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# ASSESSMENT MANUAL

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R19 REGULATION



**DEPARTMENT OF ELECTRONICS & COMMUNICATION 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

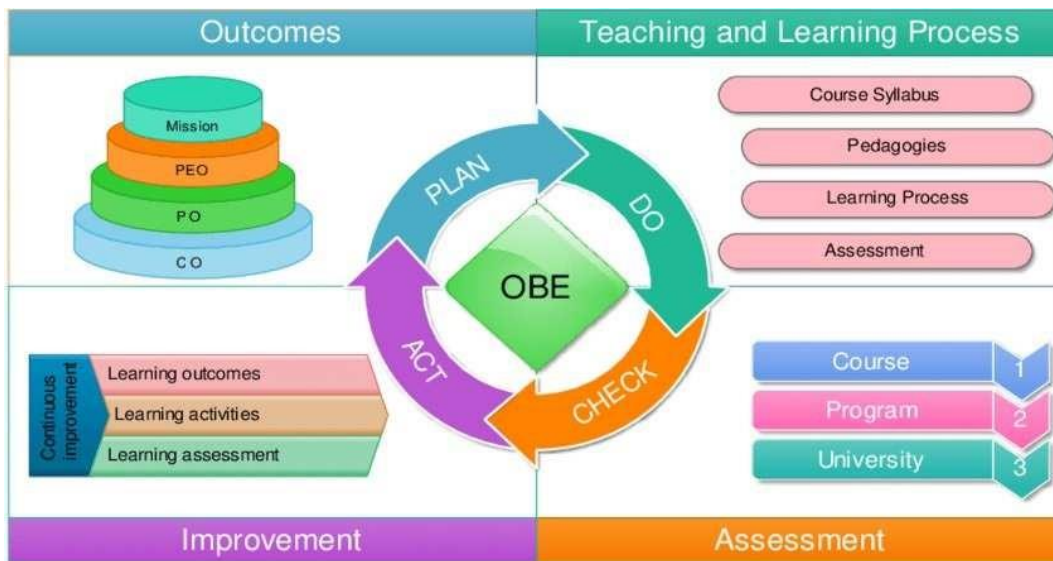
- **Clarity:** The focus on outcome creates a clear expectation of what needs to be accomplished by the end of the course.
- **Flexibility:** With a clear sense of what needs to be accomplished, instructors will be able to structure their lessons around the students' needs.
- **Comparison:** OBE can 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 recognized centre for quality electronics and communication engineering education and develop ethically sound, globally competent and socially responsible engineers  
Department Vision statement comprises of two components:

### **Mission**

**DM 1.** To provide learner-centric Electronics and Communication Engineering education to overcome the professional challenges

**DM 2.** To pursue research and new technologies in Electronics & Communication Engineering and related disciplines to serve the society, industry, government and scientific community needs.

**DM 3.** To promote activities for overall development of stakeholder with ethical and professional responsibility.

### PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO 1** Graduates will excel in their professional career and/or higher education by applying knowledge of Mathematical, Scientific and Electronics and Communication engineering.

**PEO 2** Graduates will analyse and solve real life problems, adopt the modern engineering tools to design systems that are economically feasible and socially acceptable

**PEO 3** Graduates will exhibit professionalism, social, ethical responsibility and interpersonal skills to relate engineering issues in broader social context.

**PEO 4** Graduates will have the zeal and motivation to get involved in lifelong learning process to become Innovators, Entrepreneurs and Leaders.

### 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 TEAM WORK:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10 COMMUNICATION:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, 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:** An ability to design, analyse and implement Analog and Digital Electronics systems, Communication, Signal processing, VLSI, Embedded and IoT systems using hardware and software.

**PSO 2 Soft-Skills & Ethics:** Ability to communicate effectively and practice professional ethics for societal benefit.

