NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF BASIC SCIENCES AND HUMANITIES

OUTCOME BASED EDUCATION

(OBE)



I B.TECH – R23 REGULATION

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

INSTITUTE VISION AND MISSION

VISION:

To emerge as a **Centre of excellence** in technical education with a blend of effective **student centric teaching learning** practices as well as **research** for the transformation of **lives and community**.

MISSION:

1. Provide the best class infrastructure to explore the field of engineering and research.
2. Build a passionate and a determined team of faculty with student centric teaching, imbibing experiential and innovative skills.
3. Imbibe lifelong learning skills, entrepreneurial skills and ethical values in students for addressing societal problems.

PROGRAM OUTCOMES (POs):

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6:The Engineer and the World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

NARASARAOPETA ENGINEERING COLLEGE (AUTONOMOUS)

DEPARTMENT OF BASIC SCIENCES AND HUMANITIES

Our Basic Sciences and Humanities department offers English, Physics, Chemistry, and Mathematics for first-year students to improve their conceptual understanding. We also impart knowledge on additional subjects such as Environmental Studies to develop a sense of ethics in students. We employ faculty members experienced in the respective fields.

The BS&H department is well-equipped to meet the academic requirements of engineering and management. We also have a Chemistry lab, a Physics lab, and an English Language lab. The department also provides skill enhancement training on interpersonal skills, body language, personality development, etiquettes, facing interviews, and more.

In a nutshell, we develop scientific temperament budding engineers and entrepreneurs require to excel in their careers.

OUTCOME BASED EDUCATION (OBE)

Outcome-Based Education (OBE) model is being adopted at a fast pace at Engineering colleges in India at the moment. It is considered as a giant leap forward to improve technical education in India and help Indian Engineers compete with their global counterparts. Outcome Based Education (OBE) is an important demonstration Tool for student-centered instruction that focuses on measuring student performance through outcomes.

Quality assurance and improvement process is about determining whether the set educational objectives meet a general standard of quality. Emphasis of outcome-based education (OBE) system is on quantifying what the students are capable of doing and learning outcomes of the students is one of the key components. Course Outcomes are the statements indicating knowledge and skills the student is expected to acquire at the end of a course. Program outcomes represent the knowledge, skills and attitudes the students should have at the end of program. Program outcomes can be directly measured through course outcomes. The outcome-based education model is based on defining various parameters called as Graduates Attributes (POs).

ABBREVIATIONS:

OBE	Outcome Based Education	BTL	Bloom's Taxonomy Level
LOT	Lower Order of Thinking	HOT	Higher Order of Thinking
PEO	Program Educational Objectives	PO	Program Outcome
CO	Course Outcome	PSO	Program Specific Outcome
CE	Course Exit Survey	HoD	Head of Department
PC	Program Coordinator	DAC	Department Advisory Committee
PAC	Program Assessment Committee	AY	Academic Year

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.

Accreditation Serves To Notify:

- Parents and prospective students that a program has met minimum standards.
- Faculty, HOD, Principal of a program's strengths and weaknesses and of ways to improve the programme.
- Employers that graduates are prepared to begin professional practice
- The public that graduates are aware of societal considerations.

Purpose of accreditation is NOT TO:

- Find faults with the institution but to assess the status-ante of the performance.
- Denigrate the working style of the institution and its programs but to provide a feedback on their strengths and weaknesses.
- Demarcate the boundaries of quality but to offer a sensitizing process for continuous improvement in quality provisions.
- Select only institutions of national excellence but to provide benchmarks of excellence and identification of good practices.

Benefits of Accreditation:

- Facilitates continuous Quality Improvement.
- Demonstrates accountability to the public.
- Improves staff morale.
- Recognizes the achievements/innovations.
- Facilitates information sharing.

- Priority in getting financial assistance helps the Institution to know its strengths, weaknesses and opportunities.
- Initiates Institutions into innovative and modern methods of pedagogy
- Promotes intra and inter-Institutional interactions

Pre 2013 Scenario:

- Educational quality measurements focused on inputs, activities and outputs, such as resources used, classes taught, articles published, placements and graduate enrolments
- Such performance indicators provide no measurement of the degree to which Institutions of higher learning actually develop the knowledge and skills of their students.
- These measurements are ill-suited to inform governments, students and the general public about teaching and learning quality
- In the absence of comparable learning outcomes assessment across institutions, ratings and rankings are widely used as proxies for relative educational quality.
- NBA criteria were mainly input-process-output related and there were no direct measures of quality of learning.

