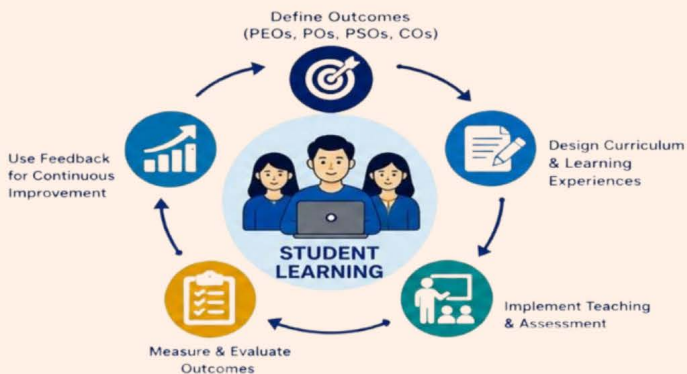


OUTCOME BASED EDUCATION (OBE) MANUAL



TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
AN AUTONOMOUS INSTITUTION

Accredited by NBA and NAAC with 'A+' Grade.

(Approved by AICTE, Affiliated to JNTU H)

Medbowli, Meerpet, Balapur, Hyderabad, Telangana – 500 097

TABLE OF CONTENTS

S NO	NAME OF THE CONTENT	PAGE NO
1	OBE AND ACCREDITATION	1
	OBE Administrative System	3
2	OUTCOME HIERARCHY	4
	Institute Vision & Mission	4
	Program Educational Objectives (PEOs)	5
	GA, PO & PSO Statements	5
	Program Outcomes (POs) Defined by NBA	6
	Program Specific Outcomes (PSOs)	6
3	ATTAINMENT & ASSESSMENT OF CO-PO	9
	Course Outcomes (COs)	9
	Writing / Framing COs	9
	Rules to Develop COs	10
	Action Verbs for COs (Bloom's Revised Taxonomy)	10
	Quality of Course Outcomes	11
	Observations	12
	Sample Course Outcomes	13
	CO-PO Mapping Guidelines	13
	Sample CO-PO Mapping	13
	Targets for CO Attainment	13
	Level of Attainment	13
	Procedure for Computation of CO Attainment	15
	Attainment of POs and PSOs	19
4	TEACHING LEARNING PROCESS	26
	Process to improve quality of Teaching & Learning	27

OBE MANUAL

	Project Based Learning	30
	Methodologies to support weak students and encourage bright students	38
5	CONTINUOUS IMPROVEMENT	42

1. OBE & ACCREDITATION

Outcome-Based Education (OBE)

Outcome-Based Education (OBE) is an educational approach that serves as the foundation of a quality education system. In OBE, there is no fixed method of teaching or assessment. Instead, all educational activities are designed to help students achieve clearly defined learning outcomes. Depending on the intended outcomes, faculty members may act as instructors, trainers, facilitators, or mentors.

OBE enhances traditional teaching methods by focusing on what students are expected to achieve rather than what is taught. Success is measured through demonstrable outcomes expressed as “students are able to do” statements. This approach establishes clear, observable, and measurable standards for student performance.

National Board of Accreditation (NBA)

The National Board of Accreditation (NBA) is the authorized body responsible for accrediting higher education programs in India. It is also a full member of the Washington Accord. NBA grants accreditation to academic programs rather than entire institutions.

NBA classifies higher education institutions into two categories:

Tier 1 Institutions

These include:

- Indian Institutes of Technology (IITs)
- National Institutes of Technology (NITs)
- Central Universities
- State Universities
- Autonomous Institutions

Graduates from Tier 1 institutions may claim benefits under the Washington Accord.

Tier 2 Institutions

These consist of colleges affiliated with universities.

What is Outcome-Based Education?

Institutions implementing OBE continuously improve their curriculum by adapting to the needs and expectations of various stakeholders, including students, parents, industry professionals, and recruiters. OBE emphasizes both outcomes and continuous feedback to ensure effective learning.

Levels of Outcomes in OBE

OBE operates through four levels of outcomes:

1. Program Educational Objectives (PEOs)

2. **Program Outcomes (POs)**
3. **Program Specific Outcomes (PSOs)**
4. **Course Outcomes (COs)**

Why OBE?

The implementation of OBE offers several advantages:

1. Provides international recognition and enhances global employment opportunities.
2. Produces graduates who are employable, innovative, socially responsible, and ethically grounded, with strong professional and soft skills.
3. Improves the visibility and reputation of educational institutions among stakeholders.
4. Encourages greater commitment and participation from all stakeholders.
5. Enables graduates to excel in their professions and achieve higher career goals.
6. Prepares graduates for leadership roles and helps them recognize opportunities in technological advancement.

Benefits of OBE

Clarity

OBE establishes clear expectations regarding what students should achieve by the end of a course.

Flexibility

With clearly defined outcomes, instructors can design learning experiences that address the diverse needs of students.

Comparison

Learning outcomes can be assessed and compared at various levels, including individual students, classes, batches, programs, and institutions.

Student Involvement

Students take greater responsibility for their own learning. Increased involvement promotes independent learning and deeper understanding.

Enhanced Teaching Practices

- Teaching becomes more creative and innovative.
- Faculty members are no longer required to be the sole source of knowledge.
- Educators play a crucial role in shaping students' thinking, skills, and vision related to a course.

OBE, Accreditation, and India

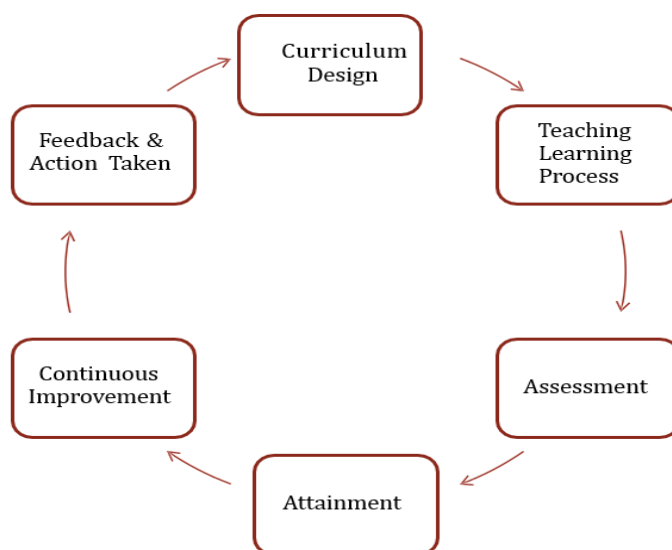
India became a permanent signatory member of the Washington Accord on 13 June 2014. Following this achievement, the implementation of Outcome-Based Education gained momentum in higher technical education across the country.

The National Assessment and Accreditation Council (NAAC) and the National Board of Accreditation (NBA) are autonomous organizations responsible for promoting global quality standards in technical education in India. Since 2013, the NBA has accredited only those programs that follow the OBE framework.

The NBA emphasizes the development of an outcome-based educational culture in institutions offering Engineering, Pharmacy, and Management programs. Outcome analysis reports help identify gaps in the educational process and support continuous improvement, which is essential for maintaining and enhancing the quality of education.

This version is suitable for assignments, reports, accreditation documentation, and academic presentations.

OBE ADMINISTRATIVE SYSTEM:



2. OUTCOME HIERARCHY

INSTITUTE VISION, MISSION AND QUALITY POLICY

VISION:

The Institution endeavors to impart quality education with ethical values and strives to make students technically competent to reach heights and make our students self-reliant and globally recognized.

MISSION:

- The institution is committed to impart quality education integrated with unwavering ethical values.
- The institution fosters to cultivate technical competence among the students, empowering them to ascend new heights of achievement.
- The institution nurtures a dynamic learning environment, to impart skills and knowledge for self-reliance and global recognition.

QUALITY POLICY:

Our Institution is committed to impart quality education integrated with ethical values to nurture technically competent, self-reliant, and globally recognized professionals.

We strive to:

Deliver Excellence in Education by fostering a dynamic learning environment that blends academic rigor with practical exposure and industry collaboration.

Cultivate Ethical and Professional Values in students so that they become responsible global citizens with integrity and leadership qualities.

Empower Students with Technical Competence by encouraging dynamism, innovation, and the use of modern tools and technologies.

Promote Self-Reliance and Global Recognition by nurturing entrepreneurial spirit, research aptitude, and problem-solving abilities in students multidisciplinary contexts.

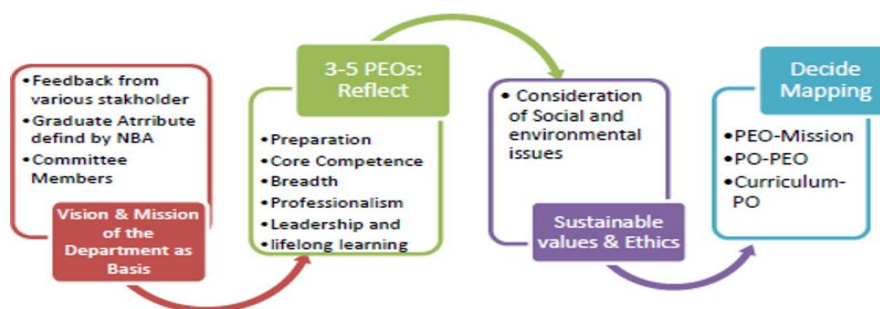
Ensure Continuous Improvement in academic processes, infrastructure, and stakeholder engagement through a transparent and outcome-based quality management system.

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. PEOs are about professional and career accomplishment after 4 to 5 years of graduation.



Process of defining PEOs of the Department



A list of PEOs written for the department of Electronics and Communication Engineering is given below

PEO 1	Graduates will master Electronics and Communication Engineering with ethics, crafting innovative solutions for industry challenges
PEO 2	Graduates will continually improve technical skills, contributing to multidisciplinary interactions and paving the way for professional development.
PEO 3	Graduates through exemplary education, will adeptly communicate, collaborate in teams to address societal needs.

GA, PO & PSO Statements

GRADUATE ATTRIBUTES (GAs):

- The GAs are exemplars of the qualities and attributes expected of a graduate

from an accredited programme.

- Graduates Attributes (GAs) are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level

PROGRAM OUTCOMES (POs):

- 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 at the end of 4 years.
- The POs essentially indicate what the students can do from the knowledge acquired by them during the program.
- As such, POs define the professional profile of an engineering graduate. NBA has defined the following 12 POs for an engineering graduate and are applicable to all engineering programs:

PROGRAM OUTCOMES (POs) DEFINED BY NBA:

Engineering Graduates will be able to:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and computing to solve Computer Science and Engineering related problems.
2. **Problem Analysis:** Demonstrate the ability to identify, formulate and solve engineering problems related to Computer Science and Engineering.
3. **Design / Development of Solutions:** Demonstrate the ability to design, analyze and interpret data and implement solutions for software based real life problems.
4. **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.
5. **Modern tool usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities related to Computer Science and Engineering with an understanding of the limitations.
6. **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.
7. **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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and Team Work:** Function effectively as an individual and as a member or leader to diverse teams, and in multidisciplinary settings.
10. **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 report and design documentation, make effective presentations, and give and receive clear instructions.
11. **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.
12. **Life-Long Learning:** Recognize the need for, and have the ability to engage in, independent and lifelong learning within the broad context of technological change.

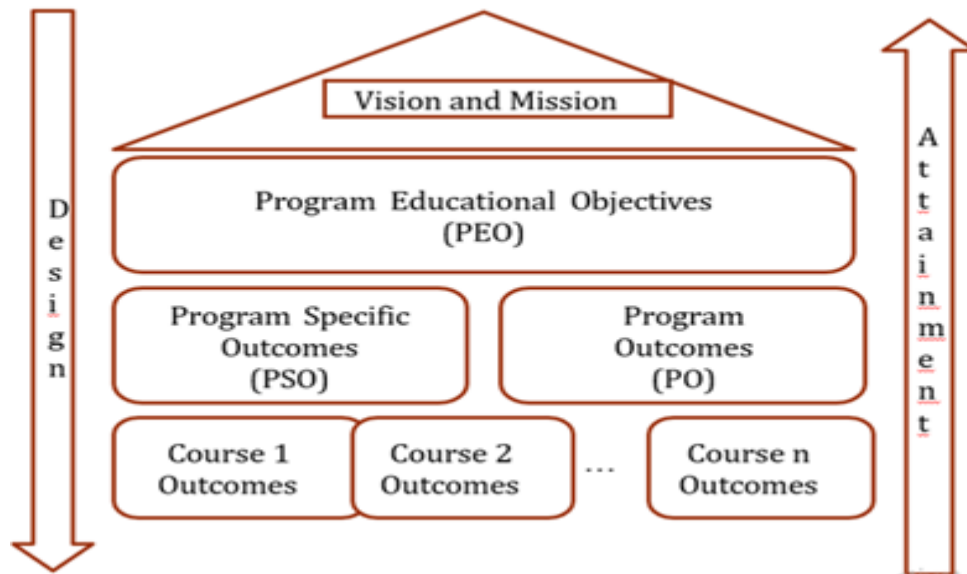
PROGRAM SPECIFIC OUTCOMES (PSOs)

ProgramSpecificOutcomes (PSOs) are statements that describe what the graduates of a specific engineering program should be able to do. A list of PSOs written for the department of Electronics and Communication Engineering is given below