## **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**

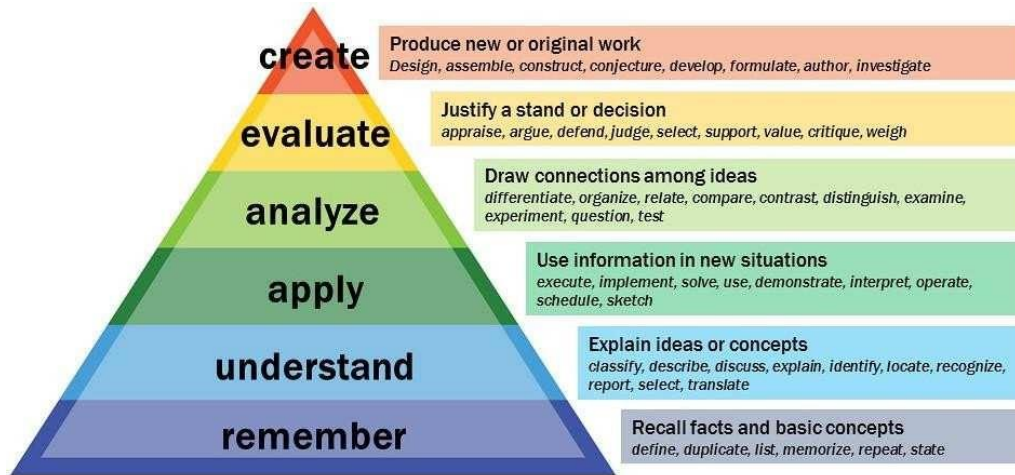
- Verification of Course file/Lesson plan
- Approve & allow to teach
- Identifying student competency & action taken
- Execution of all other activities

#### **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 Prepare
			Investigate	Value	Produce
			Outline	Weigh	Project
			Point out		Rearrange
			Question		Reconstruct
			Reduce		Reorganize
			Relate		Revise
			Separate		Setup
			Specify		Synthesize
			Subdivide		
			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 stake holder? 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 course 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 = 3per week x 16 weeks = 48 Hours Tutorial = 1Hr x 16 Weeks = 16 Hours

Practical = 2Hr 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**

Level	Assessment tools used to assess the CO
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, 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>✓ 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>
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

#### Distribution and Weightage of marks:

The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks for theory subject and 50 marks for practical subject. For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End Examinations.

S. No	Components	Internal	External	Total
1	Theory	25	75	100
2	Engineering Graphics/Design/Drawing	25	75	100
3	Practical	20	30	50
4	Mini Project/Internship/Industrial Training/Skill Development programmes/Research Project	-	50	50
5	Project Work – Part I	20	30	50
5	Project Work – Part II	60	90	150

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

### Theory Courses Evaluation

For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one online objective examination (ii) one descriptive examination and (iii) one assignment. The online examination (objective) and descriptive examination shall be for 10 marks each with a total duration of 1 hour 50 minutes (20 minutes for objective and 90 minutes for descriptive paper). The online examination (objective) is set with 20 multiple choice questions for 10 marks (20 questions x ½ marks) from first two and half units (50% of the syllabus) and it is conducted by **University Examination Section**. The descriptive examination is set with 3 full questions from first two and half units (50% of the syllabus), the student has to answer all questions. The second online examination shall be conducted on the rest of the syllabus. The assignment is given by the concerned class teacher for five marks from first two and half units (50% of the syllabus). The second assignment shall give from rest of the syllabus. The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The total marks secured by the student in each mid-term examination are evaluated for 25 marks. The first mid marks (Mid-1) consisting of marks of online objective examination, descriptive examination and assignment shall be submitted to the University examination section within one week after completion of first mid examination. The mid marks submitted to the University examination section shall be displayed in the concerned college notice boards for the benefit of the students. If any discrepancy found in the submitted mid-1 marks, it shall be brought to the notice of university examination section within one week from the submission. Second mid marks (Mid-2) consisting of marks of online objective examination, descriptive examination and assignment shall also be submitted to University examination section within one week after completion of second mid examination and it shall be displayed in the notice boards. If any discrepancy found in the submitted mid-2 marks, it shall be brought to the notice of university examination section within one week from the submission. Internal marks can be calculated with 80% weightage for better of the two mid exams and 20% Weightage for another mid exam.