WASHINGTON ACCORD:

It recognizes the substantial equivalency of programs accredited by those bodies and recommends that graduates of programs accredited by any of the signatory bodies be recognized by the other bodies as having met the academic requirements for entry to the practice of engineering.

The induction of India in the Washington Accord in 2014 with the permanent signatory status of The National Board of Accreditation (NBA) is considered a big leap forward for the higher education system in India. It means that an Engineering graduate from India can be employed in any one of the other countries who have signed the accord. For Indian Engineering Institutions to get accredited by NBA according to the pacts of the accord, it is compulsory that engineering institutions follow the Outcome Based Education (OBE) model. So, for an Engineering Institution to be accredited by NBA it should compulsorily follow the OBE model. Similarly, NAAC is also now following the same path and OBE is benchmarked as a standard for accreditation.

What are Outcomes?

- An outcome of an education is what the student should be able to do at the end of a program/ course/ instructional unit.

- Outcome-based education is an approach to education in which decisions about the curriculum are driven by the exit learning outcomes that the students should display at the end of the program/ course.
- Outcomes are the abilities the students acquire at the end of the program
- In outcome-based education, "product defines process".
- It is the results-oriented thinking and is the opposite of input-based education where the emphasis is on the educational process and where we are happy to accept whatever is the result.
- Outcome-based education is not simply producing outcomes for an existing curriculum.

A learning outcomes answers the question: "What is it that your students should be able to do at the end of the hour/lecture that they could not do before?". It provides a clear guidance for the planning and development of the teaching process, including the design and organization of materials, the selection of the most appropriate teaching methods, as well as providing a measure for quality assurance (Biggs, 2003).

Some important aspects of the Outcome Based Education:

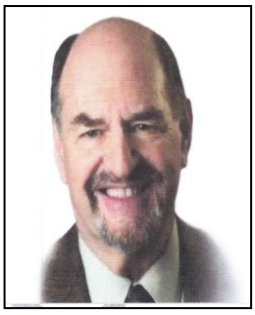
1. **Course** is defined as a theory, practical or theory cum practical subject studied in a semester. For example Engineering Mathematics
2. **Course Outcome (CO)** Course outcomes are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.
3. **Program** is defined as the specialization or discipline of a Degree. It is the interconnected arrangement of courses, co-curricular and extracurricular activities to accomplish predetermined objectives leading to the awarding of a degree. For Example: B.E., Marine Engineering.
4. **Program Outcomes (POs)** Program outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.
5. **Program Educational Objectives (PEOs)** The Program Educational Objectives of a program are the statements that describe the expected achievements of graduates in their career, and also in particular, what the graduates are expected to perform and achieve during the first few years after graduation.
6. **Program Specific Outcomes (PSO)** Program Specific Outcomes are what the students should be able to do at the time of graduation with reference to a specific discipline. Usually there are two to four PSOs for a program.

All OBE approaches take a criterion-based view of assessment and focus on what students can do with knowledge after a period of learning

LEVELS OF OUTCOMES:

- **Program Educational Objectives:** PEOs are broad statements that describe the career and professional accomplishments in five years after graduation that the program is preparing graduates to achieve.
- **Program Specific Outcomes:** PSOs are statements that describe what the graduates of a specific engineering program should be able to do.
- **Program Outcomes:** POs are statements that describe what the students graduating from engineering programs should be able to do.
- **Course Outcomes:** COs are statements that describe what students should be able to do at the end of a course. The method of assessment of the candidates during the program is left for the institution to decide. The various assessment tools for measuring Course Outcomes include Mid -Semester and End Semester Examinations, Tutorials, Assignments, Project work, Labs, Presentations, Employer/Alumni Feedback etc…

FOUR PRINCIPLES IN OBE:



Dr. William Spady is considered as the father of OBE.

