

# ASSESSMENT MANUAL

R20 REGULATION



**DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING**

**BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE**

**AMALAPURAM**

## 1. INTRODUCTION

**Outcome Based Education (OBE)** is an educational model that forms the base of a quality education system. There is no single specified style of teaching or assessment in OBE. All educational activities carried out in OBE should help 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?

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

### BENEFITS OF OBE

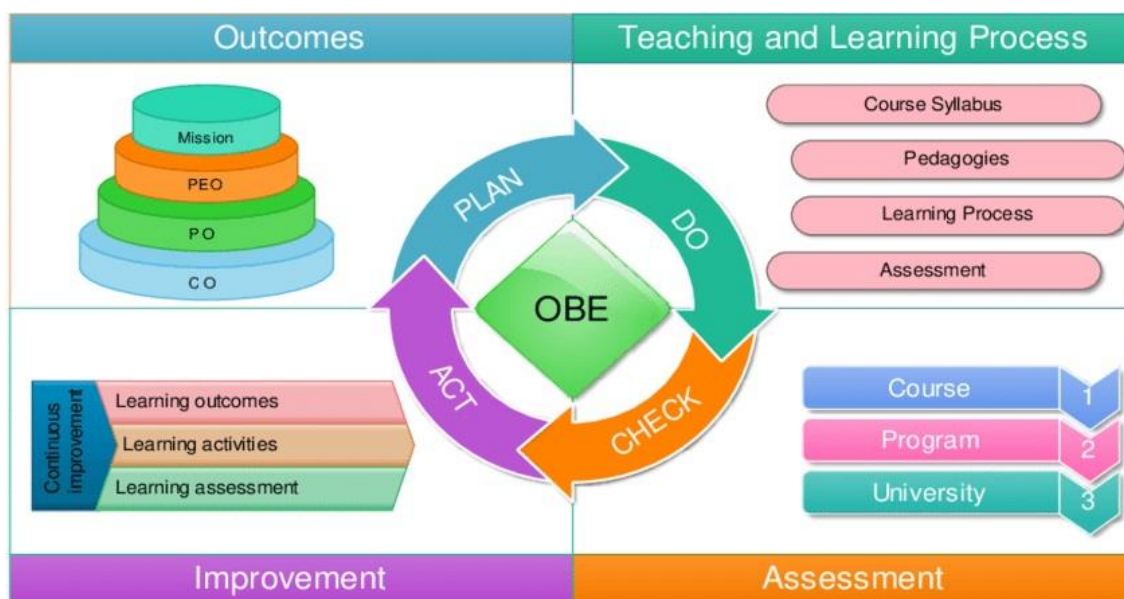
- **Clarity:** The focus on outcome creates a clear expectation of what needs to be accomplished by the end of the course.
- **Flexibility:** With a clear sense of what needs to be accomplished, instructors will be able to structure their lessons around the students' needs.
- **Comparison:** OBE can 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.

### 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.

OBE 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.
- 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.



### 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 case 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 or programme.

## INSTITUTE VISION AND MISSION

### **Vision**

To be a Premier Institution in Education and Research, producing global leaders in Engineering, Technology and Management

### **Mission**

**IM 1.** Imparting quality and outcome-based education towards academic excellence

**IM 2.** Inculcating team spirit and professional ethics among stakeholders.

**IM 3.** Strengthening links with industry through internships and collaborative development works.

## DEPARTMENT VISION AND MISSION

### **Vision**

To become a centre of excellence in electrical and electronics engineering education, research and technology development to handle challenges of the nation, with innovation and critical thinking.

### **Mission**

**DM 1.** Empower stakeholders with state of the art knowledge and technological skills

**DM 2.** Promote industry institute interaction through practical problem solving.

**DM 3.** To impart trainings for overall development.

**DM 4.** To develop the ability to function in multi-disciplinary teams with emphasis on creativity and passion for the betterment of mankind.

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO 1** Graduates will be able to define, analyse and solve Electrical & Electronics engineering problems and employ necessary tools, techniques, hardware for modern Engineering applications.

**PEO 2** Graduates will be able to pursue successful career in MNCs, private and government organizations.

**PEO 3** Graduates will pursue higher studies to enhance their professional and inter-personal skills.

**PEO 4** Graduates will be able to contribute to the development of the chosen field with continuous learning.

### PROGRAM OUTCOMES (POs)

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

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

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

**PO4 CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

**PO6 THE ENGINEER AND SOCIETY:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

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

**PO9 INDIVIDUAL AND TEAMWORK:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

**PO11 PROJECT MANAGEMENT AND FINANCE:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own

work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

### PROGRAM SPECIFIC OUTCOMES (PSOs)

**PSO 1 Professional Skills:** Sustainable energy solutions: Design cutting edge technologies and provide solutions to overcome the Global Energy crisis.

**PSO 2 Soft-Skills & Ethics:** MATLAB, IOT Usage: Application of IOT, MATLAB in solving complex electrical engineering problems.