**Mid – 1 mark** = Marks secured in (online examination – 1+descriptiveexamination – 1+one assignment-1)

**Mid – 2 marks** = Marks secured in (online examination – 2+descriptive examination – 2+one assignment – 2)



**Final internal Marks** = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)

With the above criteria, university examination section will send mid marks of all subjects in consolidated form to all the concerned colleges and same shall be displayed in the concerned college notice boards. If any discrepancy found, it shall be brought to the notice of university examination section through proper channel within one week with all proofs. Discrepancies brought after the given deadline will not be entertained under any circumstances.

**Semester End Theory Examinations Evaluation:** The semester end examinations will be conducted university examination section for 75 marks consists of five questions carrying 15 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

**Direct Method:**

<b>Evaluation</b>	<b>Exam Mode</b>	<b>Max. Marks</b>	<b>Frequency</b>	<b>Duration</b>
<b>Internal</b>	MID (Descriptive)	10	Twice per Semester	90 min.
	Objective Quiz (MCQ)	10	Twice per Semester	20 min.
	Assignment	5	Six per Course	-
	Internal Assessment (25 marks) = 80% of Best Mid Marks + 20% of the other Mid Marks			
<b>External</b>	Answer any one from each unit,	75	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 20 internal marks and 30 end examination marks. The internal 20 marks shall be awarded as follows: day to day work - 5 marks, Record-5 marks and the remaining 10 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner appointed by controller of examinations, JNTUK.

#### Direct Method:

Evaluation	Exam Mode	Max. Marks	Frequency	Duration
Internal	Day – to – Day work	5	Once per Experiment	150 min.
	Laboratory Record	5	Once per Experiment	
	Internal Exam	10	Once per Semester	180 min.
External	End Exam	30	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	3	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 – 1 Marks	1 – 2 Marks	3 Marks
Execution	4	Not executed	Partially executed	Completely executed
		0 – 1 Marks	2 – 3 Marks	4 – 5 Marks
Viva – Voce	3	Insufficient Knowledge of experiment	Fair knowledge of experiment	Good knowledge of experiment
		0 – 1 Mark	1 – 2 Marks	3 Marks

### CO Assessment Process for Engineering Drawing

For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 25 marks for internal evaluation (15 marks for continuous Assessment (day-to-day work) and 10 marks for internal tests) and 75 marks for end examination. There shall be two internal tests in a Semester for 10 marks each and final marks can be calculated with 80% weightage for better of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day to day work.

#### Direct Method:

Evaluation	Method	Max. Marks	Frequency	Duration
Internal	Day-to-Daywork	15		
	Internal Test	10	Twice per semester	90Minutes
	Internal assessment(25marks) = 80% of Best Mid + 20% The other Mid			
External	Exam	75	Once per semester	3Hours

#### Mandatory Course (MC)

There shall be Mandatory Course with zero credits. There shall be no external examination. However, a minimum of 75% attendance is mandatory in that particular subject.

#### Engineering Exploration Course:

The motivation of including Engineering Exploration Project in the curriculum is to make the students practice creative problem-solving method - Design Thinking which fosters collaboration and solve problems in human-centred ways. It enables the students to exercise

and identify design opportunities through various phases with the help of hands-on activities. Obtaining a best solution for an identified problem involves a non-linear, iterative process which seeks to understand users, challenge assumptions, redefine problems and create innovative solutions to prototype and test. The students are encouraged to explore real-world problems and expected to take charge of their own learning, work together in teams towards the problem. The evaluation of the Engineering Exploration Project involves in writing their observations in Activity Cards at the end of each task given in syllabus and submitting a final report along with working prototype.