The most widely used one is the four principles suggested by Dr. William Spady in the year 1994.

CLARITY OF FOCUS:

Clarity of focus, meaning that all activities (teaching, assessment, etc) are geared towards what we want students to demonstrate;

DESIGNING DOWN:

Design down, meaning designing the curriculum from the point at which you want students to end up.

HIGH EXPECTATIONS:

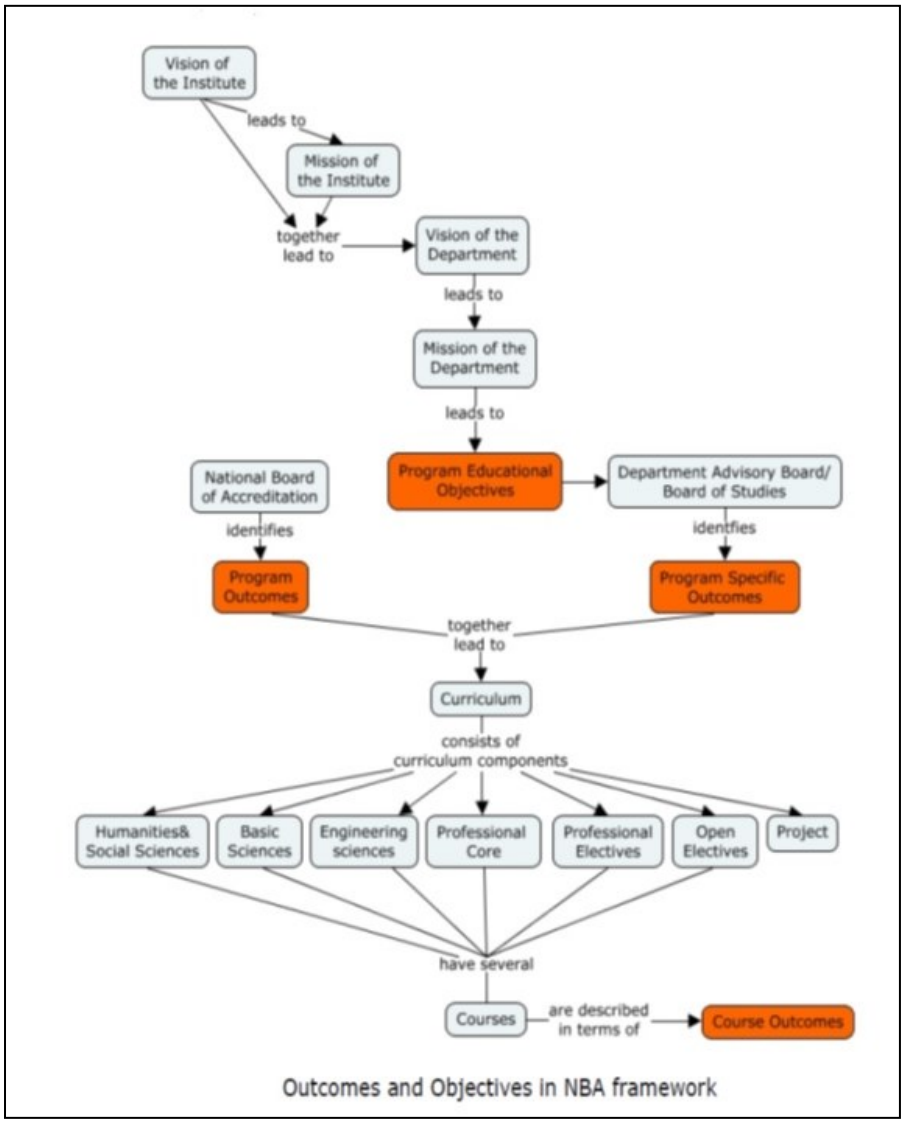
- Establish high, challenging performance standards.
- Engage deeply with issues are learning.

EXPANDED OPPORTUNITES:

- All students can be successful. Its only that they may require different instructional strategies.
- Additional learning opportunities in order to do so.