### OBE FRAMEWORK OF THE INSTITUTE

#### The adoption of OBE framework

##### I. Before Start of Semester

- Competency Matrix
- Subject Preference form
- Subject Allotment by HoD (Based on Competency)
- Subject confirmation by faculty
- Curriculum, Lesson Plan, Course file, Authentication by HoD

##### II. During Semester

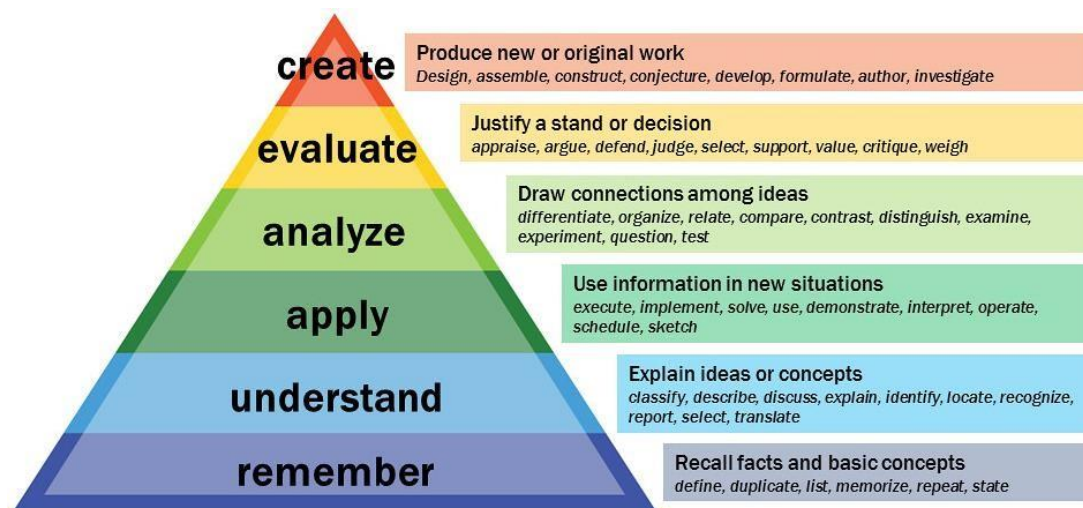
- Verification of Course file/Lesson plan
- Approve & allow to teach
- Identifying student competency & action taken
- Execution of all other activities

##### III. Till End of Semester

- Implementation & Verification in classrooms and labs
- If any difficulty faced, Resolve with Subject Expert/Program Coordinator/HoD
- Assessment and Evaluation, CO-PO attainments & analysis
- Submission of Analysis to PAQIC / HoD

### REVISED BLOOM'S TAXONOMY (RBT)

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. A summary of Anderson and Krathwohl's revised version of Bloom's taxonomy of critical thinking is provided in below Figure 1:



#### Definitions of the different levels of thinking skills in Bloom's taxonomy

- **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.
- **Understand:** The ability to grasp the meaning of information (facts, definitions, concepts, etc.) that has been presented.
- **Apply:** Being able to use previously learned information in different situations or in problem solving.
- **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.
- **Evaluate:** Being able to judge the value of information and/or sources of information based on personal values or opinions.
- **Create:** The ability to creatively or uniquely apply prior knowledge and/or skills to produce new and original thoughts, ideas, processes, etc. At this level, students are involved in creating their own thoughts and ideas.

The cognitive process dimensions- categories					
Lower Order of Thinking (LOT)			Higher Order of Thinking (HOT)		
L1: REMEMBER	L2: UNDERSTAND	L3: APPLY	L4: ANALYSE	L5: EVALUATE	L6: CREATE
<ul style="list-style-type: none"> <li>Recognizing (identifying)</li> <li>Recalling (retrieving)</li> </ul>	<ul style="list-style-type: none"> <li>Interpreting</li> <li>Exemplifying</li> <li>Classifying</li> <li>Summarizing</li> <li>Inferring (concluding)</li> <li>Comparing</li> <li>Explaining</li> </ul>	<ul style="list-style-type: none"> <li>Executing</li> <li>Implementing</li> </ul>	<ul style="list-style-type: none"> <li>Differentiating</li> <li>Organizing</li> <li>Attributing</li> </ul>	<ul style="list-style-type: none"> <li>Checking (coordinating, detecting, testing, monitoring)</li> <li>Critiquing (judging)</li> </ul>	<ul style="list-style-type: none"> <li>Planning</li> <li>Generating</li> <li>Producing (constructing)</li> </ul>

The Knowledge Dimension			
General Categories			
FACTUAL	CONCEPTUAL	PROCEDURAL	METACOGNITIVE
<ul style="list-style-type: none"> <li>Knowledge of terminologies</li> <li>Knowledge of specific details &amp; elements</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge of classifications and categories</li> <li>Knowledge of principles &amp; generalizations</li> <li>Knowledge of theories, models &amp; structures</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge of subject specific skills and algorithms</li> <li>Knowledge of subject specific techniques and methods</li> <li>Knowledge of criteria for determining when to use appropriate procedures</li> </ul>	<ul style="list-style-type: none"> <li>Strategic Knowledge</li> <li>Knowledge about cognitive task, including appropriate contextual and conditional Knowledge</li> <li>Self- Knowledge</li> </ul>