### Direct Method:

Evaluation	Method	Max. Marks	Frequency	Duration
Internal	Presentation I	20		
	Presentation II	20	Twice per semester	90Minutes
	Internal assessment (20 marks) = 80% of Best Mid + 20% The other Mid			
External	Exam	30	Once per semester	3Hours

### Rubrics for Engineering Exploration Course

Parameter	Rubric			Marks
	Poor	Average	Good	
Seminar report	Objectives not clear	Clear objectives and organized	Clear objectives, advanced technology based and organized	10
	1 – 3 Marks	4 – 6 Marks	7 – 10 Marks	
Preparation	Contents are inappropriate	Appropriate contents, not well arranged	Appropriate contents and well arranged	10
	1 – 3 Marks	4 – 6 Marks	7 – 10 Marks	
Queries answered	No answer or explanation	Inappropriate answer and explanation	Clear, concise answer with explanation and with supported	10

			facts	
	1 – 3 Marks	4 – 6 Marks	7 – 10 Marks	

### **Mini Project/Internship/Industrial Training/Skill Development programmes/Research**

#### **Project guidelines:**

There shall be a Mini Project/Internship/Industrial Training/Skill Development programmes/Research Project, in collaboration with an industry of their specialization. Students shall pursue this course during summer vacation just before its offering as per course structure. The minimum duration of this course is at least 16 hours. The student shall register for the course as per course structure after commencement of academic year. An individual or group of students can take up this course under the guidance of a supervisor from concerned department. The supervisor shall maintain the attendance of the course for the students allotted. Attendance requirements are as per the norms of the University. After completion the students shall be submit a technical report and presented before the committee. A certificate from industry/skill development center shall be included in the report. It shall be evaluated for 50 external marks at the end of the semester. The committee consists of an external examiner appointed by the University; Head of the Department, supervisor of the Mini Project/Internship/Industrial Training/Skill Development programmes/Research Project and a senior faculty member of the department. There shall be no internal marks for Industrial Oriented Mini Project/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.

#### **Rubrics for Mini – Project**

Parameter	Rubric			Marks
	Poor	Average	Good	
Project Report	Objectives not clear	Clear objectives and organized	Clear objectives, advanced technology based and organized	20
	1 – 6 Marks	7 – 14 Marks	15 – 20 Marks	
Presentation	Contents are inappropriate	Appropriate contents, not well	Appropriate contents and well	20

		arranged	arranged	
	1 – 6 Marks	7 – 14 Marks	15 – 20 Marks	
Queries answered	No answer or explanation	Inappropriate answer and explanation	Clear, concise answer with explanation and with supported facts	10
	1 – 3 Marks	4 – 6 Marks	7 – 10 Marks	

### Project Work Phase – I:

The object of Project Work I is to enable the student to take up investigative study in the broad field of concerned branch of specialization, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or a group of students, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preliminary approach to the problem relating to the assigned topic;
- Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/ Feasibility;
- Preparing a written report on the study conducted for presentation to the department;
- Final Seminar, as oral Presentation before a departmental committee.
- The evaluation of the Project Work I will be done as per the procedure suggested by the university

### CO Assessment Process for Project Phase – I

Review #	Coverage Points	Marks
1	Assessment	5
2	Report	5
3	Presentation	10
External Project Phase – I Evaluation		30
Total		50

**Project Work Phase – II:**

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under Project Work I, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

- a) In depth study of the topic assigned in light of Report prepared under Project Work I;
- b) Review and finalization of the approach to the problem relating to the assigned topic;
- c) Preparing an Action Plan for conducting the investigation, including team work;
- d) Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
- e) Final development of product/process, testing, results, conclusions and future directions;
- f) Preparing a paper for Conference presentation/publication in Journals, if possible;
- g) Preparing a dissertation in the standard format for being evaluated by the department;
- h) The evaluation of the Project Work II will be done as per the procedure suggested by the university.