THE ESSENTIALS OF OBE:

- In OBE, what matters ultimately is not what is taught, but what is learned.
- Teachers must set appropriate course intended learning outcomes, instead of teaching objectives.
- Constructive alignment: What we teach, how we teach and how we assess ought to be aligned with the intended learning outcomes, such that they are fully consistent with each other.
- The quality of teaching is to be judged by the quality of learning that takes place;



Outcomes and Objectives in NBA framework

PROGRAM OUTCOME (PO) are descriptions of the qualities, skills, abilities and understandings, an institutional community agrees that its students should develop as a consequence of the learning they engage with the program of study in that institution. POs indicate what students are expected to know and be able to do by the time they graduate from the institution. POs are not directly connected to any specific academic disciplines.

Students join an institution from different backgrounds, cultures and experiences. While studying at the institution, we want them to broaden their horizon and attitudes, and to develop their current skills and abilities and learn new ones. This is expected not only to help them in their studies and future careers, but also to support their role within society. POs also reflect the Vision, Mission and Core Values of the institution.

POs are not simply taught but developed through meaningful experiences and the processes of learning and reflection. They are unique to every student, yet might be able to identify some common areas that the institution wants their students to develop. Students will have their own starting points, progress and experiences in these areas while at the institution which will shape them as individuals.