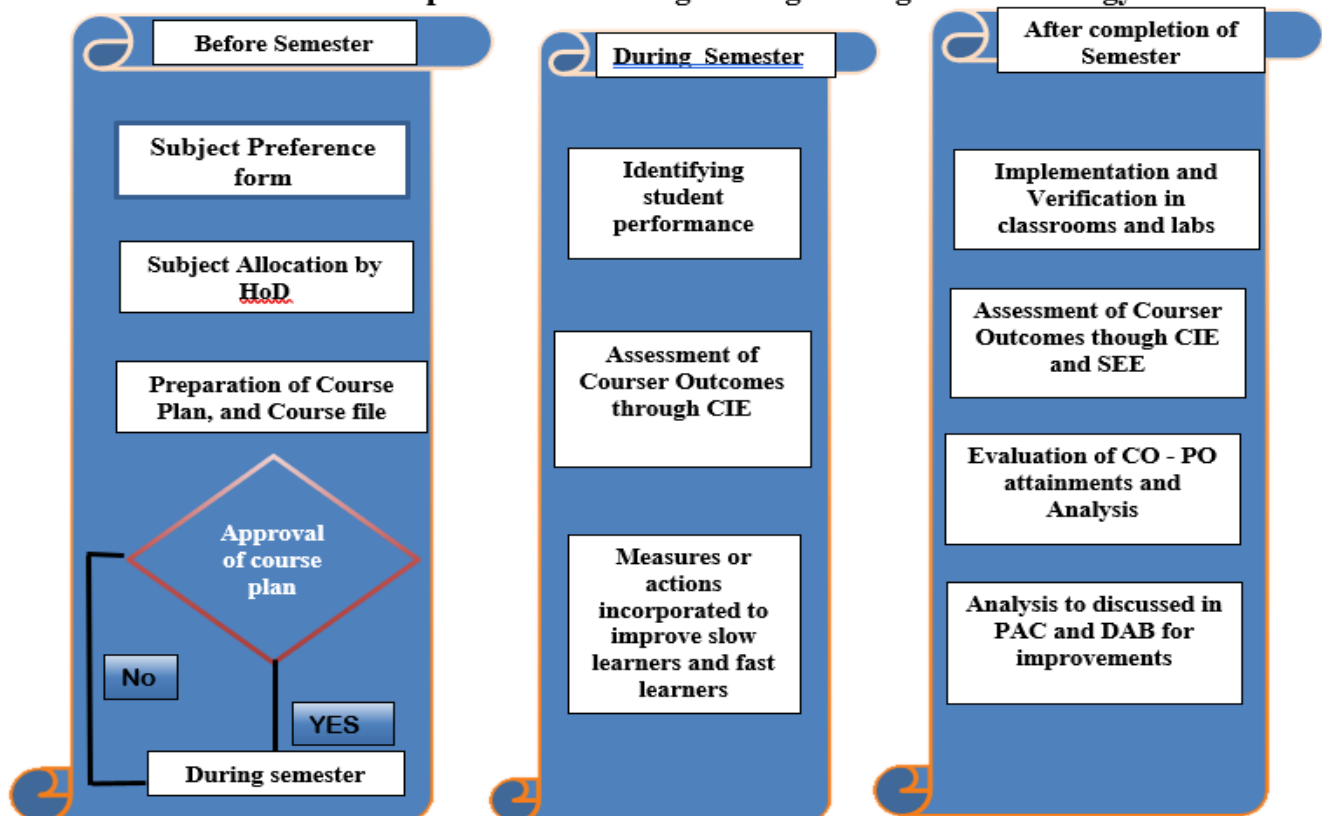
PSO 1: Ability to apply the acquired knowledge of Electronics and Communication Engineering in design and development, in areas of VLSI and Image Processing

PSO 2: Analyze and solve the complex Electronics and Communication Engineering problems using state of art hardware and software tools.

PROCESS FOR DESIGNING CURRICULUM FOR ATTAINING THE POs & PSOs



OBE Framework adapted at TKR College of Engineering and Technology



3.ATTAINMENT & ASSESSMENT OF CO-PO

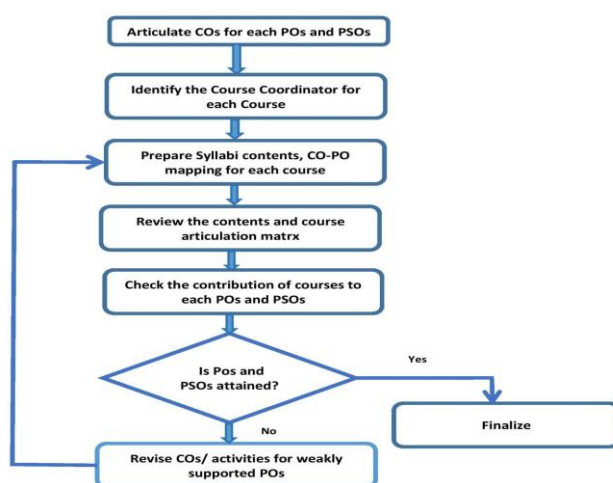
COURSE OUTCOMES (COs):

- It is a detailed description of what a student must be able to do at the end of a course.
- COs are the statements of Knowledge/ Skills/ Attitude that students are expected to know, understand and perform, as a result of learning experiences.
- Course Outcome remains the base of the hierarchy of outcomes and is the tools that can be used to measure student performance in each course.
- The course outcomes need to be concise descriptions of what learning is expected to take place by course completion.
- It should be narrower and measurable statements
- Well-written COs facilitate the faculty in measuring the achievement of the CO at the end of the semester. It also helps the faculty in designing suitable delivery and assessment methods to achieve the designed COs.
- New COs are developed when a new course is offered.

WRITING/ FRAMING COs

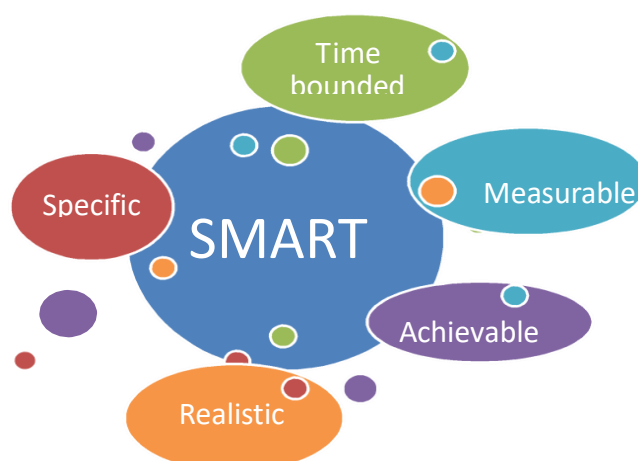
Well-written CO facilitates the faculty in measuring the achievement of the CO at the end of the semester.

- The CO statements are defined by considering the course content covered in each module of a course.
- Focus on the learning that results from the course rather than describing activities or lessons that are in the course.
- Create statements that have a student focus rather than an instructor centric approach.
- For every course there may be 5 or 6 Course Outcomes.
- The keywords used to define CO are based on Bloom's Taxonomy
- It also helps the faculty in designing suitable delivery and assessment methods to achieve the designed Course Outcomes



RULES TO DEVELOP COs

The rules to develop COs are **SMART**.



- **Specific:** Students can state what they should be able to achieve from reading the outcomes.
- **Measurable:** Students can be able to recognize when they have achieved the outcomes.
- **Achievable:** It is genuinely possible to complete the outcomes in the time and with the resources available.
- **Realistic:** Outcomes are appropriate for the student.
- **Time bounded:** Outcomes have a time limit for completion

Process to maintain Quality of the Course Outcomes (COs)

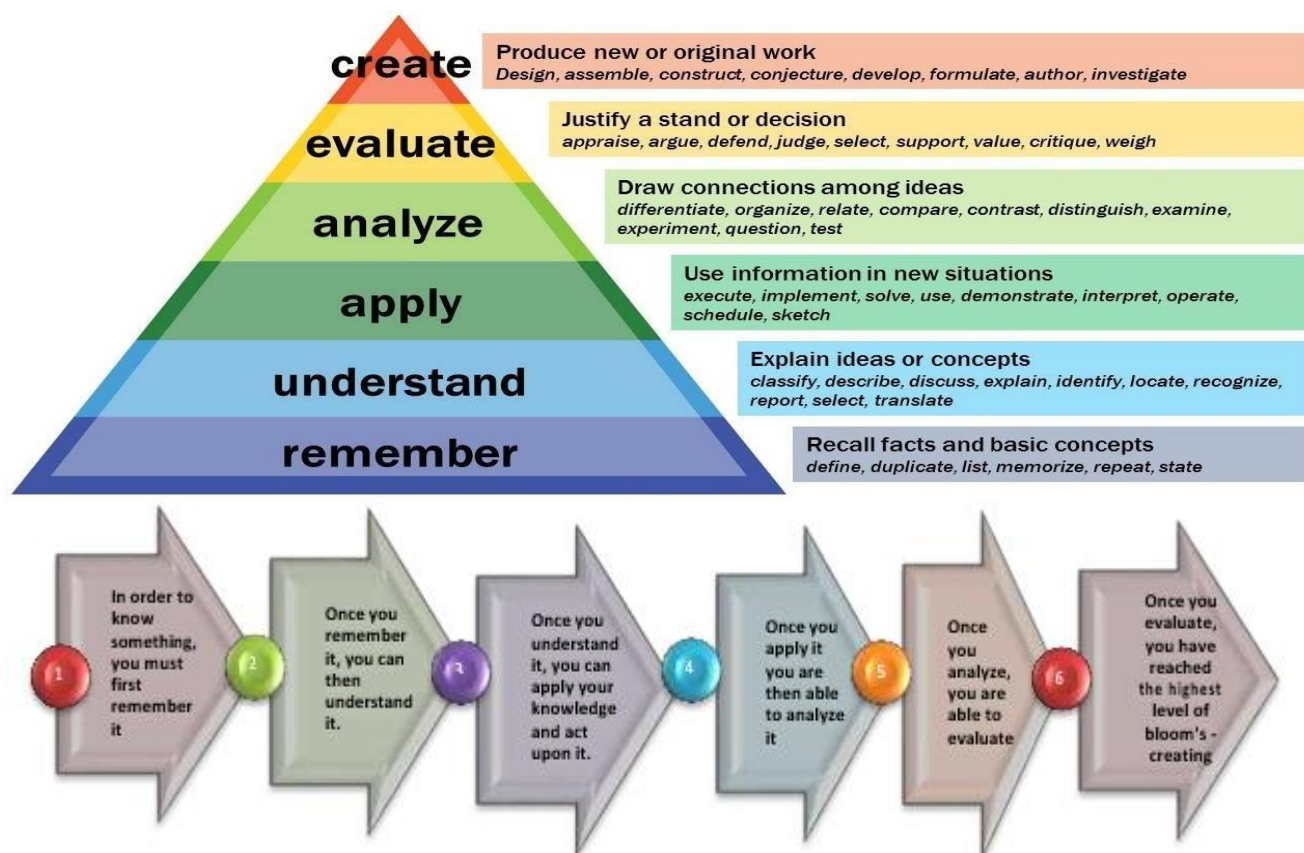
Guidelines for Writing Course Outcomes: Well-written course outcomes involve the following parts:

1. Action verb
2. Subject content
3. Level of achievement as per BTL

Action Verbs for COs

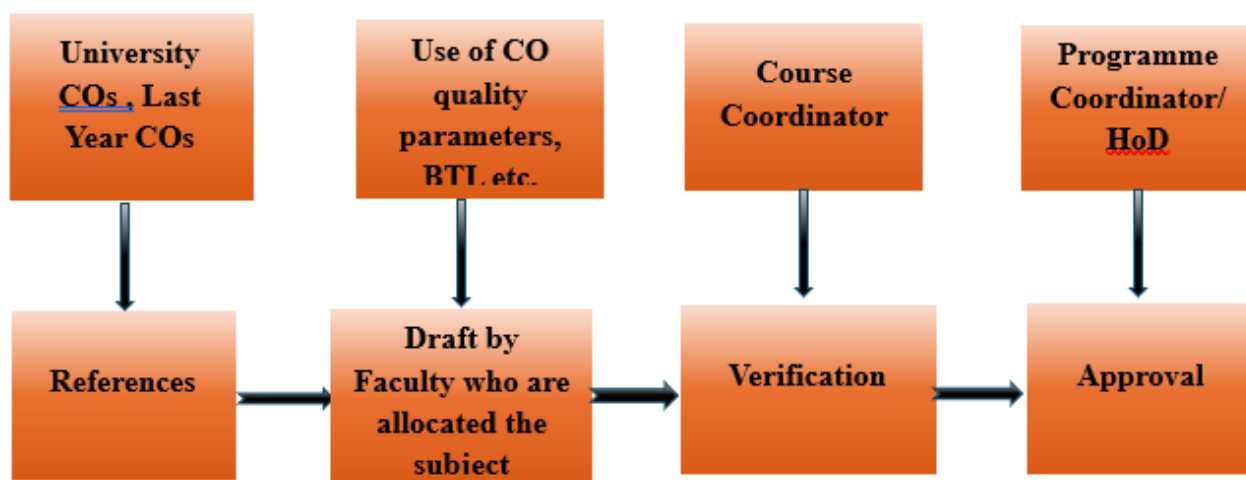
Lower Order of Thinking (LOT)			Higher Order of Thinking (HOT)		
Remember	Understand	Apply	Analyze	Evaluate	Create
Define	Explain	Solve	Analyse	Reframe	Design
Describe	Describe	Apply	Compare	Criticize	Create
List	Interpret	Illustrate	Classify	Judge	Plan
State	Summarise	Calculate	Distinguish	Recommend	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
Choose	Illustrate	Make use of	Discover	Choose	Compile

Sample Action verbs:



QUALITY OF COs

Process at department level to maintain quality of CO



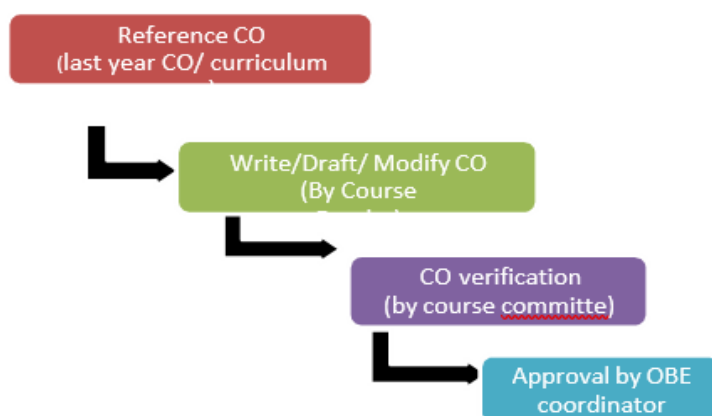
CO-PO Mapping Guidelines

CO-PO Course Articulation Matrix (CAM) Mapping

Type	POs	Action Verb(s) in POs	Bloom's level(s) for POs	Bloom's level(s) for COs
Technical	PO1	Apply	L3	Bloom's L1 to L4 for theory courses.
	PO2	Identify	L2	Bloom's L1 to L5 for laboratory courses.
		Formulate	L6	Bloom's L1 to L6 for project work, experiential learning
		Review	L2	
	PO3	Design	L6	
		Develop	L3, L6	
	PO4	Analyze	L4	
		Interpret	L2, L3	
		Design	L6	
	PO5	Create	L6	
		Select	L1, L2, L6	
		Apply	L3	
Non-Technical	PO6	Thumb Rule:		
	PO7	If Bloom's L1 Action Verbs of a CO: Correlates with any of PO6		
	PO8	to PO12, then assign 1.		
	PO9	If Bloom's L2 to L3 Action Verbs of a CO: Correlates with any of		
	PO10	PO6 to PO12, then assign 2.		
	PO11	If Bloom's L4 to L6 Action Verbs of a CO: Correlates with any of		
	PO12	PO6 to PO12 then assign 3		

Observations:

- For the theory courses, while writing the COs, restrict between Blooms Level 1 to Level 4.
- For the laboratory courses, while composing COs, restrict between Blooms Level 1 to Level 5.
- For mini-project and major projects, extend up to Blooms Level 6 while composing Cos



Sample Course Outcome Statements:

Digital Signal Processing

Upon completing this course, the student will be able to

1. Apply time, frequency, and Z-transform analysis techniques on signals and systems.
2. Calculate time domain and frequency domain of signals using DFT and develop FFT Algorithm for faster realization of signals and systems.
3. Design Digital IIR filters from analog filters using various techniques and analyze the realization of Digital filter.
4. Design a FIR digital filter based on given specifications, comprehend the significance of various filters, analyse its realization and their impact on signal processing.
5. Analyze Multi rate signal processing, DSP processor and its architecture.

Setting Target for CO Attainment

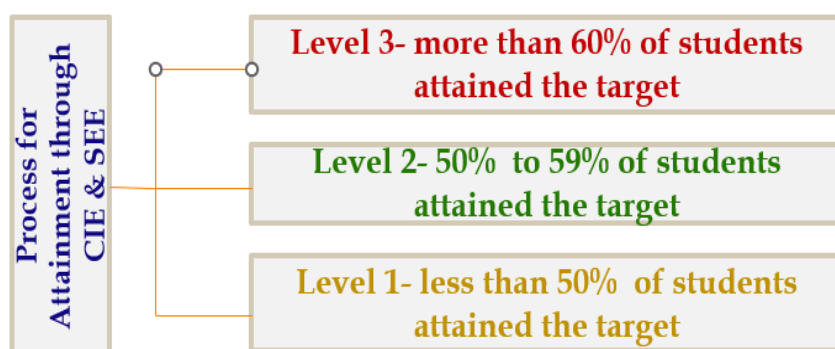
- Target level for attainment of COs can be set initially based on average marks of that course in the last three previous academic years.
- However, it can also be based on some threshold (minimum passing criteria or some other threshold)

SAME TARGET FOR ALL THE COs OF A COURSE

- For example, the target for all the course outcomes can be $\geq 60\%$ of the maximum marks allocated to CO.

LEVEL OF ATTAINMENT

Here 3 levels of attainment are taken as 1-Low; 2-medium; 3- High. These 3 levels of attainment can be defined as:



SAMPLE OF CO-PO MAPPING

CO'S	PROGRAM OUTCOMES												PSOs		Justification
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO 1	3	2													Strongly uses mathematical and engineering knowledge (PO1). Requires analytical skills to interpret signals in different domains (PO2)
CO 2	3	2													Involves applying engineering mathematics and transforms (PO1). Requires problem-solving and analytical ability to compute and optimize FFT (PO2).
CO 3	3	2											1		Applies knowledge of system theory and filter design (PO1). Problem analysis required for transformation techniques (PO2). Life-long learning (PO12) needed for advanced DSP methods. Directly contributes to PSO1 as filter design is central to DSP applications.
CO 4	3	3											2	2	Requires engineering knowledge and design capability (PO1). Strong analytical skills for specification-based filter design (PO2). Involves learning advanced filter applications (PO12). Directly linked with PSO1 and PSO2 as FIR filters are widely used in communication and embedded DSP systems.
CO 5	2												1	2	Uses engineering knowledge to understand multi-rate concepts and DSP architectures (PO1). Involves continuous learning about evolving DSP processors (PO12). Relates to PSO1 in terms of digital

															systems and PSO2 in applying DSP processors in real-time signal processing
AVG	2.8 0	2.2 5											1. 3 3	2. 0 0	

ASSESSMENT PROCESS FOR CO ATTAINMENT: The assessment tools and processes used to gather the data upon which the evaluation of CO's:

For measuring the attainments of COs of a theory course, the **targets** for the attainment are **fixed** as indicated below:

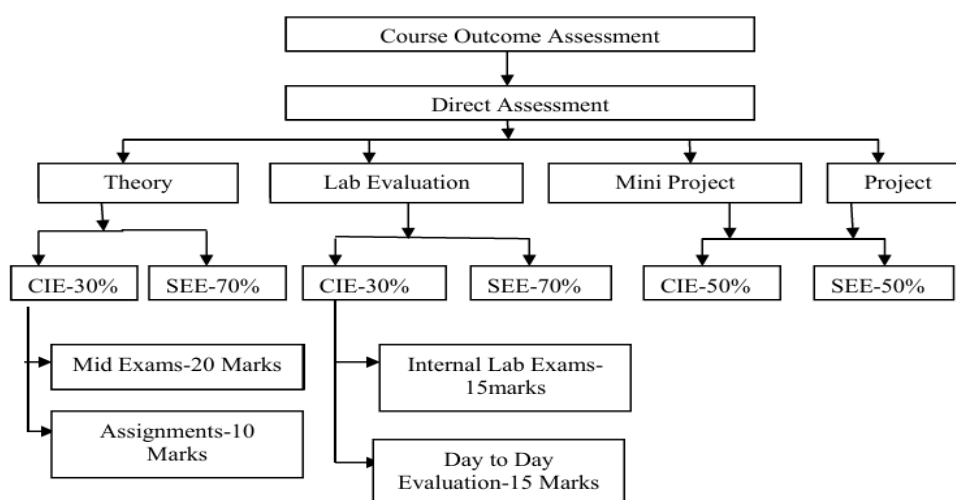


Fig.: Flow chart for evaluation of Course Outcome

- **Mid Exam I & II** : 40% of maximum marks
- **Assignments(Minor I & Minor II)**:40% of maximum marks
- **Semester End Examination:** Average Marks obtained subject to a minimum of 40% marks

For **Theory courses**, in measuring the overall course attainment,

- 90% weightage is given for the Direct measurement that includes attainments in assignments, Mid-term examinations, Semester End Examinations.
- 10% weightage is for Indirect measurement that includes Students' feedback on Course End Survey.

Table: CO Attainment Calculation for Theory

Type of Attainment	Name of the Exam	Assessment	Marks
Direct	Minor Examinations -1(Assignment)	Continuous	90%

OBE MANUAL

	Mid Term-1	Internal Evaluation (CIE)	
	Minor Examinations -2(Assignment)		
	Mid Term-2		
	Semester End Examinations	SEE	
Indirect	Course end Survey		10%

In the **Direct measurement**

- 70% weightage is given for the Semester End Examination and
- 30% weightage is given for the internal marks that includes
 - Mid-term examinations (20%),
 - Assignments (10%)

Both Mid -1 and Mid -2 is considered in measuring the attainment levels.

Direct Attainment of CO = 0.2* Mid-term + 0.1* Assignment + 0.7* End Sem. Exam

Indirect Attainment of CO = Course End Survey

Overall CO Attainment = 0.9* Direct Attainment Level + 0.1* Indirect Attainment Level

In the case of **laboratory courses**, 30% of marks awarded in internal (Mid Term) and 70% of Semester End Examination are considered for attainment calculation.

Direct Attainment of CO = 0.3* CIE + 0.7* SEE

Indirect Attainment of CO = Course End Survey

Overall CO Attainment = 0.9* Direct Attainment Level + 0.1* Indirect Attainment Level

Table: CO Attainment Calculation for Lab

Type of Attainment	Name of the Exam	Assessment	Marks
Direct	Day to Day + Lab Internal-1	Continuous Internal Evaluation (CIE)	90%
	Day to Day + Lab Internal-2		
	Semester End Examinations	SEE	
Indirect	Course end Survey		10%

NOTE:

- In the Mid Term and End semester Examinations of a particular Theory course, the question paper comprises of two questions Question1 (Q1) or Question2(Q2) from each unit of the syllabus , with internal choice.
- Each of the two questions may have sub parts also.
- A Student is supposed to answer either of Q1 or Q2.
- If Student answers both Q1 and Q2, then the question awarded with more marks among the two will be considered for the calculation of attainment.

SAMPLE RECORD OF ATTAINMENT OF COs:

Consider Assignment1,MID 1,Semester End Exam Marks to calculate CO1,similarly for other COs as per the below table

R20	Type of Exam	Marks	Type of Exam	Marks	Type of Exam	Marks	Total Marks
CO1	Assignment 1	2.5	Mid 1	3.5	SEE	14	20
CO2	Assignment 1	2.5	Mid 1	3.5	SEE	14	20
CO3	Mid1	3	Mid 2	3	SEE	14	20
CO4	Assignment 2	2.5	Mid 2	3.5	SEE	14	20
CO5	Assignment 2	2.5	Mid 2	3.5	SEE	14	20

Table : CO Weightage distribution

Name of the Subject: Digital Logic design-(R20)											
Subject Code: 3P3DB		Year/Sem	II/I	A.Y.	2021-22	Target	40	Attainment			
CO1								60	50	<50	
	EXAM TYPE	Assign-1	MID-1		SEEM			3	2	1	
	Q.NO	1,2	1,2,6,7	11 OR 12	1	2	11 OR 12	Total	%	SCORE	TARGET
S.NO	MAX MARKS	2.5	1	2.5	2	2	10	20	100	3,2,1	>=40% (Y/N)
1	20K91A0401	2.5	0.75	2.5	1	2	8	16.75	83.75	3	Y
2	20K91A0402	2.5	0.5	2	2	2	10	19	95.00	3	Y
3	20K91A0403	2.5	0.5	2.5	2	2	10	19.5	97.50	3	Y
4	20K91A0404	2.5	1	2.5	2	2	9	19	95.00	3	Y
5	20K91A0406	2.5	1	2.5	0	1	10	17	85.00	3	Y
6	20K91A0407	2.5	1	2.5	0	0	0	6	30.00	1	N
7	20K91A0408	2.5	1	2.5	2	2	10	20	100.00	3	Y
8	20K91A0409	2.5	1	2	1	1	6	13.5	67.50	3	Y
9	20K91A0410	2.5	1	2.5	0	2	6	14	70.00	3	Y
237	21K95A0449	2.5	0.75	2	2	2	7	16.25	81.25	3	Y
238	21K95A0450	2.5	0.75	2.5	2	2	8	17.75	88.75	3	Y
239	21K95A0452	1.5	0	0	0	0	3	4.5	22.50	1	N
240	21K95A0453	2.5	0.75	2.5	2	2	8	17.75	88.75	3	Y
241	21K95A0454	2.5	1	2.5	2	2	10	20	100.00	3	Y
242	21K95A0455	2	0.75	1.5	0	0	4	8.25	41.25	1	Y
243	21K95A0456	2.5	1	2.5	1	2	8	17	85.00	3	Y
244	21K95A0457	2	0	1.5	1	1	6	11.5	57.50	2	Y
245	21K95A0458	2.5	0.75	1.75	0	0	5	10	50.00	2	Y
246	21K95A0459	2.5	1	2	2	1	7	15.5	77.50	3	Y
247	21K95A0460	2.5	0.75	2.5	1	2	7	15.75	78.75	3	Y
248	21K95A0461	2.5	1	2	2	1	7	15.5	77.50	3	Y
249	21K95A0462	2.5	1	1.5	0	1	4	10	50.00	2	Y
250	21K95A0463	2.5	0.75	1.75	1	1	8	15	75.00	3	Y
251	21K98A0401	0	0.5	0	0	0	0	0.5	2.50	1	N
TOTAL								251	251	2.43	
								215	215		
								85.66	85.66		
								LEVEL 3	166		
								LEVEL 2	28		
								LEVEL 1	57		

Individual CO Assessment Process:

- **Level 3:** If the student secure $\geq 60\%$ of total marks

OBE MANUAL

- **Level 2:** If the student secure $\geq 50\%$ to $< 60\%$ of total marks
- **Level 1:** If the student secure $< 50\%$ of total marks

$$CO1 = \sum \frac{(No. of students attained) * (the weightage score given)}{(Total No. of students)}$$

As per above table FOR DIRECT ATTAINMENT $(166*3+28*2+57*1)/251=2.43$



TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

57, Medbowli, Meerpet, Saroornagar, Hyderabad-500097

COURSE END SURVEY FORM

Course Name: **ELECTRONIC CIRCUIT ANALYSIS (C43PC1)** Date:

Participant Name:

Roll No.