The Knowledge Dimension			
Categories specific to Engineering			
FUNDAMENTAL DESIGN CONCEPTS	CRITERIA AND SPECIFICATIONS	PRACTICAL CONSTRAINTS	DESIGN INSTRUMENTALITIES
<ul style="list-style-type: none"> <li>Operational principles of devices and components within a device or system</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge of translating the qualitative goals for the device into specific, quantitative goals</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge of an array of less sharply defined considerations derived from experience in practice, considerations that frequently do not lend themselves to theorizing, tabulation, or programming into a computer.</li> </ul>	<ul style="list-style-type: none"> <li>Procedural knowledge including the procedures, way of thinking, and judgmental skills by which it is done.</li> </ul>

### List of Action Words Related to Critical Thinking Skills

Here is a list of action words that 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.

L1	L2	L3	L4	L5	L6
REMEMBER	UNDERSTAND	APPLY	ANALYZE	EVALUATE	CREATE
Arrange Cite	Alter	Acquire	Analyze	Appraise	Create
Define	Classify	Apply	Appraise	Argue	Arrange
Describe	Compare	Calculate	Ascertain	Assess	Assemble
Duplicate	Convert	Change	Associate	Attach	Collect
Identify	Defend	Chart	Breakdown	Choose	Combine
Label	Describe	Choose	Calculate	Compare	Comply
List	Discuss	Compute	Categorize	Conclude	Compose
Memorize	Estimate	Demonstrate	Classify	Criticize	Conceive
Match Name	Explain	Discover	Compare	Critique	Construct

Order	Express Extend	Dramatize	Conclude	Deduce	Create
Outline	Generalized	Draw	Contrast	Defend	Derive
Pronounce	Give Examples	Employ	Criticize	Estimate	Design
Quote	Indicate	Illustrate	Designate	Evaluate	Develop
Recall	Interpret	Interpret	Determine	Grade	Devise
Recite	Locate	Manipulate	Diagnose	Judge	Expand
Recognize	Paraphrase	Modify	Diagram	Justify	Extend
Record	Recognize	Operate	Differentiate	Measure	Formulate
Repeat	Rephrase	Practice	Discriminate	Predict	Generalize
Reproduce	Restate	Prepare	Distinguish	Prove	Generate
State	Reword	Produce	Divide	Rate	Integrate
Tabulate	Rewrite	Schedule	Examine	Recommend	Invent
	Select	Show	Experiment	Reframe	Modify
	Summarize	Sketch	Explain	Review	Organize
	Translate	Solve	Explore	Support	Originate
	Write	Use	Find Infer	Test	Plan
			Investigate	Value	Prepare
			Outline	Weigh	Produce
			Point out		Project
			Question		Rearrange
			Reduce		Reconstruct
			Relate		Reorganize
			Separate		Revise
			Specify		Set up
			Subdivide		Synthesize
			Test		

## GUIDELINES FOR WRITING COURSE OUTCOME STATEMENTS

### What are Course Outcomes?

- Course Outcomes (COs) are what the student should be able to do at the end of a course.
- It is an effective ability, including attributes, skills and knowledge to successfully carry out the
- identified activity.
- The most important aspect of a CO is that it should be observable and measurable.

### Structure of a CO statement

**Action:** Represents a cognitive/ affective/ psychomotor activity the learner should perform. An action is indicated by an action verb, occasionally two, representing the concerned cognitive process(es).

**Knowledge:** Represents the specific knowledge from any one or more of the eight knowledge categories

**Condition:** Represents the process the learner is expected to follow or the condition under which to perform the action (This is an optional element of CO)

**Criteria:** Represent the parameters that characterize the acceptability levels of performing the action (This is an optional element of CO)

### While writing COs the following questions/points must be addressed properly.

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

### Dos and Don'ts

- Use only one action verb
- Do not use words including 'like', 'such as', 'different', 'various' 'etc.' with respect to knowledge elements. Enumerate all the relevant knowledge elements.
- Put in effort to make the CO statement as detailed as possible, and measurable.
- Do not make it either too abstract or too specific.

### Check List

- ✓ Does the CO begin with an action verb?
- ✓ Is the CO stated in terms of student performance (rather than teacher performance or course content to be covered)?
- ✓ Is the CO stated as a learning product rather than as a learning process?
- ✓ Is the CO stated at the proper level of generality, and relatively independent of other COs?
- ✓ Is the CO attainable in the given context (students' background, prerequisite competences, facilities, time available and so on)?

### Number of COs for a Course

- Too small a number of COs do not capture the course in sufficient detail and may not serve instruction design that well.
- Too many COs make all the processes related to assessment design and computation of attainment of COs messy and demanding.
- A 3:0:0, 3:1:0 and 3:0:1 courses should have 5 or 6 course outcomes.