1**. Engineering Knowledge**

2. Problem Analysis

3. Design and Development of Solutions

4. Conduct Investigations on Complex Problems

5. Engineering Tool Usage

6. The Engineer and the World

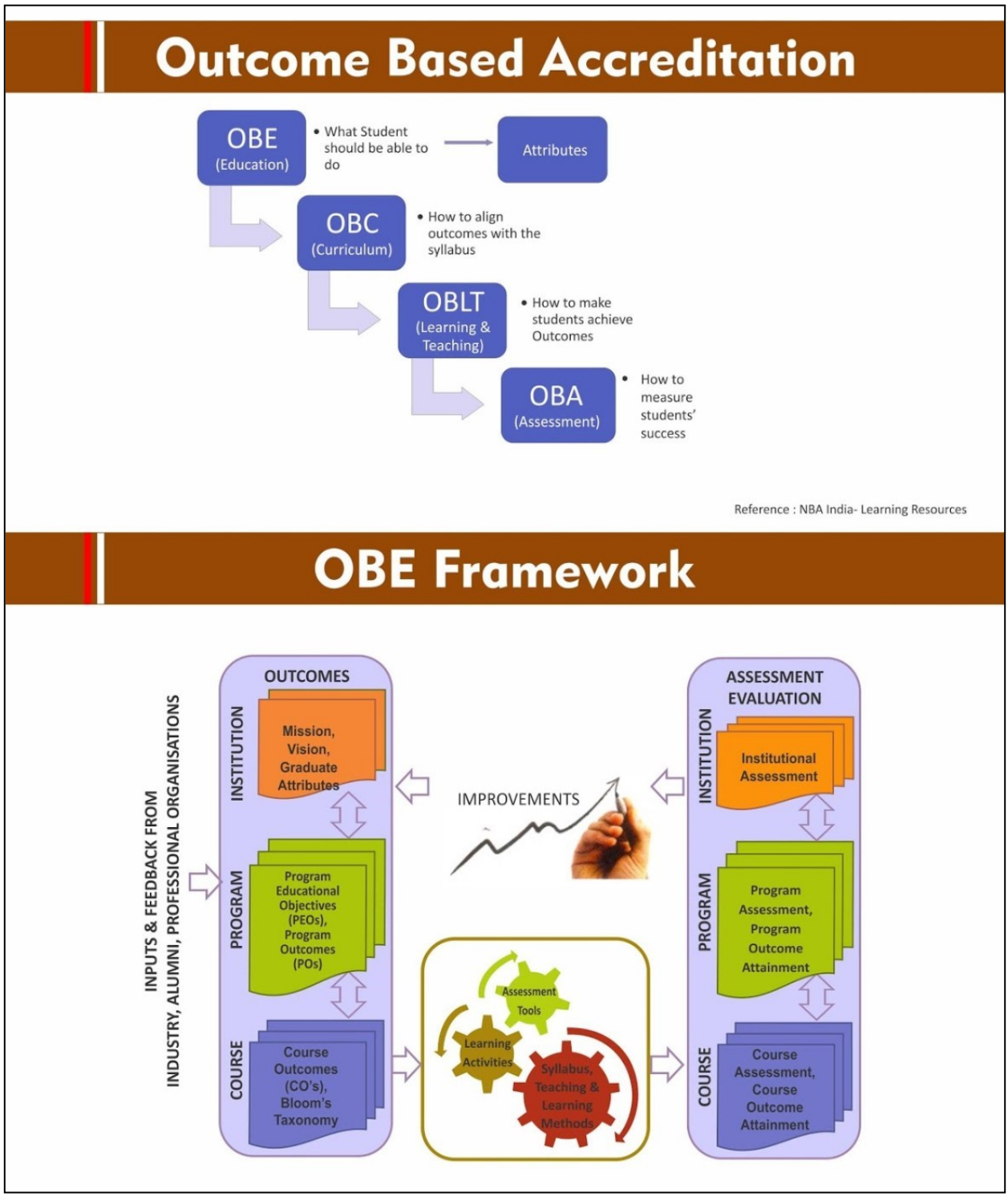
7. Ethics

8. Individual and Collaborative Team Work

9. Communication

10. Project Management and Finance

11. Life-Long Learning



TRADITIONAL VS THE OUTCOME-BASED APPROACH:

The traditional way of teaching was where the teacher instructs the students and the students generally take down the notes without even logical thinking. The important thing regarding teaching in the traditional method is that topic is written on the blackboard and students take down notes from the blackboard as a result at the end of the day the students memorize the same and appear for the examination with the at most intention to pass the

Examination. With the recent advancement, there is no point in adhering to the Traditional method as the competition towards has increased enormously.

Outcome based education is seen a paradigm shift in the higher education that is student focused and outcome orientated. The table below provides a comparison of the traditional teaching approach and the outcome-based approach.

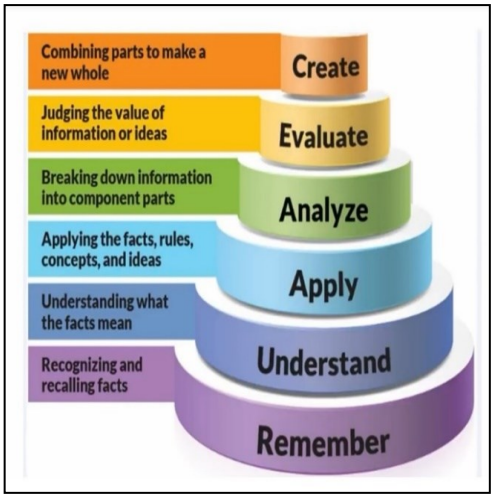
Outcome-Based Approach	Traditional Teaching Approach
Learner/student-centered	Teacher-centered
Teacher's role as partner/facilitator	Teacher's role as instructor
Focus on learner's output	Focus on teacher's input
Flexible and empowering	Rigid and controlling
Emphasis on progress and overall learning	Emphasis on products
Learning outcomes/Learning programmes are seen as guides that allows teachers to be innovation and creative in achieving learning outcomes	Course objectives/Syllabus is seen rigid & non negotiable
Criterion-reference assessment	Norm-referenced assessment
Ability building and skills development	Content-based and content delivery

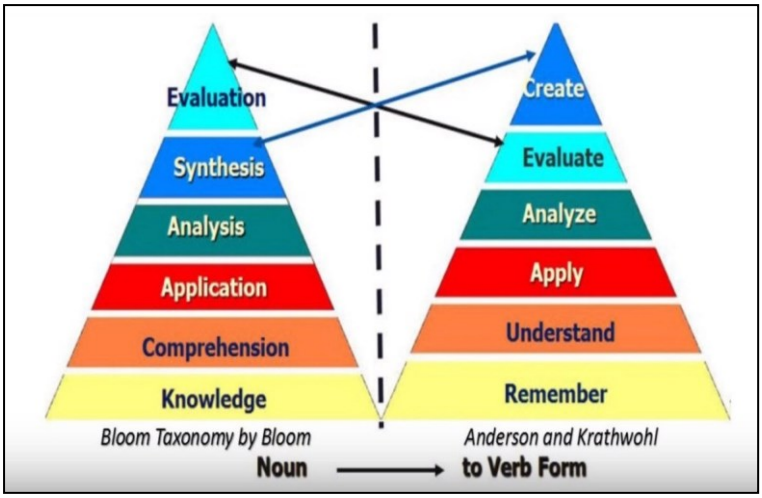


ADMINISTRATIVE SYSTEM FOR OBE:

BLOOM'S TAXANOMY:

Bloom's Taxonomy provides an important framework to not only design curriculum and teaching methodologies but also to design appropriate examination questions belonging to various cognitive levels. Bloom's Taxonomy of Educational Objectives developed in 1956 by Benjamin Bloom was widely accepted by educators for curriculum design and assessment. In 2001, Anderson and Krathwohl modified Bloom's Taxonomy to make it relevant to the present-day requirements. It attempts to divide learning into three types of domains (cognitive, affective, and behavioural) and then defines the level of performance for each domain. Conscious efforts to map the curriculum and assessment to these levels can help the programs to aim for higher-level abilities which go beyond remembering or understanding, and require application, analysis, evaluation or creation. Revised Bloom's taxonomy in the cognitive domain includes thinking, knowledge, and application of knowledge. It is a popular framework in engineering education to structure the assessment as it characterizes complexity and higher-order abilities. It identifies six levels of competencies within the cognitive domain as shown below which are appropriate for the purposes of engineering educators.





The blooms taxonomy is shown in figure where the lower levels become foundation for the higher levels. The Bloom's taxonomy process is ordered in such a way that the lowest level is the simplest form of recognition, while the highest level built on lower levels involves more complex form of cognitive skill. By providing a hierarchy of levels, this taxonomy can assist teachers in designing assessment framework to measure the student's learning ability and making teaching method, innovative and adaptive to student's competencies and enhancing the same.

- Developed to provide a common language for teachers to discuss and exchange learning and assessment methods.
- It is a hierarchical model used to classify educational learning objectives into levels of complexity and specificity

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

ASSESSMENT PROCESS

COURSE OUTCOME ASSESSMENT PROCESS

The Key aspects in Outcome-Based Education (OBE) are the assessment of Course Outcomes. At the initial stage of OBE implementation, the Course Outcomes (COs) for each course are defined based on the Program Outcomes (POs) and other requirements. At the end of each course, the COs need to be assessed and evaluated to check whether they have been attained or not.

The process of attainment of COs, POs and PSOs starts from writing appropriate COs for each course of the program from first year to fourth year in a four-year engineering degree program. The course outcomes are written by the respective faculty member using action verbs of learning levels suggested by Bloom and Anderson. Then, a correlation is established between COs and POs in the scale of 1 to 3, 1 being the slight (low), 2 being moderate (medium) and 3 being substantial (high). A mapping matrix is prepared in this regard for every course in the program including the elective subjects. The course outcomes written and their mapping with POs are reviewed frequently by a committee of senior faculty members before they are finalized.

Assessment is one or more processes carried out by the department, which identify, collect and prepare data to evaluate the achievement of POs and Program Specific Outcomes (PSOs). Attainment is the action or fact of achieving a standard result towards accomplishment of desired goals. Primarily attainment is the standard of academic attainment as observed by examination results.

Course Outcomes (COs): Statements indicating what a student can do after the successful completion of a course. Every Course leads to some Course Outcomes. The CO statements are defined by considering the course content covered in each module of a course. For every course there may be 5 or 6 COs. The keywords used to define COs are based on Bloom's Taxonomy

Attainment of the COs can be measured directly and indirectly. Direct attainment displays the student's knowledge and skills from their performance. It can be determined from the performance of the students in all the relevant assessment instruments like internal assessments, assignments, quiz and final examinations. These methods provide a sampling of what students know and/or can do and provide strong evidence of student learning.