Dear Student,

Please answer the questions below to help the authorities for improving the methodology of teaching learning process. Tick mark against the appropriate square block

Course Outcomes	Ratings		
	1	2	3
1. On a scale of 1 to 3, how confident do you feel in designing and analyzing BJT small signal amplifier circuits and applying the learned biasing techniques? 1 - Moderately confident 2 - Confident 3 - Very confident	☐	☐	☐
2. How comfortable are you in analyzing transistors at very high frequencies based on the course material? 1 - Moderate understanding 2 - Good understanding 3 - Excellent understanding	☐	☐	☐
3. Did the course adequately cover the application of negative feedback to enhance amplifier stability? 1 - Moderately effective 2 - Effective 3 - Very effective	☐	☐	☐
4. Rate your ability to design and realize different classes of power amplifiers and tuned amplifiers as taught in the course 1 - Moderately capable 2 - Capable 3 - Highly capable	☐	☐	☐
5. On a scale of 1 to 3, how would you rate this course overall? 1 - Adequate fidelity/accuracy 2 - Good fidelity/accuracy 3 - Excellent fidelity/accuracy	☐	☐	☐

Comments:

.....

Thank you for participating in the "Transistor Amplifier Circuits and Feedback Systems" course. Your feedback is essential for us to enhance the learning experience..

Level 3: Extremely Helpful

Level 2: Very Helpful

Level 1: Moderately

Helpful

As per above table FOR INDIRECT ATTAINMENT $(205*3+44*2+2*1)/251=2.81$

Table : Sample CO Direct Attainment

COs	Avg	%	Level
CO1	2.43	85.66	3.00
CO2	2.10	74.00	3.00
CO3	2.12	72.29	3.00
CO4	2.23	78.80	3.00
CO5	1.77	66.94	3.00

COURSE END SURVEY						
i.No	H.T No	CO-1	CO-2	CO-3	CO-4	CO-5
1	20K91A0401	3	3	3	3	3
2	20K91A0402	2	3	3	3	3
3	20K91A0403	3	3	3	1	2
4	20K91A0404	3	3	3	3	2
5	20K91A0406	3	2	3	3	3
6	20K91A0407	3	3	3	2	2
7	20K91A0408	3	3	3	3	2
8	20K91A0409	1	3	3	3	1
9	20K91A0410	3	3	3	1	3
10	20K91A0411	3	2	3	2	2
11	20K91A0412	3	3	3	2	3
12	20K91A0413	3	3	3	3	3
239	21K95A0452	3	2	2	2	3
240	21K95A0453	3	3	3	2	3
241	21K95A0454	3	3	2	2	3
242	21K95A0455	3	3	3	3	3
243	21K95A0456	1	3	3	3	3
244	21K95A0457	3	3	3	3	2
245	21K95A0458	3	3	3	3	3
246	21K95A0459	2	3	1	3	2
247	21K95A0460	3	3	3	3	3
248	21K95A0461	3	1	3	3	2
249	21K95A0462	3	3	3	1	3
250	21K95A0463	3	3	3	3	3
251	21K98A0401	2	3	3	2	3
		2.81	2.90	2.85	2.88	2.90
LEVEL 3		205	227	215	224	228
LEVEL 2		44	23	34	24	22
LEVEL 1		2	1	2	3	1

Table : Sample CO Attainment

COs	Direct	In Direct	Total	ATT %	CO Target	Y/N
	90%	10%	100%			
CO1	2.19	0.28	2.47	82.44	60	Y
CO2	1.89	0.29	2.18	72.81	60	Y
CO3	1.91	0.29	2.19	73.16	60	Y
CO4	2.30	0.29	2.59	86.43	60	Y
CO5	1.59	0.29	1.88	62.73	60	Y

COs	Target level	No.of Students Scored Above Threshold %	Total Students Attempted	Attainment Percentage	Attainment Level	No.of Students Scored Above Threshold %
CO1	60%	252	207	82.1	2.3	3
CO2		252	202	80.2	2.2	3
CO3		250	180	72	1.97	3
CO4		250	219	87.6	2.5	3
CO5		250	207	82.8	2.13	3

ATTAINMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROCESS OF PO & PSO ATTAINMENT:

Course outcomes are assessed through Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). The analysis is done to find the level of attainments of each course COs. The attainment of POs and PSOs are being calculated based on the COs attainment. For indirect assessments, survey questionnaire is circulated to students, alumni and employer. The surveys are assessed and evaluated to determine the strength of attainment level of POs/PSOs. Survey results from graduates, alumni, and employer are consolidated and the final PO values are calculated through 3-point scale (Excellent, Very Good, Satisfactory).

Program Outcomes Assessment Tools

PO Attainment	Direct Assessment	Internal Assessments, Assignments, Lab Internal Tests, Semester End Examination	80%
	Indirect Assessment	Exit, Alumni, Employee Survey	20%

Survey Forms-Questionnaires


**TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**
(Sponsored by TKR Educational Society, Approved by AICTE, Affiliated by JNTUH,
Accredited by NBA & NAAC with 'A' Grade)

Employees' feedback on curriculum design & overall performance of students
Dear Employer,

Many Graduates of TKR College of Engineering & Technology are presently employed in your esteemed organization, and we are grateful to you for providing them with employment opportunities. We request you to kindly take a few moments of your valuable time to fill this feedback form. Your feedback would be invaluable to us in improving the College further and providing you with better employees in the future.

Name of the organization:	
Name:	
Designation:	
Mobile number & Email ID:	

Rating scale		
Excellent:3	Good:2	Satisfactory:1

S.No	Quality indicators	3	2	1
1	How would you rate the technical knowledge and engineering skills of our graduates in their respective fields?			
2	How effectively do our graduates analyze problems and identify appropriate solutions in a professional setting?			
3	How well do our graduates contribute to designing or developing practical and innovative solutions for engineering challenges?			
4	How competent are our graduates in investigating complex engineering problems using appropriate research methodologies?			
5	How proficient are our graduates in using modern engineering tools and software relevant to their field of work?			
6	How effectively do our graduates understand and address societal, health, safety, legal, and cultural issues in their professional work?			
7	How aware are our graduates about environmental impacts and sustainability considerations in their engineering solutions?			
8	How would you rate the ethical conduct and professionalism demonstrated by our graduates in their workplace?			
9	How effectively do our graduates perform individually and as part of a team in achieving project goals?			
10	How competent are our graduates in communicating ideas, reports, and presentations in a professional environment?			
11	How well do our graduates demonstrate project management skills and understanding of financial principles in their roles?			
12	How prepared and willing are our graduates to engage in life-long learning and adapt to technological advancements?			

Can you suggest any improvements to be made in the academic infrastructure of our institution to improve the overall employability aspects of our students?

Fig: 3.4 Feedback Form for Employers.

**TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**
(Sponsored by TKR Educational Society, Approved by AICTE, Affiliated by JNTUH,
Accredited by NBA & NAAC with 'A' Grade)

Feedback (EXIT Survey) from Students

Dear Students,
TKR College of Engineering & Technology values your feedback to enhance the quality of education.

Name:	
Mobile number & Email ID:	
Year of Admission:	
Year of Graduated:	
Name of the Programme:	B.Tech./M.Tech./MBA

Rating scale		
Excellent: 3	Good: 2	Satisfactory:1

S.No.	Quality indicators	3	2	1
1	To what extent the ability of applying knowledge of mathematics, science and engineering fundamentals across computer science and engineering course is achieved by you?			
2	To what extent the knowledge in identifying, formulating and solving engineering problems if acquired?			
3	Is the ability in designing, developing and analyzing the complexities for real world computational problems are achieved after completing of programme?			
4	How much knowledge acquired to conduct investigations of complex problems like, that cannot be solved by straight forward application of knowledge, that require consideration of appropriate constraints, that often require use of modern computational concepts and tools?			
5	Is the ability attained, to use the techniques, skills and modern engineering tools necessary for engineering practice?			
6	What extent you can apply reasoning informed by contextual knowledge to access societal, health, safety, legal and cultural issues and consequent responsibilities?			
7	Is the knowledge attained in understanding the impact of professional engineering solutions in societal and environmental contexts?			
8	Is understanding of professional ethical responsibility attained after completion of programme?			
9	To what extent you can function effectively as an individual and as a member in teams, and in multidisciplinary settings?			
10	To what extent the knowledge of communication (oral and written) is acquired after completion of programme?			
11	What extent do you have the capability to demonstrate knowledge and execute projects in multi-disciplinary environment?			
12	After completion of 4-Year programme, to what extent recognition for ability to engage, in lifelong learning is acquired?			

Comments:

What improvements would you suggest for the development of your institution and department specifically?

Would you like to contribute to the development of the institution?


**TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**
(Sponsored by TKR Educational Society, Approved by AICTE, Affiliated by JNTUH,
Accredited by NBA & NAAC with 'A' Grade)

Feedback from Alumni on Curriculum, Course & TLP

Dear Alumnus, TKR College of Engineering & Technology values your feedback to enhance the quality of education.

Name:	
Mobile number & email ID:	
Year of Admission:	
Year of Graduated:	
Name of the programme studied:	B.Tech./M.Tech./MBA
Present Designation and Work Profile:	

Rating scale		
Excellent: 3	Good: 2	Satisfactory:1

S.No.	Quality indicators	3	2	1
1	Have you been able to apply the engineering fundamentals to analyze complex engineering problems?			
2	Has the syllabus content incorporated in your curriculum helped you in problem solving?			
3	Were the research methods and data analysis provided during the course of study were helpful to investigate complex problems.			
4	Did you use research based knowledge for interpreting your data during project work?			
5	Has the college curriculum educated you in the selection and effective use of modern engineering tools?			
6	How do you rate your understanding of impact of engineering solutions in a global on the society, economic, Environmental aspects?			
7	Has the institute industry collaboration helped you in developing solution relevant to public health and environmental protection?			
8	The curriculum has helped me in understanding the significance of sustainable development and may commitment to professional ethics in my work place.			
9	The college curriculum has helped me extensively to work as an individual and in a team in multidisciplinary settings.			
10	How do you rate your skill of communicating effectively in speech and in writing, including documentation of hardware and software systems?			
11	Understanding fundamental engineering management principles has enabled me to secure funding for effective project execution.			
12	To what extent the contents of curriculum and course structure are supportive in Life Long Learning?			

Comments:

What improvements would you suggest for the development of your institution and department specifically?

Would you like to contribute to the development of the institution?

CALCULATION OF PO & PSOs ATTAINMENT:

In measuring the attainment level of each PO,

- 80% of weightage should be given for the Direct attainment of that PO obtained in terms of Levels 1,2 and 3 of all the courses related to that PO and
- 20% of weightage for Indirect measurement that includes Exit, Alumni, Employer, Parent Survey

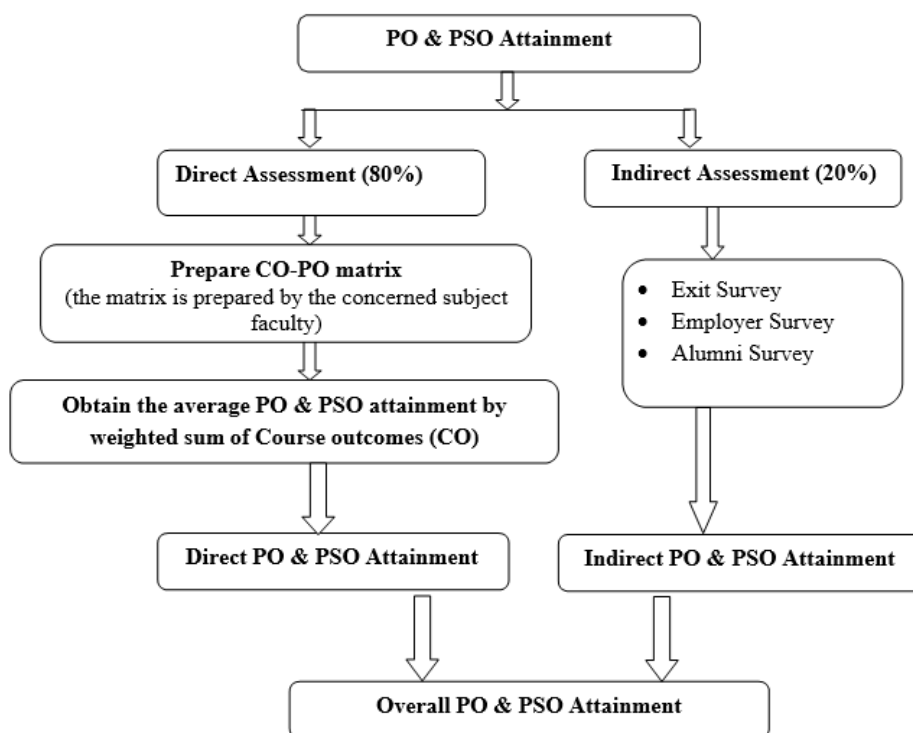


Table: CO Attainment

COs	Direct	In Direct	Total
	90%	10%	100%
CO1	2.19	0.28	2.47
CO2	1.89	0.29	2.18
CO3	1.91	0.29	2.19
CO4	2.01	0.29	2.30
CO5	1.59	0.29	1.88