### CO – PO Mapping Guidelines

Consider any Two Minimum Criteria for CO – PO Mapping Justification

- **Contact Hours: Lectures, Tutorials and Practical**

Level	Contact Hours in Percentage (including Lecture, Tutorial & Practical)
No mapping (-)	< 5%
Low (1)	5- 15%
Medium (2)	15- 25%
High (3)	>25%

### Description:

Number of Lectures = 3 per week x 16 weeks = 48 Hours  
Tutorial = 1 Hr x 16 Weeks = 16 Hours

Practical = 2 Hr x 16 Week = 32 Hours  
Total Hrs. = 48+16+32 = 96 Hrs.

Example: Let, CO1 related points are engaged in 10 Lectures + 1 Tutorial and 2 Practical Hours  
Then contact hours =  $10+1+2 \times 2 = 15$  hours

Therefore, contact hours in percentage =  $(15/96) \times 100 = 15.65\%$ . Medium mapping (2)

- **Number of Assessment Tools used**

<b>Level</b>	<b>Assessment tools used to assess the CO</b>
No mapping (-)	0
Low (1)	1 or 2
Medium (2)	3
High (3)	4 or more

### CO ASSESSMENT PROCESS

CO Assessment process is done based on the performance of the student using Direct Method (MID exam, Quiz, Assignment, Semester End Examination) and Indirect Method (Course Semester End Feedback)

For the assessment of Course Outcomes, 80% weightage is given to Direct Assessment and 20% weightage is given to Indirect Assessment.

#### List of Assessment Processes

Course Type	Direct Assessment Methods		Indirect Assessment Methods
	Internal	External	
Theory Course	<ul style="list-style-type: none"> <li>✓ Mid Examinations</li> <li>✓ Quiz</li> <li>✓ Assignment</li> </ul>	<ul style="list-style-type: none"> <li>✓ Semester End Examination</li> </ul>	<ul style="list-style-type: none"> <li>✓ Course End Feedback</li> </ul>
Lab Course	<ul style="list-style-type: none"> <li>✓ Day – to – Day work</li> <li>✓ Record</li> <li>✓ Internal Examination</li> </ul>	<ul style="list-style-type: none"> <li>✓ Semester End Examination</li> </ul>	<ul style="list-style-type: none"> <li>✓ Course End Feedback</li> </ul>
Seminar	<ul style="list-style-type: none"> <li>✓ Synopsis</li> <li>✓ Mid Term Evaluation</li> <li>✓ Internal Evaluation</li> </ul>	NA	NA
Project	<ul style="list-style-type: none"> <li>✓ Synopsis</li> <li>✓ Mid Term Evaluation</li> <li>✓ Internal Evaluation</li> </ul>	<ul style="list-style-type: none"> <li>✓ End Evaluation</li> </ul>	NA

### The Quality / Relevance of assessment processes & tools used.

#### Theory Courses Evaluation

For theory subjects, during the semester there shall be 2 tests. The weightage of Internal marks for 30 consists of Descriptive – 15, Quiz- 10, Assignment - 05 (Theory, Design, Analysis, Simulation, Algorithms, Drawing, etc. as the case may be and for Physics, Virtual Labs to be considered as Assignments) Objective -10 (Conducted at College level with 20 Multiple choice question with a weightage of ½ Mark each). The objective examination is for 20 minutes duration. The subjective examination is for 90minutes duration conducted for 15 marks. Each subjective type test question paper shall contain 3 questions and all questions need to be answered. The Objective examination conducted for 10 marks and subjective examination

conducted for 15 marks are to be added to the assignment marks of 5 for finalizing internal marks for 30.

Internal Marks can be calculated with 80% weightage for best of the two Mids. and 20% weightage for other Mid Exam. As the syllabus is framed for 5 units, the 1st mid examination (both Objective and Subjective) is conducted in 1-2.5 units and second test in 2.5-5 units of each subject in a semester.

The end semester examination is conducted covering the topics of all Units for 70 marks. End Exam Paper: Two questions are given from each unit, answer any one question in the two questions. 5 Questions out of 10 Questions are to be answered with each carrying 14 marks.

#### **Direct Method:**

<b>Evaluation</b>	<b>Exam Mode</b>	<b>Max. Marks</b>	<b>Frequency</b>	<b>Duration</b>
<b>Internal</b>	MID (Descriptive)	15	Twice per Semester	90 min.
	Objective Quiz (MCQ)	10	Twice per Semester	20 min.
	Assignment	5	Five per Course	-
	Internal Assessment (30 marks) = 80% of Best Mid Marks + 20% of the other Mid Marks			
<b>External</b>	Question paper	70	Once per Semester	180 min.

#### **Quality of the Assessment Tool**

- Due weightage is given to all the CO's covered by the portion meant for each internal exam.
- Each CO to which the Question belongs to is mentioned along with Blooms taxonomy level.
- Course coordinator along with its team validates the Question paper to ensure the desired standard from outcome attainment perspective as well as learning levels perspective.

#### **Laboratory Course Evaluation**

For practical subjects there shall be continuous evaluation during the semester for 15 internal marks and 35 end examination marks. The internal 15 marks shall be awarded as follows: day to day work - 5 marks, Record – 5 marks and the remaining 5 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner.