**CO Assessment Process for Project Phase – II**

Review #	Coverage Points	Marks
1	Assessment	15
2	Report	15
3	Presentation	30
External Project Phase – I Evaluation		90
Total		150

**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	50% of Maximum Marks	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 – 75)	Letter Grade	Level	Grade Point
≥ 90	≥ 67	O	Outstanding	10
≥80 to <90	≥60 to <67	S	Excellent	9
≥70 to <80	≥52 to <60	A	Very Good	8
≥60 to <70	≥45 to <52	B	Good	7
≥50 to <60	≥37 to <45	C	Fair	6
≥40 to <50	≥30 to <37	D	Satisfactory	5
<40	<30	F	Fail	0
			Absent	0

### Course Outcome Attainment

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

Direct CO Attainment = 50% of CIE Attainment Level + 50% of SEE Attainment Level

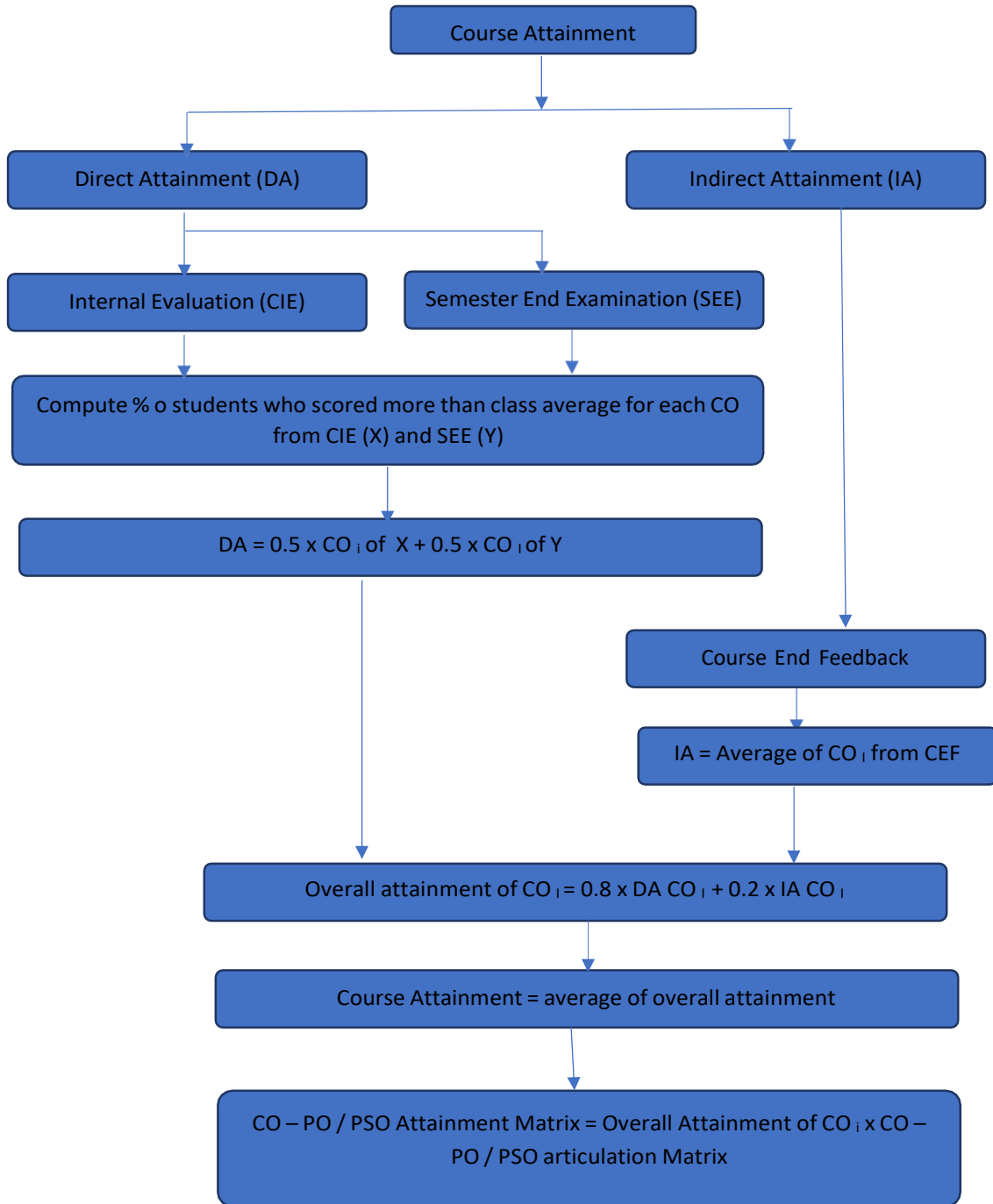
#### Computation of CO Indirect Attainment in the course