Table :PO Target Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3											3	3
CO2	3	3											2	
CO3			3										3	2

OBE MANUAL

CO4			3										3	2
CO5			3										2	2
Avg	3.0 0	3.0 0	3.0 0										2.60	2.25

Table 3.16 :PO Attainment Matrix

COs / POs	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2.47	2.47											2.47	2.47
CO2	2.18	2.18											1.46	
CO3			2.19										2.19	1.46
CO4			2.30										2.30	1.53
CO5			1.88										1.25	1.25
AVG	2.33	2.33	2.12										1.93	1.68

$$PO1 = \sum \frac{(CO \text{ Attainment value}) * (the mapping value)}{(Total Mapping Points)}$$

$$PO1 = (2.47*3+2.18*3+2.19*0+2.30*0+1.88*0)/(3+3+0+0+0)=2.33$$

TABLE: PO Attainment Batch(2020-24)

S. No	Course Code	Course Name	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2
1	C101	LINEAR ALGEBRA CALCULUS&ORDINARY DIFFERENTIAL EQUATIONS	1.83	1.96	1.48											
2	C102	APPLIED PHYSICS	2.14	2.14	1.78									1.44		
3	C103	ELECTRONIC DEVICES	2.12	1.74	1.37										1.34	1.41
4	C104	C PROGRAMMING FOR PROBLEM SOLVING	2.21	1.41												
5	C105	APPLIED PHYSICS LAB	2.92	2.92	2.92	2.92	2.43				2.76	2.11	1.95	1.95		
6	C106	ELECTRONIC DEVICES LAB					2.99		2.66	1.99	2.99				1.99	1.99
7	C107	C PROGRAMMING FOR PROBLEM SOLVING LAB	2.94	2.94	2.93											
8	C108	IT WORKSHOP	2.95	2.94	2.93											
9	C109	TRANSFORMS THEORY	1.97	1.97	1.48											
10	C110	APPLIED CHEMISTRY	2.21	2.21	1.64											
11	C111	ENGLISH	2.64	2.14	1.88	1.83	1.83	1.81				1.84		1.81		
12	C112	BASIC ELECTRICAL ENGINEERING	2.34	2.24	2.06	1.92	1.90	1.24	1.30							
13	C113	ENGINEERING GRAPHICS	1.10	0.98	1.04											
14	C114	APPLIED CHEMISTRY LAB	2.93	2.93	2.93	2.21										
15	C115	ENGLISH LANGUAGE&COMMUNICATION SKILLS LAB	2.93	2.93	2.92	1.95					1.96	2.11				

OBE MANUAL

16	C116	BASIC ELECTRICAL ENGINEERING LAB	2.8 6	2.8 6	2.8 8	2.8 8	2.2 3				2.1 2	1.9 1	0.9 5			
17	C201	COMPLEX ANALYSIS AND VECTOR CALCULUS	1.2 7	1.1 8	1.2 3											
18	C202	DIGITAL LOGIC DESIGN	2.3 3	2.3 3	2.2 2										1.99	1.73
19	C203	ELECTRONIC CIRCUIT ANALYSIS	2.1 8	2.2 4	2.3 8										1.49	2.24
20	C204	SIGNALS AND SYSTEMS	1.7 5	1.7 5											1.17	1.17
21	C205	NETWORK ANALYSIS	2.4 6	2.1 0	1.6 9	1.7 3	2.4 3	1.5 9		1.4 4		2.0 0				
22	C206	DIGITAL LOGIC DESIGN LAB					2.8 7			2.8 7	2.8 7				2.63	2.39
23	C207	ELECTRONIC CIRCUIT DESIGN LAB					1.9 1			2.8 7	2.8 7	2.8 7			1.91	2.87
24	C208	ELECTRONIC CIRCUIT SIMULATION LAB					1.9 2			2.8 8	2.8 8	2.8 8			1.92	2.88
25	C209	BASIC SIMULATION LAB					2.8 8			2.8 8	2.8 8			2.8 8	1.92	2.88
26	C210	PROBABILITY THEORY AND STOCHASTIC PROCESSES	1.8 1	1.8 1	1.8 3										1.81	1.21
27	C211	ANALOG COMMUNICATIONS	2.0 4	1.7 8												2.04
28	C212	PULSE AND DIGITAL CIRCUITS	1.9 1	1.6 8	1.3 1										1.39	1.28
29	C213	LINEAR IC APPLICATIONS	1.9 3	1.8 4	1.2 1										1.36	1.36
30	C214	ELECTROMAGNETIC THEORY AND TRANSMISSION LINES	1.8 1	1.5 7	1.0 4											1.21
31	C215	ADVANCED ENGLISH COMMUNICATION SKILLS LAB	2.7 4	2.9 4	2.6 9	1.9 6	2.4 5	2.4 5				2.9 3	2.4 5	2.4 5		
32	C216	ANALOG COMMUNICATIONS LAB					2.9 7			2.9 7	1.9 8					2.97
33	C217	PULSE AND DIGITAL CIRCUITS LAB					2.8 5			2.8 5	2.8 5		2.8 5	2.8 5	2.85	
34	C218	LINEAR IC APPLICATIONS LAB								2.9 0	2.9 0	2.9 0				1.94
35	C301	BUSINESS ECONOMICS AND FINANCIAL ANALYSIS					1.6 9	1.6 5					1.9 0	1.6 0		
36	C302	CONTROL SYSTEMS	1.9 2	1.5 5	1.2 0										1.55	1.20
37	C303	DIGITAL COMMUNICATIONS	2.0 7	1.8 9	1.8 5	2.1 7										1.85
38	C304	MICROPROCESSOR AND MICROCONTROLLERS	1.4 9	1.5 2	2.2 3	1.8 7									1.55	2.09
39	C305	PYTHON PROGRAMMING	2.4 3	1.9 6	1.8 7											
40	C306 .1	DIGITAL DESIGN THROUGH VERILOG HDL	2.2 5	2.0 9	1.9 9		2.1 0								1.92	1.94
41	C306 .2	IMAGE PROCESSING&PATTERN RECOGNITION	2.1 3	2.2 5											2.43	
42	C306 .3	INTRODUCTION TO EMBEDDED SYSTEMS	1.6 6	1.9 2	1.7 5	1.6 0									1.59	
43	C307	DIGITAL COMMUNICATIONS LAB					2.6 8			2.8 7	2.8 7				0.00	2.87
44	C308	MICROPROCESSOR AND MICROCONTROLLERS LAB					2.7 1			2.7 1	2.7 1				1.93	2.90
45	C309	FUNDAMENTALS OF MANAGEMENT	1.9 1	1.5 9	1.7 0			1.8 7			2.2 2	1.5 8	1.9 5	1.5 1		
46	C310	ANTENNAS AND WAVE PROPAGATION	2.1 0	1.8 0	1.4 4											1.38
47	C311	DIGITAL SIGNAL PROCESSING	1.5 7	1.4 3	1.5 3										1.44	1.44
48	C312	TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS	2.5 0	2.5 2												1.62
49	C313	VLSI DESIGN	1.5 9	1.4 4	1.4 7	1.5 1	1.1 6								1.97	1.57
50	C314	OOPS THROUGH JAVA	2.1 7	2.0 8	2.0 6		1.4 5									
51	C315	DIGITAL SIGNAL PROCESSING LAB					2.7 0	1.8 8	2.5 2	1.6 8	2.3 5				2.70	2.16
52	C316	VLSI DESIGN LAB		2.4 1	2.4 1		2.4 1	2.1 4	1.6 1	2.4 1	2.0 1				2.41	2.41

OBE MANUAL

53	C401	MICROWAVE ENGINEERING	2.1 7	1.7 6												1.56
54	C402 .1	ANALOG IC DESIGN	2.0 3	1.3 5	1.3 4										1.74	1.34
55	C402 .2	EMBEDDED SYSTEM DESIGN	2.3 7	1.9 6											1.80	1.80
56	C403	COMPUTER NETWORKS	2.1 9	2.2 1	1.5 6											
57	C404	ARTIFICIAL INTELLIGENCE	2.3 2	2.2 1	1.6 0											
58	C405	MICROWAVE ENGINEERING LAB					2.9 2			2.9 2	2.9 2					1.95
59	C406	ADVANCED TECHNOLOGY LAB					2.4 4		2.9 3	1.9 5	2.9 3			2.9 3		2.93
60	C407	MAJOR PROJECT PHASE I	2.7 4	2.7 4	2.7 4										2.74	2.74
61	C408 .1	LOW POWER VLSI DESIGN	1.9 3	2.0 9	2.1 1										1.97	
62	C408 .2	R ENGINEERING	1.5 3	1.6 1	1.3 5											
63	C409	SATELLITE COMMUNICATIONS	2.2 8	2.1 0												1.61
64	C410 .1	EMBEDDED C	2.1 6	1.8 2	1.1 6										1.44	2.16
65	C410 .2	WIRELESS COMMUNICATIONS AND NETWORKS	2.6 4	1.7 6												
66	C411	MAJOR PROJECT PHASE II	2.9 2	2.9 2	2.9 2	2.9 2	2.9 2			2.9 3	2.9 3	2.9 3	2.9 3	2.9 3	2.92	2.92
		Avg. of Direct Attainment=	2.1 8	2.0 5	1.9 1	2.1 1	2.3 7	1.8 3	2.2 0	2.5 7	2.6 3	2.3 7	2.1 4	2.2 3	1.93	2.00

TABLE: PO Direct Attainment Batch(2020-24)

SURVEY	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
ALUMINI	2.20	2.27	2.15	2.07	2.27	2.07	1.93	2.07	2.13	2.13	1.93	1.80	2.20	2.13
EMPLOYER	2.40	2.47	2.07	2.20	1.93	2.27	1.87	2.00	2.13	2.33	2.07	2.27	1.87	2.07
EXIT	2.13	2.20	2.31	2.13	2.20	1.93	1.93	2.07	2.13	2.13	2.00	1.73	2.48	1.93
AVG	2.24	2.31	2.18	2.13	2.13	2.09	1.91	2.04	2.13	2.20	2.00	1.93	2.18	2.04

TABLE: PO Indirect Attainment Batch(2020-24)

ATTAINMENT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
DIRECT	2.18	2.05	1.91	2.11	2.37	1.83	2.20	2.57	2.63	2.37	2.14	2.23	1.93	2.00
INDIRECT	2.24	2.31	2.18	2.13	2.13	2.09	1.91	2.04	2.13	2.20	2.00	1.93	2.18	2.04
OVERALL PO ATTAINMENT	2.20	2.10	1.96	2.12	2.32	1.88	2.14	2.46	2.53	2.34	2.11	2.17	1.98	2.01

4. TEACHING LEARNING PROCESS

Processes followed to improve quality of Teaching & Learning

The process followed to improve the quality of teaching and learning in the department

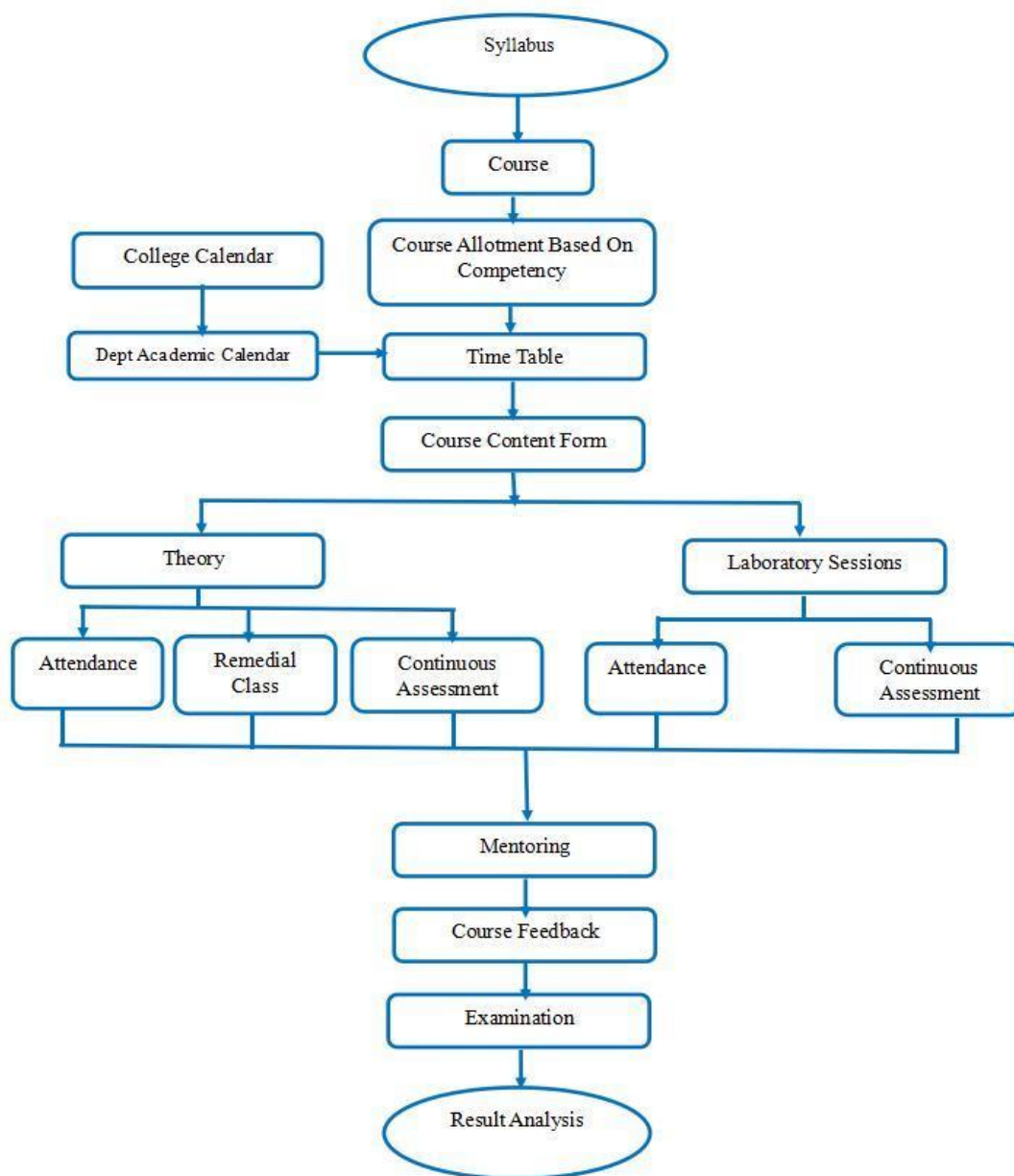


Figure:– Process to improve quality of Teaching & Learning

Process followed to improve quality of teaching & learning:

To strengthen the teaching-learning process, following initiatives have been taken:

- Adherence to Academic Calendar
 - Preparation of academic action plans/Lesson Plan
- Pedagogical Initiatives - Content Delivery (method of instruction)
 - Chalk and Talk

- ICT enabled based on requirement of the subject
- Continuous Internal Evaluation (CIE) Test
- Methodologies to support weak students and encourage bright Students
 - Mentoring System
 - Identification of Weak Students / Fast Learners
 - Action Taken
- Quality of Class Room Teaching
- Conduct of Experiments
- Student Feedback and action taken

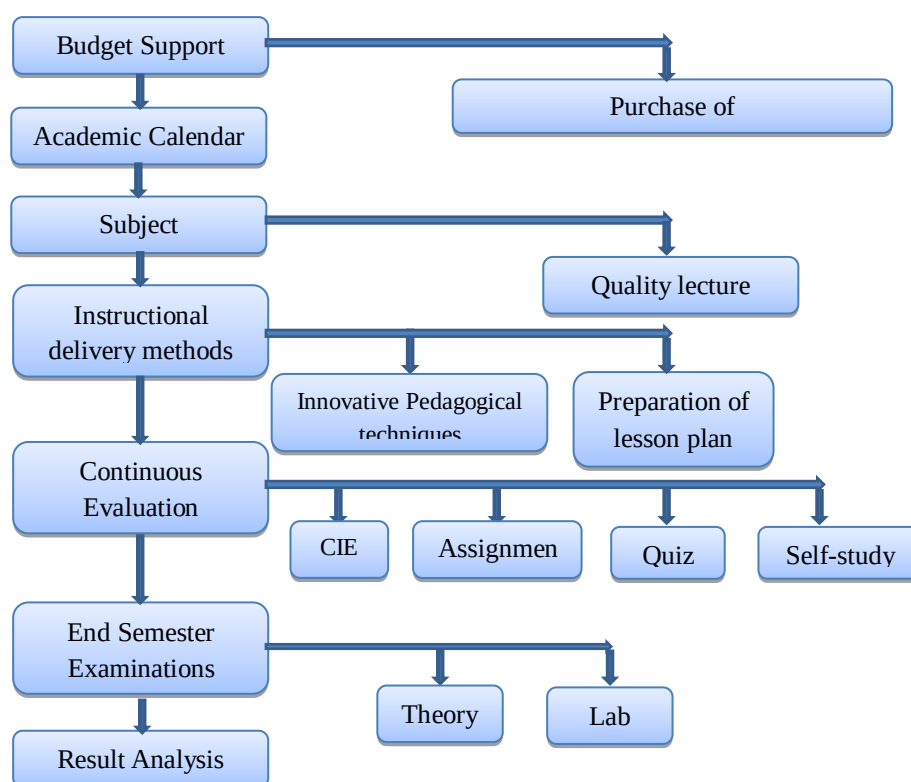


Figure: Teaching Learning Process

Pedagogical Initiatives - Content Delivery (method of instruction)

The departments modernizes education by combining traditional lectures with interactive pedagogical methods to build student problem-solving and critical thinking skills. One month pre-semester, faculty members submit subject preferences based on their expertise to ensure an optimal course allocation and workload distribution. Once assigned, professors proactively develop structured lesson plans, handouts, and assessments tailored to the student audience and mapped to course outcomes.

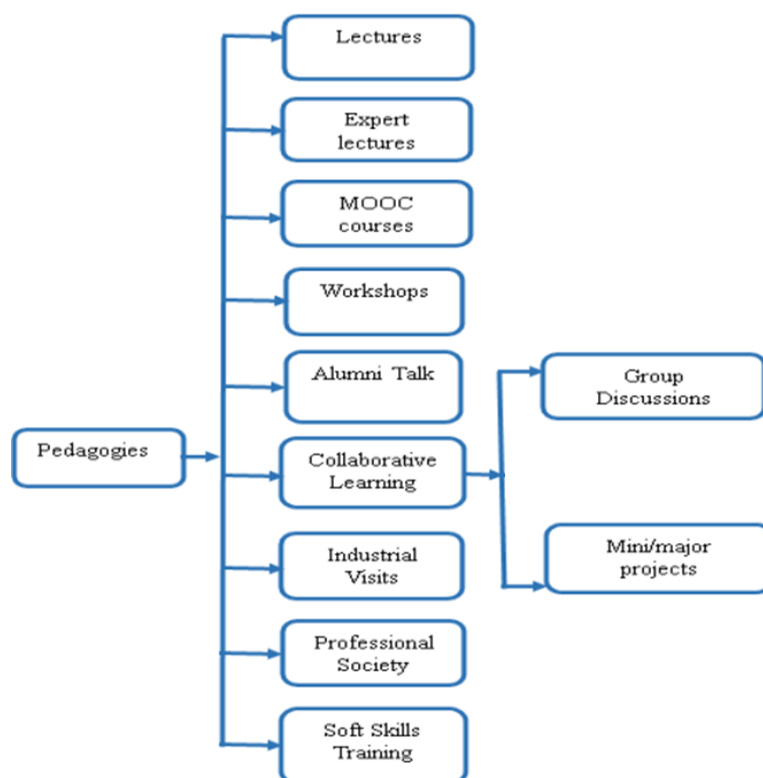


Figure 2.9 – Flow chart for Pedagogical Initiatives

Course Delivery Methods

Classroom teaching:

The lecture delivery by the faculty is through a set of educational technology/tools such as,

- Student-Centred Approach to Learning (Direct Instruction)
- Flipped Classrooms
- Inquiry-Based Learning
- Personalized Learning
- Game-Based Learning
- Case studies
- Classroom discussion
- Current events quizzes
- Debates
- Discussion groups
- Hands-on activities
- Individual projects
- Laboratory experiments
- Student presentations
- Model papers/Previous Papers
- Textbook assignments
- Video lessons

High-Tech Approach to Learning

- Workshops
- Expert talk
- Access to study material in e-resources

- Use of Open Source Software.
- **Lecture Delivery & Support Tools:** Classroom Teaching ICT facilitated (Projectors, Smart Boards) Google Classroom.
- **Collaborative Knowledge Sharing:** Group Discussions Student Presentations Peer Mode Learning.
- **External Knowledge Systems:** NPTEL/SWAYAM Courses Expert Lectures from Industry & Academia.
- **Practical & Experiential Pillars:** Internships Domain Workshops Phase-wise Project-Based Learning (PBL).

Project Based Learning (PBL)

Project-Based Learning (PBL) promotes long-term skill retention and implements Outcome-Based Education far more effectively than traditional instruction. Engineering students apply their technical knowledge by executing a Major Project in a phased manner (Phase I & II) across their seventh and eighth semesters. This work is developed under faculty guidance and is evaluated at the end of each semester by external examiners.

To maintain academic rigor, the course is monitored by a Project Review Committee (PRC) chaired by the HoD and composed of the Project Coordinator, Division Chair, senior faculty, and the project guide.

- ◆ HoD - Chairman
- ◆ Project Coordinator
- ◆ Division Chair
- ◆ Two Senior Faculty of the Department
- ◆ Guide

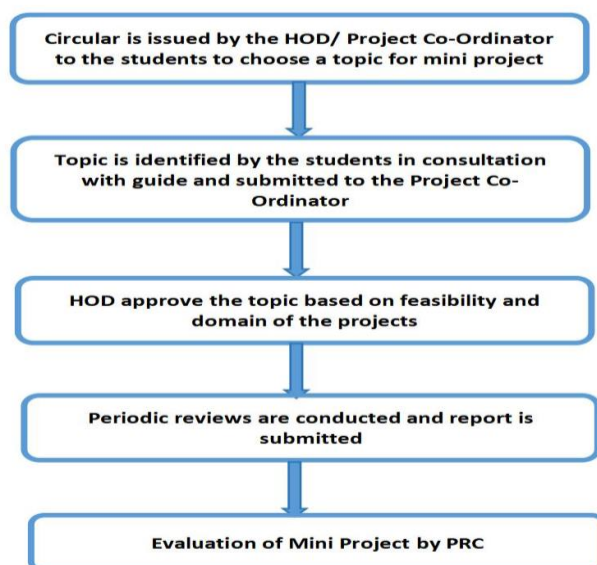


Figure: Process of Project Based Learning (PBL)

OBE MANUAL

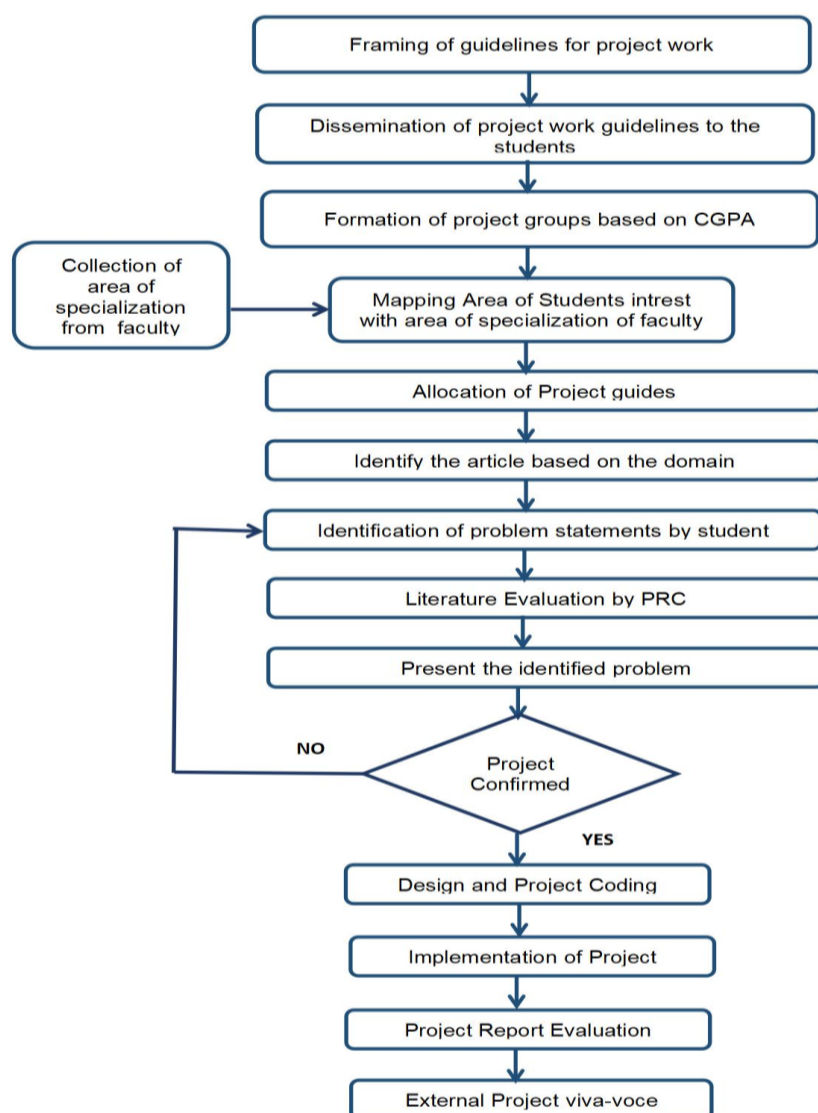


Figure: Process of project identification, allotment, monitoring and evaluation

Project Based Learning Rubrics for Internal Guides

Assessment Components	Excellent (10)	Good (8)	Average (6)	Acceptable (4)
Rubric #R1: Project Synopsis & Proposal Evaluation				
a) Identification of Problem Domain (10)	Detailed and extensive explanation of the purpose and need of the project	Good explanation of the purpose and need of the project	Moderate explanation of the purpose and need of the project;	Explanation of the purpose and need of the project is not well defined
b) Study of the Existing Systems and Feasibility of Project Proposal (10)	Detailed and extensive explanation of the specifications and the limitations of the existing systems	Collects a great deal of information and good study of the existing systems	Moderate study of the existing systems; collects some basic	Explanation of the specifications and the limitations of the existing systems not very