**Direct Method:**

Evaluation	Exam Mode	Max. Marks	Frequency	Duration
<b>Internal</b>	Day – to – Day work	5	Once per Experiment	150 min.
	Laboratory Record	5	Once per Experiment	
	Internal Exam	5	Once per Semester	180 min.
<b>External</b>	End Exam	35	Once per Semester	180 min.

**Rubrics used for laboratory Course.**

Parameters	Marks	Poor	Average	Good
Students' observation book preparation	5	Insufficient	Fair	Good
		0 – 2 Marks	3 – 4 Marks	5 Marks
Attendance	5	75 % - 80 %	80 % - 90 %	90 % - 100 %
		0 – 2 Marks	3 – 4 Marks	5 Marks
Record	5	Insufficient recording of content, calculations and conclusion	Fair recording of content, calculations and conclusion	Good recording of content, calculations and conclusion
		0 – 2 Marks	3 – 4 Marks	5 Marks

**Rubrics used for Laboratory Internal Examination**

Parameters	Marks	Poor	Average	Good
Experiment writeup	2	Not able to write procedure and calculations	Able to write procedure but not able to show calculations	Able to write procedure and show calculations
		0 – 0.5 Marks	0.5 – 1 Marks	2 Marks
Execution	2	Not executed	Partially executed	Completely executed
		0 – 0.5 Marks	0.5 – 1 Marks	2 Marks



Viva – Voce	1	Insufficient Knowledge of experiment	Fair knowledge of experiment	Good knowledge of experiment
		0 Mark	1 – 0.5 Marks	1 Marks

### CO Assessment Process for Engineering Drawing

#### Direct Method:

Evaluation	Method	Max. Marks	Frequency	Duration
Internal	Day-to-Day work	20		
	Internal Test	10	Twice per semester	90 Minutes
	Internal assessment (30 marks) = 80% of Best Mid + 20% The other Mid			
External	Exam	70	Once per semester	3 Hours

#### summer internships:

It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme. Students shall pursue this internship during summer vacation just before its offering as per course structure. The minimum duration of this course shall be at least 6 weeks. The student shall register for the internship as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the University. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner appointed by the University; Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful

completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.

### **Mandatory Course (MC)**

Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified.

### **MOOC:**

There shall be a Discipline Centric Elective Course through Massive Open Online Course (MOOC) as Program Elective course. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed.

### **Job-oriented skill course**

It may be registered at the college or at any accredited external agency. A student shall submit a record/report on the on the list skills learned. If the student completes job-oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external (appointed by the

university) and internal examiner (course instructor or mentor). There are no internal marks for the job-oriented skill courses.

For the skill development program, Training program will be conducted to enhance the technical skill of the student. The duration for this program is 30 hours. There shall be no external examination for the skill development program.

### CO Assessment Process for Skill Development Program

Evaluation	Method	Marks
External	Final report	50

### Project

Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project and evaluated by an internal committee.

### CO Assessment Process for Project

Review #	Coverage Points	Marks	Weightage
1	Project Proposal Evaluation	20	30%
2	Mid – Term Evaluation	20	
3	Final Evaluation	20	
External Project Evaluation		140	70%
Total		200	100%

### Rubrics for Project Internal Evaluation

Review #	Parameter	Rubric			Marks
		Poor	Average	Good	
1	Objectives, Project	Need Improvement	Clear and Moderate	Well defined and good	20

	Synopsis, Literature Survey	0 – 7 Marks	8 – 14 Marks	15 – 20 Marks	
2	Proposed Methodology & Project execution progress	Need Improvement	Clear and Satisfactory	Well defined and good	20
		0 – 7 Marks	8 – 14 Marks	15 – 20 Marks	
3	Result, Conclusion and Presentation	Inappropriate	Average	Effective	20
		0 – 7 Marks	8 – 14 Marks	15 – 20 Marks	

### Indirect Method

The indirect assessment for course outcome is done by the Semester End Course Feedback taken at the end of each course from the students. For each CO, there will be three options with weightage namely GOOD (3), AVERAGE (2) AND POOR (1), out of which the student has to select one option.

Sl. No.	Method	Frequency
1	Course End Feedback	Per course at the end of each semester

## CO ATTAINMENT PROCESS

### Course Outcomes (CO) Direct Attainment Level

S. No.	Threshold level (%)	Attainment level Criteria	Attainment level
1	Class Average	More than 80% of students scoring more than class average	3
		56 to 79% of students scoring more than class average	2
		At least 55% of students scoring more than class average	1

### University Result grading system

Marks Range Theory (Max – 100)	Marks Range Lab (Max – 50)	Level	Letter Grade	Grade Point
≥ 90	≥ 45	Outstanding	A+	10
≥80 to <89	≥40 to <44	Excellent	A	9
≥70 to <79	≥35 to <39	Very Good	B	8
≥60 to <69	≥30 to <34	Good	C	7
≥50 to <59	≥25 to <29	Fair	D	6
≥40 to <49	≥20 to <24	Satisfactory	E	5
<40	<20	Fail	F	0
-		Absent	AB	0