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.

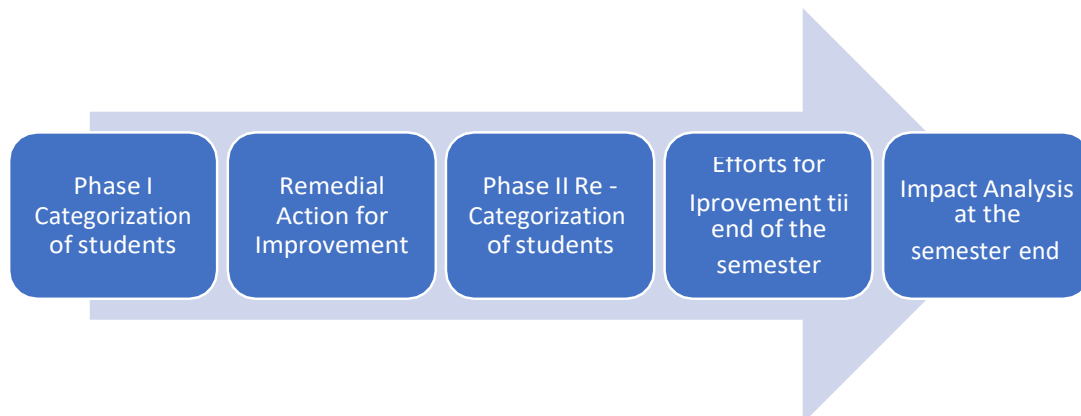






## STUDENT COMPETENCY

### 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

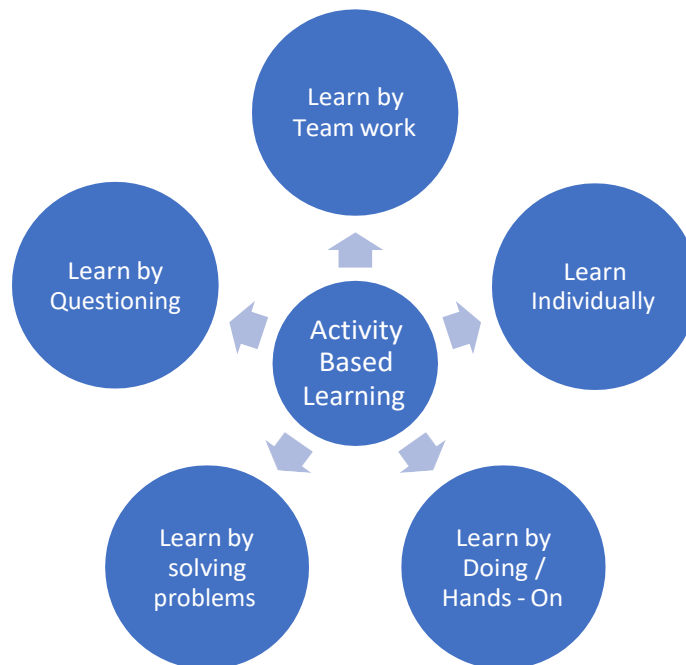
**Note: Remedial sessions should be conducted once every week.**