OBE MANUAL

			information	satisfactory;
c) Objectives of the proposed work(5)	All objectives of the proposed work are well defined;	Good justification to the objectives;	Incomplete justification to the objectives proposed;	Only Some objectives of the proposed work are well defined;
Rubric #R2: Project Analysis/ Design Evaluation				
a) Requirements Analysis (10)	Completely understanding of requirements both functional and Non-functional	Most completely understanding of requirements both functional and Non-functional	Incomplete understanding of requirements both functional and Non-functional	Minimal understanding of requirements both functional and Non-functional
b) Planning of Project Work and Team Structure(10)	Appropriate distribution of project work	Distribution of project work inappropriate	Distribution of project work un-even	Un-even distribution of project work and no synchronization
c) Presentation (5)	Contents of presentations are appropriate and well arranged	Contents of presentations are appropriate but not well arranged	Contents of presentations are appropriate but not well arranged	Contents of presentations are not appropriate
Rubric #R3: Project Coding / Implementation Evaluation				
a) Design Methodology(15)	Appropriate design methodology and properly justification	Design methodology not properly justified	Design methodology not defined properly	Design methodology not defined properly
b) Project Demonstration & Presentation (15)	All defined objectives are achieved and Contents of presentations are appropriate and well delivered	All defined objectives are achieved and Contents of presentations are appropriate and well delivered	All defined objectives are achieved and Contents of presentations are appropriate but not well delivered	Some of the defined objectives are achieved and Contents of presentations are not appropriate
Rubric #R4: Project Report Evaluation				
a) Project Report(5)	Project report is according to the specified format	Project report is according to the specified format	Project report is according to the specified format but some mistake	Project report is not fully according to the specified format
b)Description of Concepts and Technical Details(10)	Strong description of the technical requirements of the project	In-sufficient description of the technical requirements of the project	In-sufficient description of the technical requirements of the project	In-sufficient description of the technical requirements of the project

OBE MANUAL

c) Conclusion and Discussion (5)	Results are presented in very appropriate manner	Results are presented in good manner	Results are presented are not much satisfactory Project	Results are presented are not much satisfactory
---	--	--------------------------------------	---	---

Table: Project Based Learning Rubrics for External Examiner

Assessment Components	Excellent (10)	Good (8)	Average (6)	Acceptable (4)
a) Identification of Problem and Detailed Analysis (15)	Detailed and extensive explanation of the purpose and need of the project	Good explanation of the purpose and need of the project	Average explanation of the purpose and need of the project;	Moderate explanation of the purpose and need of the project
b) Study of the Existing Systems and Feasibility of Project Proposal (15)	Detailed and extensive explanation of the specifications and the limitations of the existing systems	Collects a great deal of information and good study of the existing systems;	Moderate study of the existing systems; collects some basic information	Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information
c) Objectives and Methodology of the Existing Work (20)	All objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are clearly specified	Good justification to the objectives; Methodology to be followed is specified but detailing is not done	Incomplete justification to the objectives proposed; Steps are mentioned but unclear; without justification to objectives	Only Some objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are not specified properly
d) Project Demonstration (10)	All defined objectives are achieved.Each module working well and properly demonstrated All modules of project are well integrated and system working is accurate	All defined objectives are achieved Each module working well and properly demonstrated Integration of all modules not done and system working is not very satisfactory	All defined objectives are achieved Modules are working well in isolation and properly demonstrate Modules of project are not properly integrated	Some of the defined objectives are achieved Modules are working well in isolation and properly demonstrated Modules of project are not properly integrated
e)	Contents of	Contents of	Contents of	Contents of

OBE MANUAL

Presentation(10)	presentations are appropriate and well delivered Proper eye contact with audience and clear voice with good spoken language	presentations are appropriate and well delivered Clear voice with good spoken language but less eye contact with audience	presentations are appropriate but not well delivered Eye contact with few people and unclear voice	presentations are not appropriate Eye contact with few people and unclear voice
f) Conclusion (10)	Results are presented in very appropriate manner Project work is well summarized and concluded Future extensions in the project are well specified	Results are presented in good manner Project work summary and conclusion not very appropriate Future extensions in the project are specified	Results presented are not much satisfactory Project work summary and conclusion not very appropriate Future extensions in the project are specified	Results presented are not much satisfactory Project work summary and conclusion not very appropriate Future extensions in the project are not specified
g) Viva voce(20)	Provides a clear, organized, and logical explanation with well-structured responses.	Provides a clear explanation, but may lack organization or clarity in certain areas.	Struggles to explain concepts clearly, providing disorganized or incomplete answers.	Struggles to explain concepts clearly, providing incomplete answers

Table - Rubrics mapping with POs and PSOs of Major Project Part-A & Part-B

Review	Agenda	Description	Assessment	POs	PSOs	Marks
Review 1	Project Synopsis and Proposal Evaluation	a) Identification of Problem Domain and Detailed Analysis (10) b) Study of the Existing Systems and Feasibility of Project Proposal (10) c) Objectives and Methodology of the Proposed Work (5)	Rubric R1	PO1, PO2	PSO2	25
Review 2	Requirement analysis and planning evaluation	a) Requirements analysis(10) b) Planning of project work and team structure(10) c) Presentation(5)	Rubric R2			25

Review 3	Project Analysis and Implementation Evaluation	a) Design Methodology (15) b) Demonstration and Presentation (15)	Rubric R3	PO1, PO2, PO3	PSO1, PSO2	30
Review 4	Project Report Evaluation	a). Project Report (5) b). Description of Concepts and Technical Details (10) c) Conclusion and Discussion (5)	Rubric R4			20
Total						100

Process for internal semester question paper setting and evaluation and effective process implementation:

CIE Question paper

- Every course has a coordinator – course coordinator who is responsible for the setting of the question paper.
- The syllabus pertaining to the respective CIE is announced well before the commencement of the same.
- The department conducts two internal assessment tests and covers 100% syllabus. Each test portion may vary from 1 to 2.5 modules. The question paper is set for 20 marks and the duration is 1 hour 20 minutes.
- While framing the question paper the course coordinator keeps in mind Blooms Taxonomy and Course Outcomes.
- Questions asked are mapped to the Course Outcomes.
- The question paper is submitted to the CoE one week prior to the commencement of the test.

Quality of question papers-Semester End Evaluation (SEE)

- Question papers for End-semester exams are based on learning levels like remember, understand, apply analyze, evaluate and create of Bloom's taxonomy with each COs.
- Faculty engaged in teaching with not less than five years of experience in relevant subject in any University/Autonomous College, or Research Institute other than the host institution shall be appointed to set question papers.
- For each subject three question papers will be set, one question paper will be set by internal Member and one each from two external Members.
- The following materials are sent to question paper setters:
 - Copy of the guidelines for question paper setter's
 - Syllabus of the concerned course
 - Bloom's Taxonomy
 - Question paper Format
- During scrutiny following essentials are considered:
 - Total ten question with two from each unit to be set uniformly covering the entire syllabus for both Part A and Part B format of question paper.

- Each Question of Part B should not have more than four sub questions.
- RBT levels and CO are checked for consistency.
- The question papers will be scrutinized by internal subject experts and Controller of Examinations.

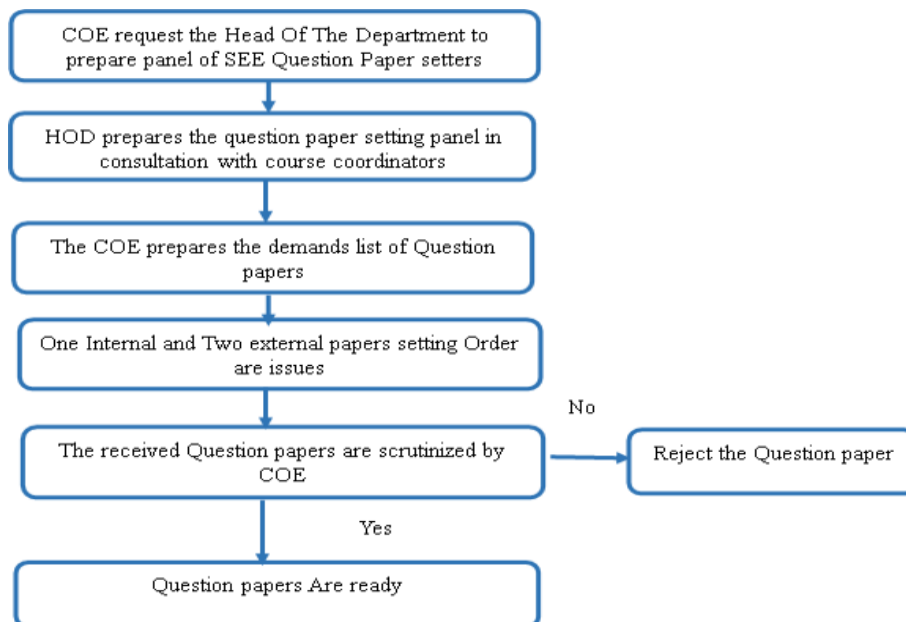


Figure Process involved in preparation of SEE question paper

Internal Assessment Test:

The institute conducts two internal assessment tests after completing 8th week (for 2.5 units of syllabus) and 16th week (remaining 2.5 units of syllabus) respectively. Each test covers half of the syllabus. The tests are conducted for a maximum of 30 marks. (No minimum marks criteria from the university). The duration of the test is one hour twenty minutes and question paper is set to make the student to learn time management. Program Coordinator along with course-coordinator is responsible for the conduction of the test. The Department HoD and two senior faculty members to check the quality of the question paper, BT levels and COs compliance.

Process for Internal Assessment Test Question Paper Setting:

- The course coordinator sets the question paper for the Internal Assessment.
- The course coordinator ensures to frame questions based on various BT levels and is mapped to the Course Outcomes (COs) to assess the students at various BT levels.

Procedure for Conduction and Evaluation of Internal Assessment Test:

The Internal Assessment Test will be conducted as per academic calendar and the exam dates (Exam Time Tables) are announced and kept in the notice board 15 days prior to the commencement of the test.

Question Paper:

For each course, question bank is prepared. While setting the question paper all previous university exam papers are taken into consideration. According to level of toughness the questions

are prepared (viz., analyzing the problems, implementation of modern tools, formulating the problems etc), which is termed as Bloom's Taxonomy.

The questions will be of three categories:

I. Multiple Choice Questions

II. Fill in the Blanks

III. Descriptive Questions

The Questions are formulated meticulously to meet cognitive levels of course outcomes.

Assignments:

- Assignment issue and submission dates are announced by the respective faculty members. Assignment questions are prepared using Bloom's Taxonomy process.
- Surprise tests, quizzes, video links are provided.
- In order to bridge the gap in curriculum, bright students are given some assignment beyond Syllabus.
- Assignments are evaluated and feedback is given to the students to improve their learning and appreciate their efforts

Evaluation:

The faculties after every internal assessment test, they explain the solution of the questions in the class which will enable them to perform well in the final examination. For any genuine reasons, if a student was unable to perform well in the given two internal assessment tests, improvement test is given to him/her.

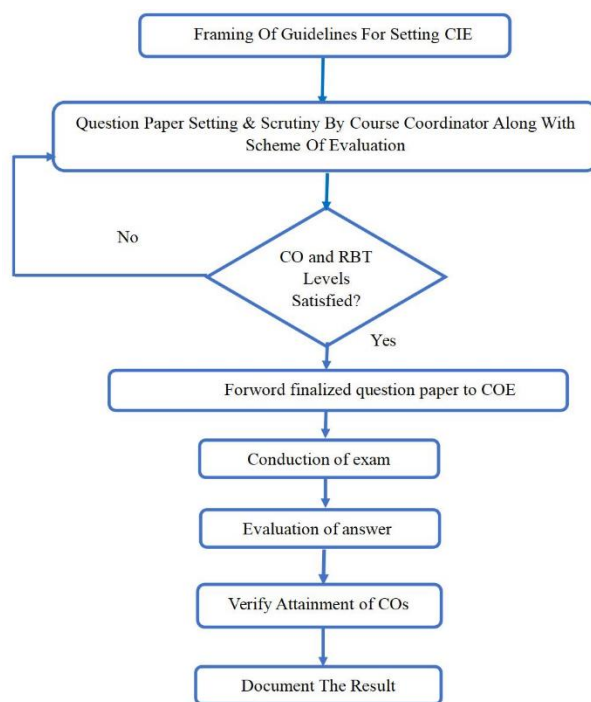


Figure: Process of CIE

Evaluation Scheme:

Rubrics Reference:			
Assessment	Internal	External	Total Assessment
Marks	40	60	100
Name of the Exam	Type of the Examination		Marks
Minor-1	Assignment		5
Mid Term-1	Objective		10
	Subjective		20
	Mid Term-1 Total		40
Minor-2	Assignment		5
Mid Term-2	Objective		10
	Subjective		20
	Mid Term-2 Total		40
Average of Minor-1 and Minor-2			5
Average of Midterm-1 and Midterm-2			30
Average of Minor + Average of Midterm			5+35=40
End Examination	Part-A 10 Questions each Question Carries 1 Marks		10
	Part-B 5 Questions internal unit wise choice each Question Carries 10 Marks		50
End Examination Total Marks			10+50=60
Total Marks			40+60=100

Process to ensure questions from outcomes/learning levels perspective

1. Internal assessment question paper template is shared by the exam section to all faculty members.
2. Faculty sets the question paper as per the CO's blooms levels.
3. The question papers were handed over to the exam coordinator by the respective subject expert.
4. Each question in internal test is mapped to COs and BLT levels in each subject. The marks obtained by each student in each COs for each internal assessment component is considered and CO-PO attainment is calculated based on that.