### Course Outcome Attainment

#### Computation of CO Direct Attainment in the course

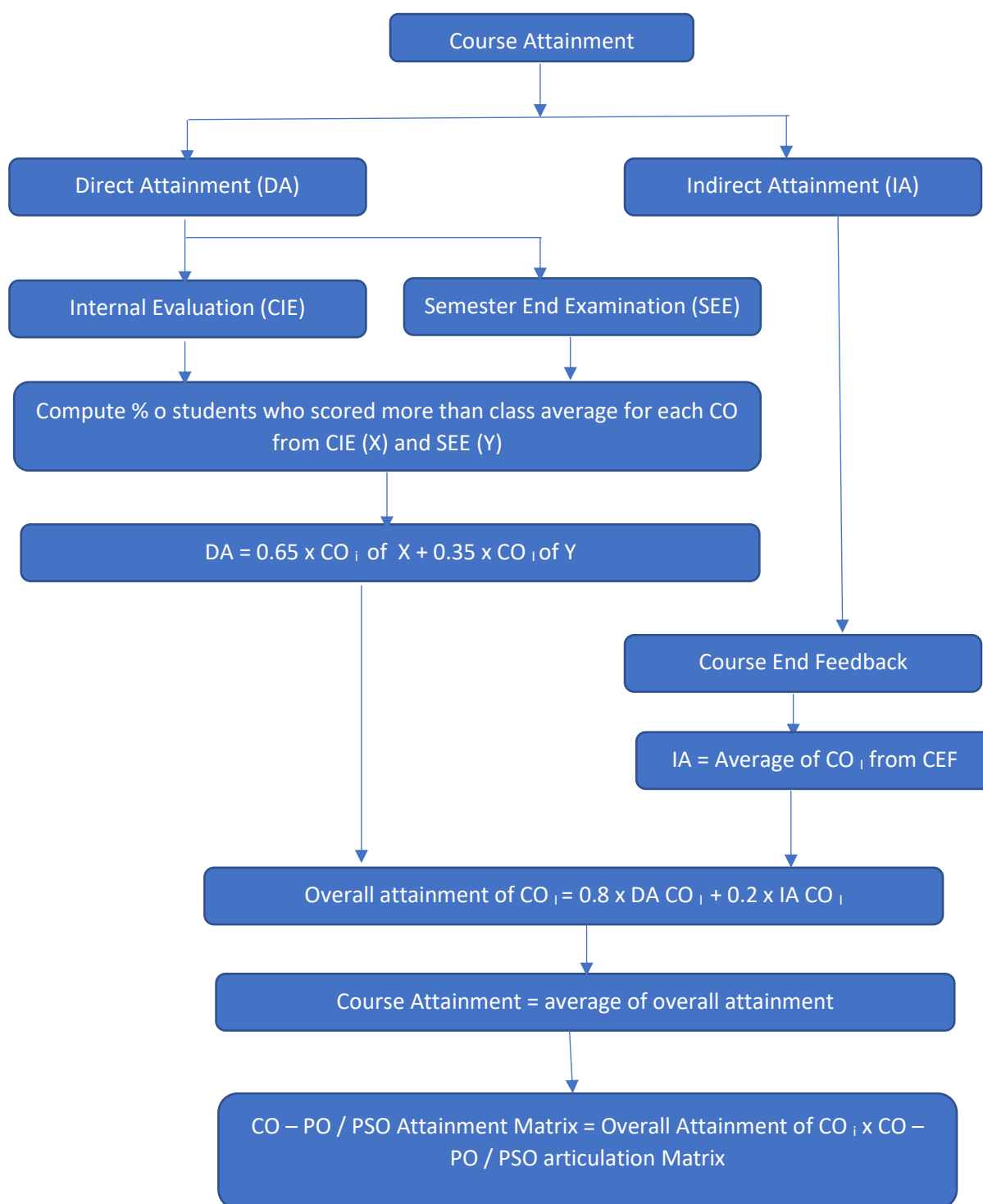
Direct CO Attainment = 65% of CIE Attainment Level + 35% of SEE Attainment Level

#### Computation of CO Indirect Attainment in the course

Indirect Attainment Average value of each CO

#### OVERALL CO Attainment in the course:

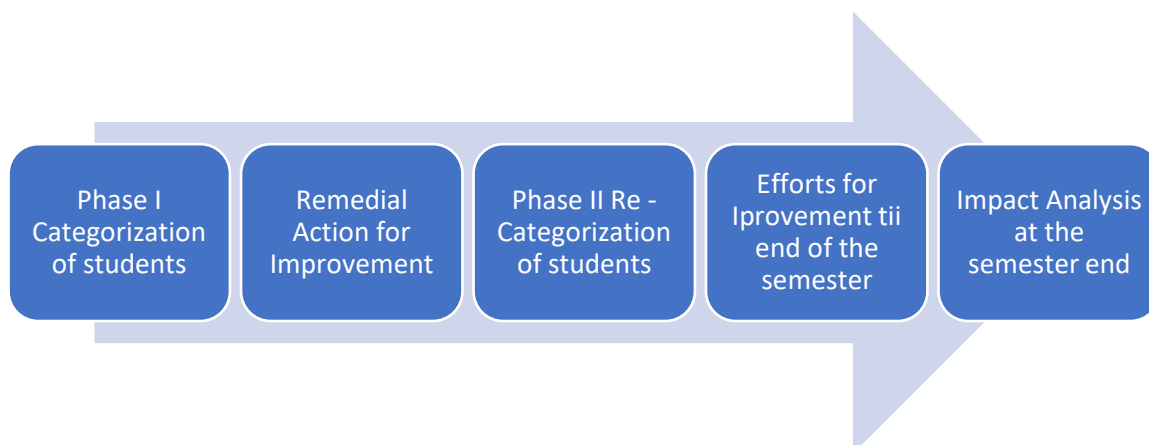
Computation of Attainment of COs in the course = 80% of Direct CO Attainment + 20% of Indirect CO Attainment