### 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
- Seminar
- 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**

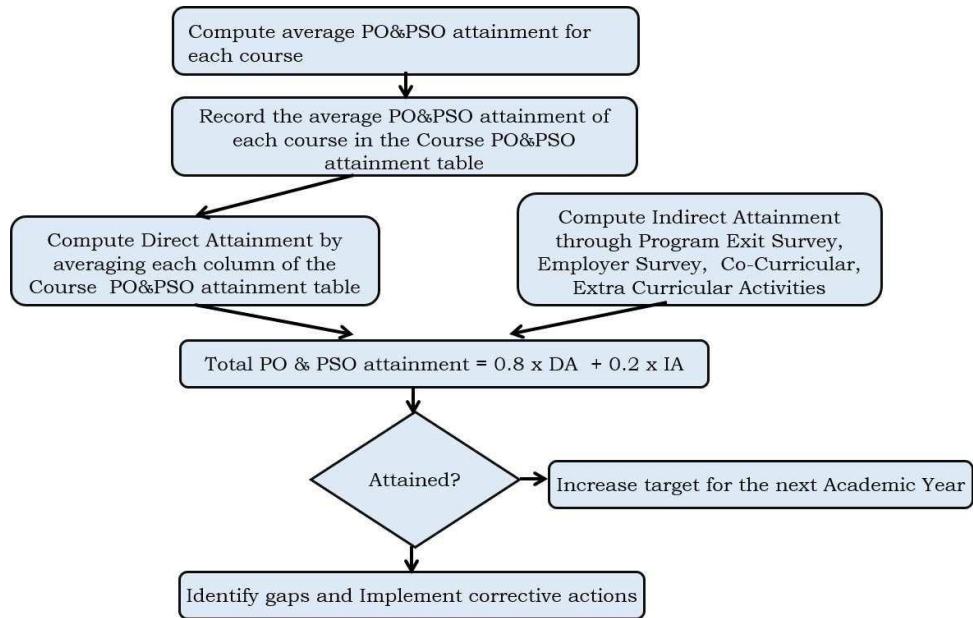
1	Assessment of COs & their contribution to PO Attainment	80 %
2	Indirect Assessment (Students Exit Feedback, Alumni Feedback, Employer Feedback)	20 %

#### **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	Low (1)	Medium (2)	High (3)	Relevance to POs and PSOs	Activities conducted	Assessment
1.	Guest Lectures	1 Guest Lectures	2 Guest Lectures	>= 3 Guest Lectures	PO1, PO5, PO8, PO9, PO10,	1	1
2.	Add-on courses /Summer internships	Nil	1 program organized	More than 2 programs organized	PO7, PO9, PO10, PO12, PSO1	2	2
3.	NSS Activities	Less than 25	26-50 student's	Above 50 student's	PO6, PO7, PO8, PO9, PO12	50% student's	3
4.	Programs on Entrepreneurship	Nil	1 program organized	More than 2 programs organized	PO9.PO12	4	3
5.	Job/Skill Oriented Programs	1-10 Programs	11-20 Programs	More Than 20 Programs	PO9, PO10, PO12	8	2
6.	Students participation	1-25 students	26-50 students	More than 50	PO6, PO7, PO9	25%	1
7.	Students internships	Less than	1-10	More than	PO7, PO9, PO10, PO11, PSO1, PSO2	6	2
8.	Workshop	1 Workshop	03	More than 5	PO8, PO10, PSO1, PSO2	1	1





### 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.

$$\frac{\sum_{i=1}^5 COA_i * CPM_i}{\sum_{i=1}^5 CPM_i}$$