Indirect methods such as Course End Surveys ask the students to reflect on their learning. They access opinions or thoughts about the graduate's knowledge or skills. Indirect measures can provide information about graduate's perception of their learning and how this learning is valued by different stakeholders. The entire assessment process is depicted in the following

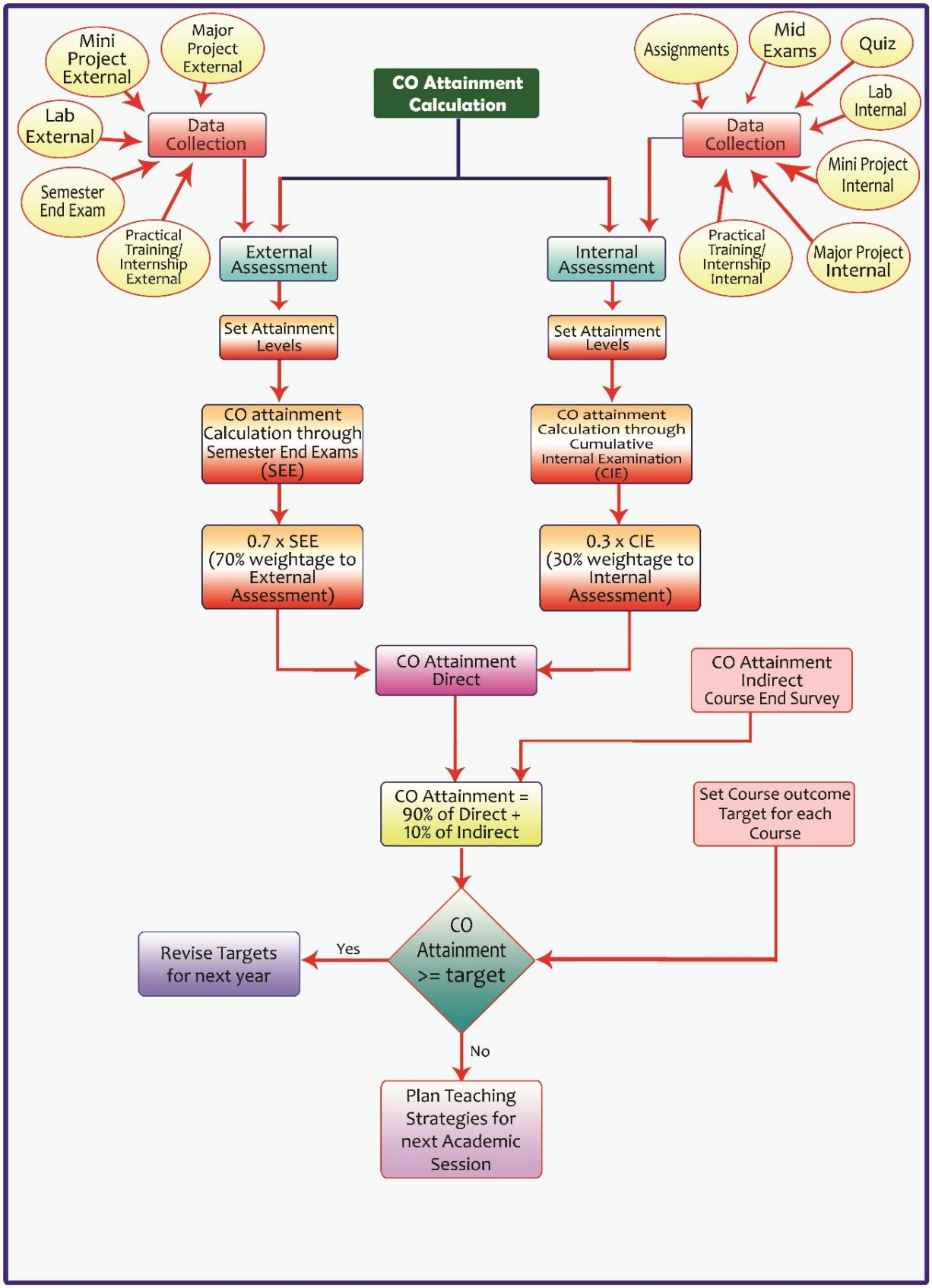


Figure.**CO ATTAINMENT CALCULATION PROCESS**

CO ATTAINMENT CALCULATION PROCESS:

For the evaluation and assessment of CO's and PO's, rubrics are used. Course Outcome is evaluated based on the performance of students in internal assessments and in Sem end examination of a course. Internal assessment contributes 30% and End examinations assessment contributes 70% to the total attainment of a CO. After measuring CO attainment for a course, CO-PO mapping table will give Program Outcome attainment levels. The Program outcomes (PO's) are defined by NBA, New Delhi which are mandatory.