[illegible]

## STUDENT COMPETENCY

### Chart of Action Plan



### Guidelines for First Year

Phase I- Categorization (After 20 Days of start of semester)	Phase II- Re-categorization (After Mid Term Result)
12th Marks	MID Term I Result
Attendance & Behavior	Timely Completion of Assignment
	Attendance & Behavior
	Previous Semester University Result (Applicable for Sem-II)

### Guidelines for Higher Classes

Phase I- Categorization (After 15 Days of start of semester)	Phase II- Re-categorization (After Mid Term Result)
Previous semester University Result whichever is available	Mid Term Result
Attendance & Behavior	Timely completion of Assignment work
	Attendance & Behavior
	Previous semester University Result

### Base Score for student category

Less than **threshold value\*** - Slow Learner

Greater than **threshold value\*** - Advanced Learner

**\*Threshold Value – decided by course coordinator**



## Strategies for Slow 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 Counseling

**Note: Remedial sessions should be conducted once every week.**

### For Advanced Learners

- Encouraging to present & publish papers in journals/conferences/competitions
- Guidance for GATE/ competitive Examination
- Encouraging to participate in professional activities.
- Specially designed activities to improve the portfolio of students.
- Individual guidance for career building

**Note: Activities should be on continuous basis.**

### Activity Based Learning



### Examples:

MOOC, Flipped Classroom, Think Pair Share, Think Pair Solo, Four Corners, Round Robin, Collaborative Learning, Jig-Saw Puzzle, Matrix Method, Peer Learning, Work-Based Learning, Problem-Based Learning, Personalized Learning, Group Discussion, Debate, Case Studies, Fish Bowl, Reciprocal Teaching, etc.

## ATTAINMENT OF PROGRAM OUTCOMES (POs) AND PROGRAM SPECIFIC OUTCOMES (PSOs)

For **Direct Attainment** of POs/PSOs course attainment is computed for all the courses that the batch has studied/opted and CO-PO/PSO attainment averages are obtained for all the Courses. The Course-PO/PSO attainment matrix is prepared by arranging the Course-PO/PSO attainment of all the courses in a table. Individual Course-PO/PSO attainments are obtained by taking the average of the respective columns of Course-PO/PSO attainment matrix.

Evaluations of attainment of POs and PSOs based on 80% of Direct Attainment (DA) + 20% of Indirect Attainment (IA) combined to arrive at the Final Evaluation.

**Indirect Attainment** is computed using the tools including:

- **Student Exit Feedback** is collected from the students of that batch immediately after their graduation.
- **Employer Feedback** is collected from the corporate companies which recruit students in big numbers.
- **Indirect attainment through Co-Curricular activities** is computed through student achievements which include paper presentations, project presentations, coding competitions, participation in seminars / workshops / Guest Lectures / Keynote addresses and internships.
- **Indirect attainment through extracurricular activities** is computed through student achievements which include NSS, College Newsletter, Event coordination, Cultural Activities, Sports.

### List of Assessment Tools and Processes

Attainment of POs & PSOs is based on direct assessment tools as well as indirect assessment tools. Direct Assessment of POs & PSOs is based on the student's performance in both internal examinations and University Examinations for all courses.

Performance of the students in different assessments such as internal examinations and University examinations lead to attainment of COs and they in turn leads to attainment of POs & PSOs based on the mappings of CO-PO/PSO.

To evaluate the attainment of POs/PSOs the following tools are used.

- Direct Assessment Tools
  - Internal Examinations
    - Theory Courses
    - Lab Courses

- Project
- University Examinations
  - Theory Courses
  - Lab Courses
  - Project
- Indirect Assessment Tools
  - Student Exit Feedback
  - Alumni Feedback
  - Employer Feedback

### Quality and Relevance of Assessment Tools and Processes

The Programme Assessment and Quality Improvement Committee (PAQIC) decided to have the following PO Assessment methods for various POs, depending on the number of courses contributing to each PO.

