]		

Attainment of Program Outcomes & Program Specific Outcomes

The table given below describes the assessment tools and processes used for assessing the attainment of each POs and PSOs.

Attainment	Correlation values used	Assessment Process
DIRECT PO/PSO-ATTAINMENT (80%)	DIRECT CO-ATTAINMENT (80%) + CO-ATTAINMENT (20%)	As per the details in 6.5
	80 % of the Correlation value (CO-attainment) obtained is used in direct PO/PSO attainment.	
	Assessment Tools used	Assessment Process
INDIRECT PO/PSO-ATTAINMENT (20%)	• Program Exit Survey: (Once in a year at the end of EVEN semester for final year students) • Alumina Survey: (Once in a year for passed out students)	• The objective type questionnaire based on program outcome is prepared by the program coordinator. • Feedback of students is analyzed using said questionnaires. • The objective type questionnaire for Alumina is prepared by the program coordinator. • Feedback of alumina is analyzed using said questionnaires
	• 20 % of the Correlation value (Program Exit Survey + Alumina Survey) obtained is used in indirect PO/PSO attainment.	

The POs and PSOs are evaluated by adding attainment from direct attainment (80%) and indirect attainment (20%). The derived attainment level is compared with the desired attainment level to check the attained POs & PSOs. The POs & PSOs which are not attained for concerned academic year are highlighted and the required action plans are prepared for the same and executed in next academic year.

PO Attainment Flow Chart
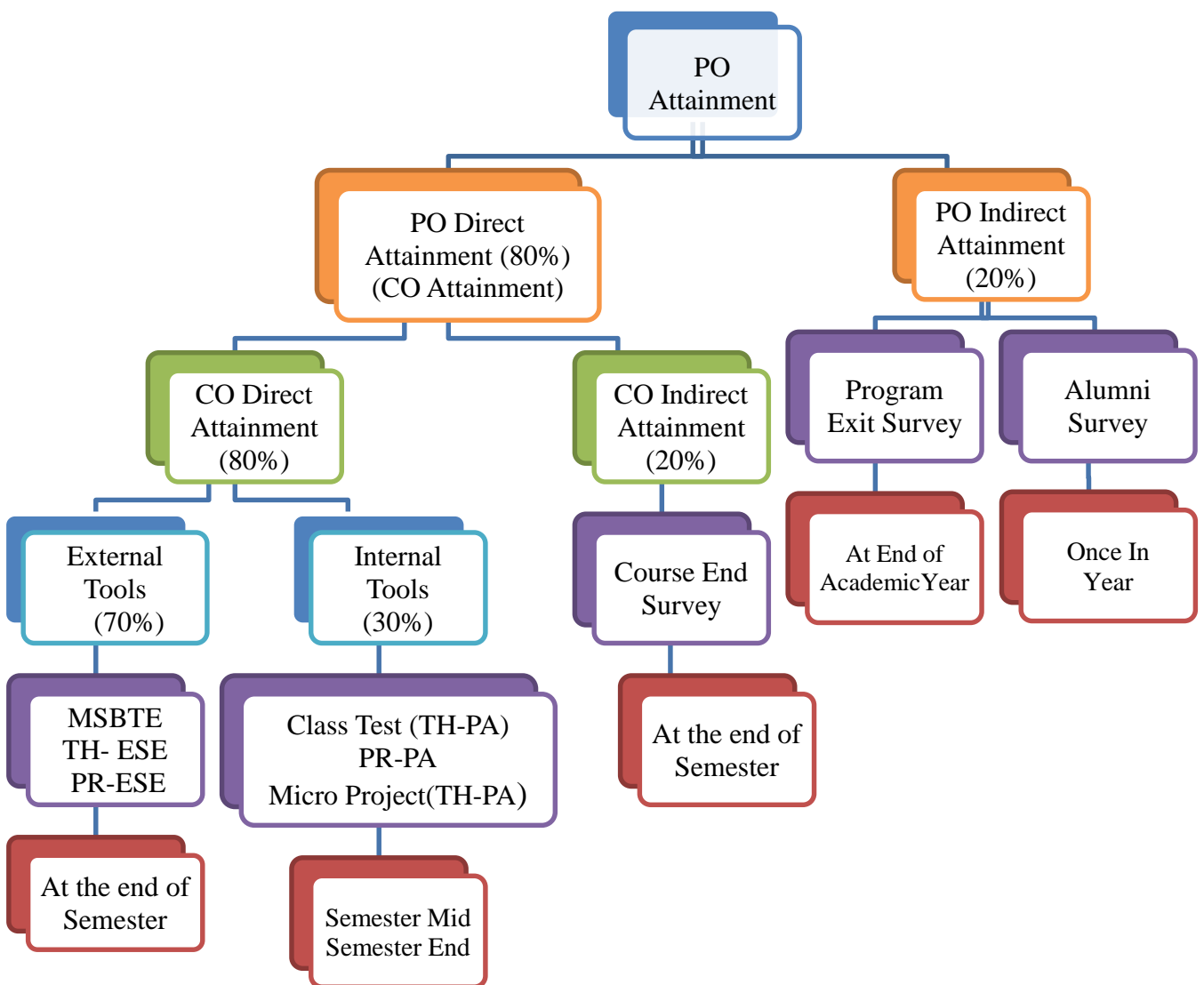
Continuous Improvement

I. Contribution of CO in PO attainment and Continuous Improvement (Faculty Level)

Outcome	Action to be taken by faculty
High attainment of allCO-PO (>2.5 out of 3)	Set new higher targets or attainment levels for next Academic Year (A.Y.).
Moderate attainment of all CO-PO (1.8 to 2.49 out of 3)	Record observations, Continue action plan of last A.Y. with plan for improvements.
Low attainment of all CO-PO (0.9 to 1.79 out of 3)	Record observations, assess the target set, revise/improve action plan of last A.Y. to achieve the attainment with plan for improvements.
CO-PO not attained, poor performance (<0.9 out of 3)	Record observations, Critical assessment of target with Program Assessment Committee (PAC), Revise action plan of last A.Y. at faculty/department level.

PO attainment and Continuous Improvement (PC and HOD Level)

Category	Outcome	Action by PO and HOD
Course Related	PO attained highly	Include activities with HOT.
	PO not attained highly	Identify concerned courses, plan for immediate improvements, guide, support and monitor its execution.
Activity Related	Activities Conducted	Critical assessment, impact analysis to be doneand revise as per the need for improvements.

Checklist of documents for faculty

The following documents shall be prepared and produced (when required) by each faculty

- ✓ Course file verified by the HOD and IAMC
- ✓ Personal file
- ✓ Institute TSI record of the Theory course
- ✓ Calculation of Institute TSI for non-theory course
- ✓ CO-wise data of all internal assessment tools. (Class Test, TW, Microprojects & any other tools)
- ✓ Result analysis of term end examination
- ✓ CO-PO-PSO Semiautomatic excel sheet to be submitted to the concerned department criteria 3 coordinators
- ✓ Record of remedial actions taken
- ✓ Record of mentoring
- ✓ Sample term work/ micro project record/Class test papers/Assignments (Minimum 5: Bright/Average/Poor)
- ✓ Typewritten operating procedure of the experiments to be displayed in the laboratory
- ✓ Standard data/results
- ✓ Innovation in teaching-learning process
- ✓ Content beyond syllabus for Theory and Practical
- ✓ Records of portfolios assigned by HOD