Evidence of COs coverage in class test / midterm tests

All faculty members follow the BLT levels and the COs in the question paper

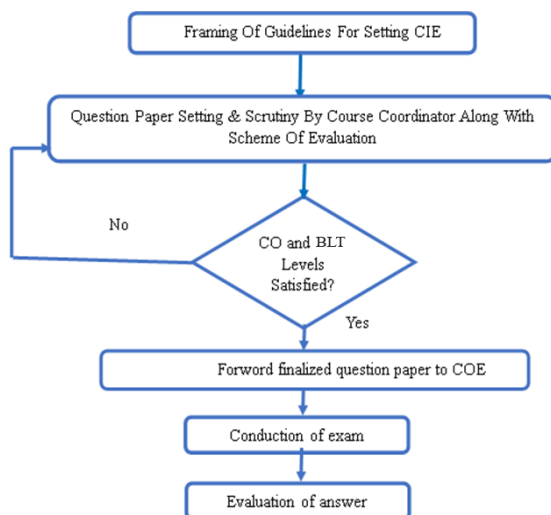
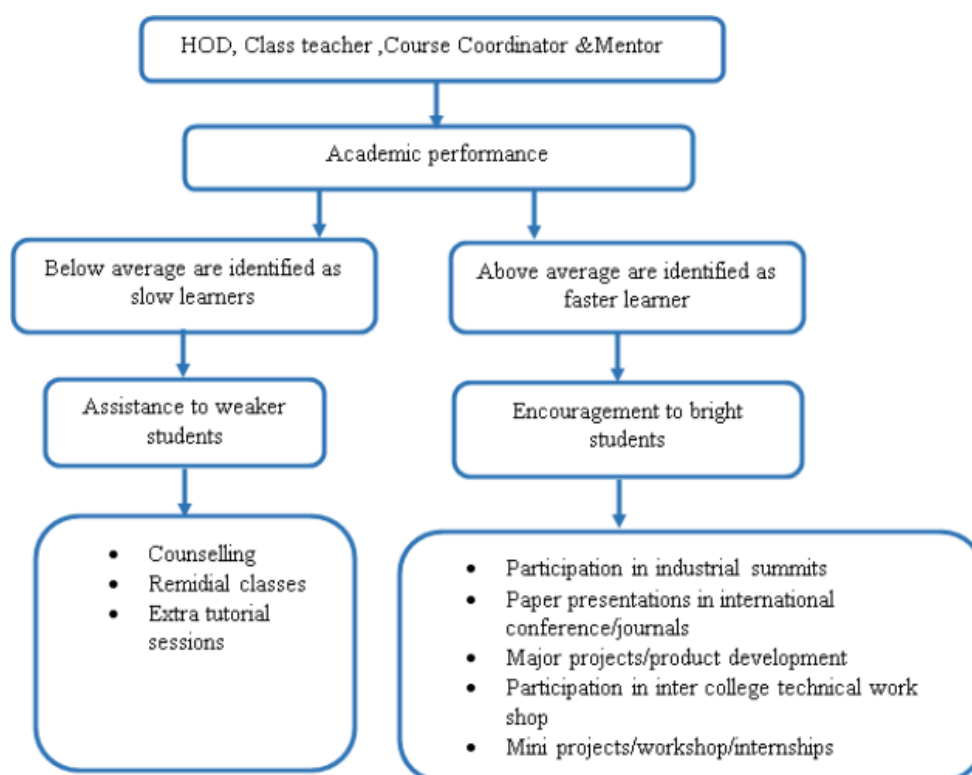


Figure: Process of COs coverage

METHODOLOGIES TO SUPPORT WEAK STUDENTS AND ENCOURAGE BRIGHT STUDENTS



PROCESS TO IDENTIFY AND SUPPORT WEAK STUDENTS AND ENCOURAGE BRIGHT STUDENTS

Criteria for categorizing weak and bright students CGPA

This involves the following steps:

(i) MENTORING SYSTEM

Faculty members identify the list of slow and fast learners of their respective courses and

accordingly guide them to achieve their goals and grades. Mentoring happens at the departmental level and if the student needs more inputs, we take the assistance of Senior faculty.

(ii) IDENTIFICATION OF WEAK STUDENTS / FAST LEARNERS

Faculty members identify the list of slow and fast learners of their respective courses. Broadly, the identification is based on CGPA, mentors report and Assignments conducted after completion of 50% of each unit. Students are also assessed through Lab classes assignments, Mid Examination I, Mid Examination II results.

(iii) ACTION TAKEN

Student identification of slow learners, fast learners and extra care taken for them are presented below

Table : Category of learners

Category of learners	Method of categorization	Extra care taken for students
Slow learners	Current CGPA<6	• Identify the courses in which student is weak. • Additional time is spent by the faculty member for making the concepts had better understand. • Extra counseling to motivate students and guide students for better preparation. • Mentors are facilitated to understand personal and professional difficulties of students.
Fast learners	Current CGPA>8.5	• Supplementary assignments are provided to develop skills on complex problems solving. • Fast learners are given practical applications scenario to implement in the laboratory. • Extra classes for advance topics. • Special guidance to publish papers and carry out innovative projects.

Table Actions taken in assisting weak students

Identification Criteria	Actions Taken
Students scoring less marks	➤ Peer teaching is conducted by senior faculty. ➤ Counselling is given to the students by subject handling faculty, concerned faculty advisors, Class Counsellors and HoD. ➤ Students' performances are intimated to parents. ➤ Remedial measures (counselling, classes, retest, and tutorial) are taken.

Failures in Semester End Examinations	➤ Examination failure reasons are analysed. ➤ Counselling is given to the student. ➤ Remedial classes are conducted before the commencement of semester end examination. ➤ Discussion on important concepts and question bank.
---------------------------------------	---

IMPACT ANALYSIS OF WEAK STUDENTS:

- Improvement in Semester end examinations.
- Develops positive attitude among students.
- Improvement in analytical and communication skills.
- Improvement in programming skills.

SUPPORT TO BRIGHT STUDENTS

Bright students are found on the basis of their class performances, involvement in classroom, internal assessments and grades. The following facilities are there for bright students to apply and improve their learning on various platforms:

- Extra assignment to enhance complex problems solving skills.
- Extra counselling to motivate students to take up advanced study or take-up projects.
- Involve fast learners for peer tutoring the slow learners.
- Students are motivated to take up one additional advanced level MOOC/SWAYAM / NPTEL in that course.
- They are encouraged to finding the solution of complex problem/innovative projects.
- Open ended/challenging lab based problem.
- Students are encouraged to take up competitive exams like GATE, GRE, TOEFL, IELTS, CAT, PGCET etc.
- Students are encouraged to be members of professional bodies like IEEE (India) /ISTE /CSI/organize technical events.
- Bright and diligent students are motivated and inspired to get top ranks in their Semester End Examinations and in competitive examinations.
- Students are encouraged to take part in various club activities.

Table: Actions taken in assisting bright students

Identification Criteria	Actions Taken
Rank Holders, Semester Toppers	➤ To motivate to get Gold medals and cash prizes given on Graduation Day. ➤ To motivate to get Mementos and cash prizes given in department functions. ➤ Encouraging them to take part in Research Activities. ➤ Motivating them to take part in national level competitions for projects.
Students with First Class	➤ Motivation to continue Excellency. Encouragement to get nationwide exposure. ➤ Motivating them to attend conferences, workshop, and other co-curricular activities.

Impact Analysis of Bright students:

- ✓ Improvement in CGPA.
- ✓ Improvement in communication skills and interpersonal skills.
- ✓ Improvement in programming skills.
- ✓ Improvement in inter-institute event participation.
- ✓ Improvement in placement and higher studies.
- ✓ The students were able to do quality projects, present papers in conferences

Additional resources for online learning both for students

Exposure was given for additional learning resources both for faculty and students. Some of the resources are listed below:

- TKRCET digital library resources on the Internet/text books / Question papers / Lesson modules / Student project reports / other references / e-books are available online
- Virtual labs, e-Content URL's
- Open access resources
- e-books
- Online certification courses
- Websites for academic enrichment
- Webinars

5.CONTINUOUS IMPROVEMENT



POs and PSOs attainment

POs/PSOs	Target level 2018-2022	Attainment 2018-2022	Target level 2019-2023	Attainment 2019-2023	Target level 2020-2024	Attainment 2020-2024	Target level 2021-2025	Attainment 2021-2025
PO1	1.8	2.33	1.89	2.28	1.95	2.20	2.01	2.32
PO2	1.8	2.16	1.89	2.14	1.95	2.10	2.01	2.21
PO3	1.8	2.05	1.89	2.03	1.95	1.96	2.01	2.15
PO4	1.8	2.26	1.89	2.06	1.95	2.12	2.01	2.29
PO5	1.8	2.45	1.89	2.27	1.95	2.32	2.01	2.34
PO6	1.8	2.49	1.89	2.25	1.95	1.88	2.01	2.07
PO7	1.8	2.60	1.89	2.43	1.95	2.14	2.01	2.01
PO8	1.8	2.56	1.89	2.40	1.95	2.46	2.01	2.50
PO9	1.8	2.53	1.89	2.42	1.95	2.53	2.01	2.48
PO10	1.8	2.41	1.89	2.48	1.95	2.34	2.01	2.18

PO11	1.8	2.77	1.89	2.40	1.95	2.11	2.01	2.07
PO12	1.8	2.36	1.89	2.28	1.95	2.17	2.01	2.16
PSO1	1.8	2.28	1.89	2.18	1.95	1.98	2.01	1.86
PSO2	1.8	2.28	1.89	2.12	1.95	2.01	2.01	1.95

The Process to identify extent of compliance of the curriculum for attaining the program Outcomes and Program Specific Outcomes is shown as given below in Fig

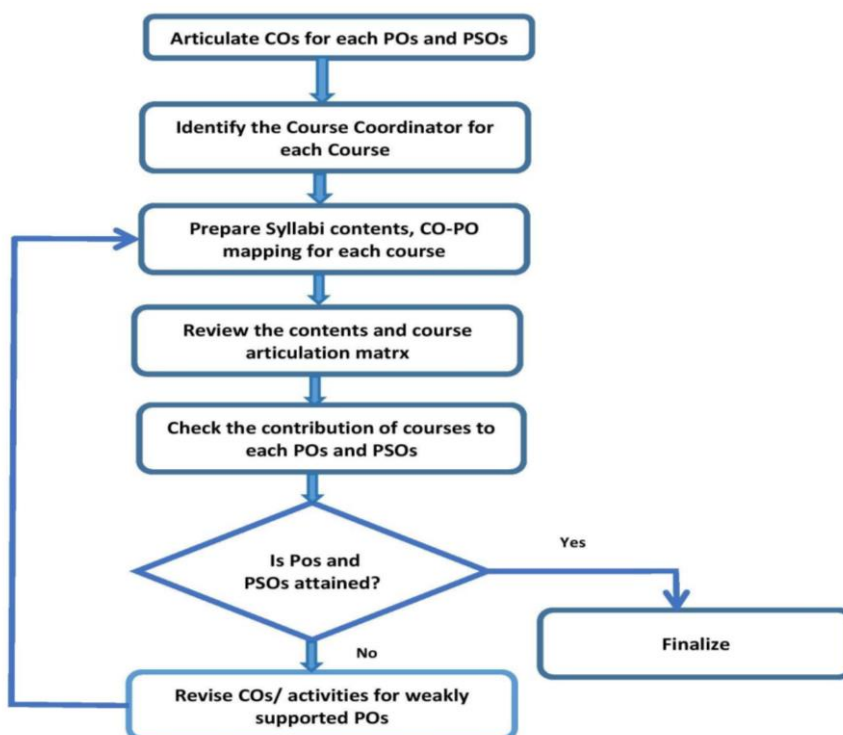


Fig: Process to identify extent of compliance of the curriculum for attaining the POs & PSOs

The below fig. represents a flow chart which describes how the revision of COs are made for weakly supported POs.

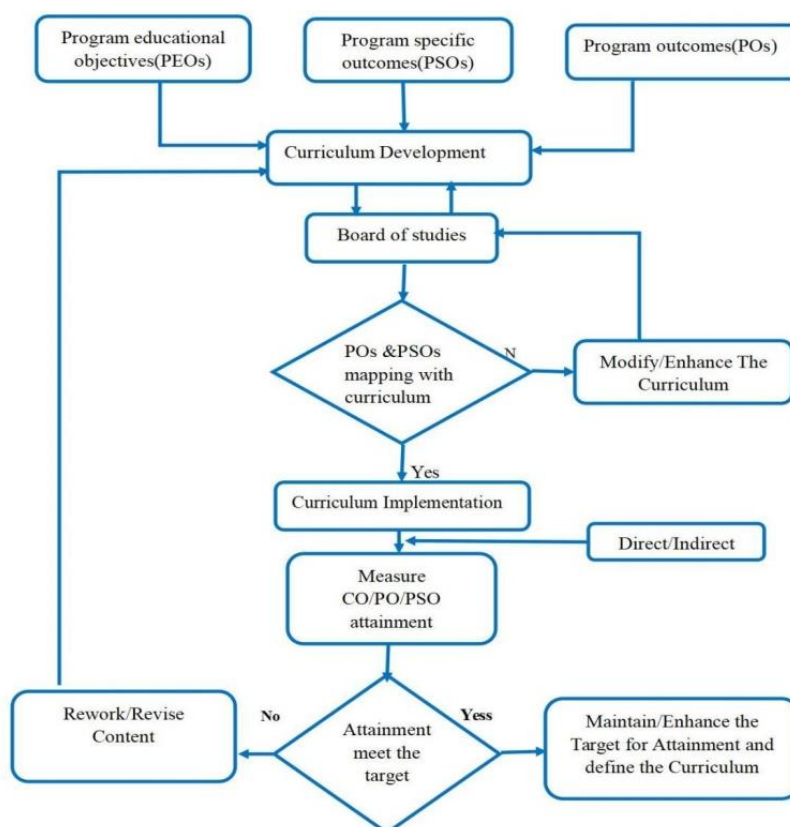


Fig: Process to describe how the revision of COs is made for weakly supported POs.