#### PO Attainment having more than 50% courses contributed to PO / PSO

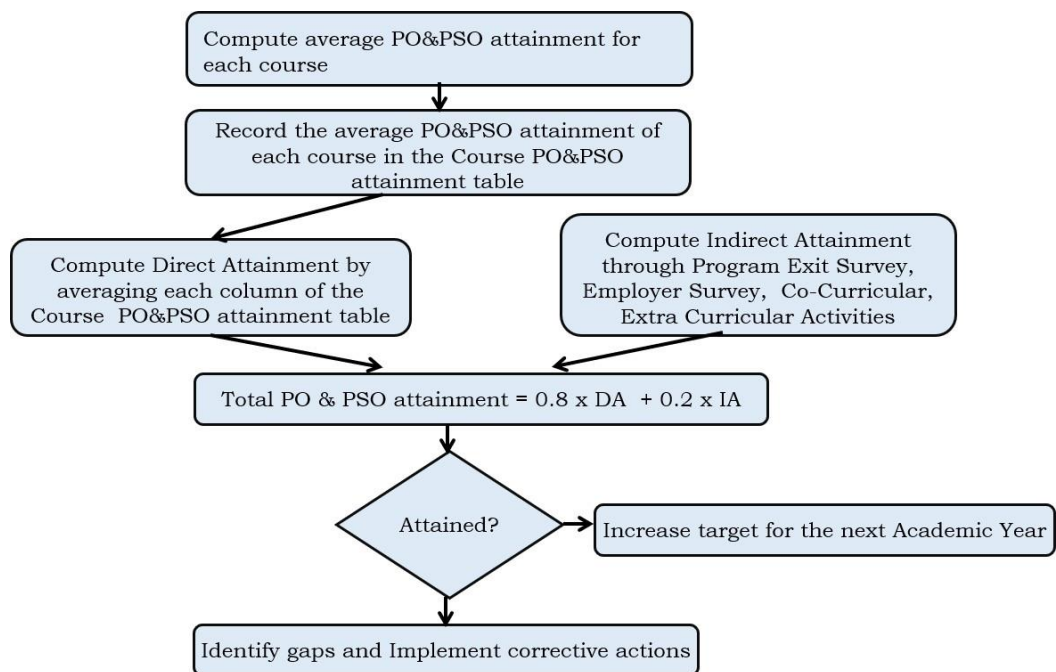
1	Assessment of COs & their contribution to PO Attainment	80 %
2	Indirect Assessment (Students Exit Feedback, Alumni Feedback, Employer Feedback)	20 %

#### PO Attainment having less than 50% courses contributed to PO / PSO

1	Assessment of COs & their contribution to PO Attainment	60%
3	Students Exit Feedback	20 %
2	Alumni Feedback	
3	Employer Feedback	
4	Assessment of student participation in Co/Extra-curricular Activities & contribution to PO Attainment	20%

### Rubrics for student participation in Co / Extra-Curricular activities for attainment of PO / PSO

S.NO	Activity	Poor (1)	Satisfactory	Good (3)
1	Guest Lecturers, Workshops & Seminars (Co-Curricular)	Program Organizes 1-2 Guest Lecturers	Program Organizes 3-4 Lecturers	Program Organizes 5 or more Guest Lecturers
2	Add-on Courses (Co-Curricular)	Program organized 1 Add on Program	Program organized 2 Addon Program	Program organized 3 or More Add on Program
3	Projects Exhibition (Co-Curricular)	No Project Exhibitions	Every Year	Every Semester
4	Paper Presentations (Co-Curricular)	Nil	Every Year	Every Semester
5	NSS Activities (Extra-Curricular)	Less than 25% Program Students Participate	26-50% Students Participate	Above 50% Students Participate
6	Program on Environment Sustainability Organized (Co-Curricular)	Nil	1-2 Programs	More Programs
7	Programs on Ethics (Co-Curricular)	Nil	1-2 Programs	More Programs
8	Ethical Practices - Like Honesty Shops Yoga etc (Extra-Curricular)	Nil	1-2 Practices	More Practices
9	Library, Internet Hours (Co-Curricular)	Nil	Lib or Internet	Both
10	Students Seminar & English Communication Hours (Co-Curricular)	Nil	Either	Both
11	Entrepreneurship - Lecturers (Co-Curricular)	Nil	1-2 Lecturers	More Lecturers
12	Students Qualification in English Communication Certification (Co-Curricular)	Nil	25-50% Students	Above 50% Students
13	Programs on Health or Course on Human Anatomy	Nil	1-2 Programs	More Programs
14	Programs on Safety Engineering	Nil	1-2 Programs	More Programs
15	Students Participation in Cultural Events, Activities	10-25%	26-50%	51% & Above
16	Industry Internship	Less than 10 students participated	10-15 students participated	15 or above students participated
17	Industry visits/tours	Less than 10 students participated	10-15 students participated	15 or above students participated



## CONTINUOUS IMPROVEMENT

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

Outcome	Action to be taken by faculty
High attainment of all CO-PO (>2.5 out of 3)	Set new higher targets or attainment levels for next Academic Year (AY)
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 and Quality Improvement Committee (PAQIC), Revise action plan of last A.Y. at faculty/department level.

### PO attainment and Continuous Improvement (PC and HoD Level)

Category	Outcome	Action by PC 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 done and revise as per the need for improvements.