Program Outcomes (POs): Program outcomes describe what students are expected to know and would be able to do by the time of graduation. These relate to the skills, knowledge, and behaviours that students acquire as they progress through the program. Apart from the PO's every department has liberty to define its own Program Specific Outcomes (PSO's).

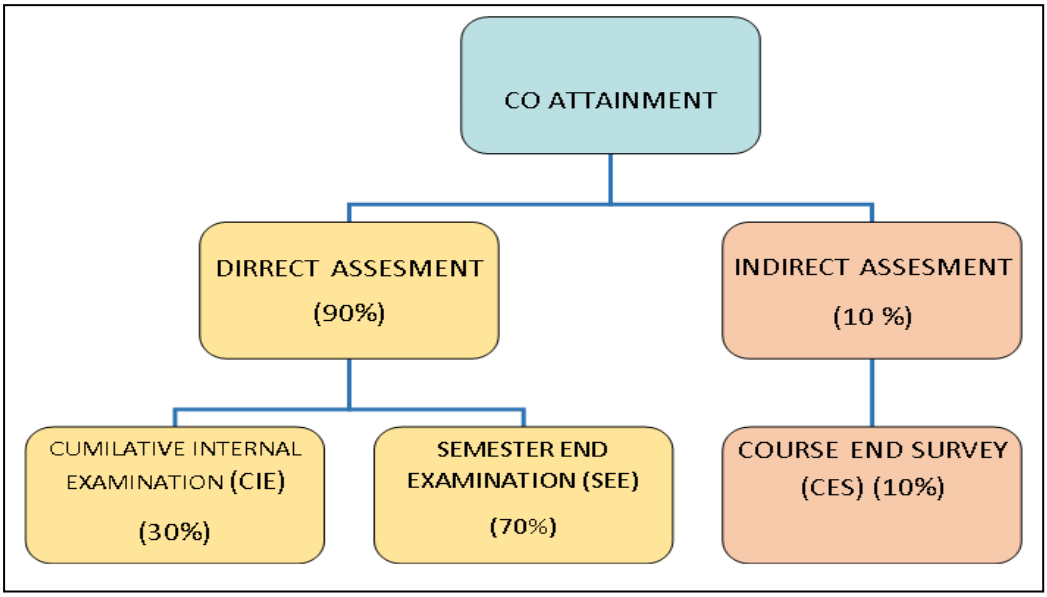
PROCESS INVOLVED IN CO-PO MAPPING:

The role of CO-PO mapping will be assigned to the faculty as per hierarchy. After the course (subject) allotment from the department, the course in-charge of the course has to write appropriate COs for their corresponding course. It should be narrower and measurable statements. By using the action verbs of learning levels, CO's will be designed. CO statements should describe what the students are expected to know and able to do at the end of each course, which are related to the skills, knowledge and behaviour that students will acquire through the course.

After writing the CO statements, CO will be mapped with PO of the department. If the department is having more than one section in a year or the same course is available for more than one program of the same institute in a semester, the subject expert will be nominated as course coordinator of the corresponding course. The role of the course coordinator is to review the CO statements and the CO-PO mapping which has been done by course in-charge. The year wise coordinator has to consolidate the CO's of the respective year and maintain the documentation of the CO attainment level of the respective year courses as well as documentation of the individual student's extra-curricular and co-curricular activities. These details will hand over to the program coordinator in order to evaluate PO attainment of the individual student as well as individual course at the end of the eighth semester. The Program coordinator has to evaluate the PO attainment of individual student through direct and indirect method after the student completing their program. All these works have to be done under the guidance of Department Advisory Committee (DAC).

Following are the different methods for Assessment, Evaluation and Measurement of POs/PSOs:

- **Direct Assessment methods**
- **Indirect Assessment methods**



DIRECT ASSESSMENT METHODS:

Cumulative internal Assessment (30%): COs are assessed through internal Examinations like descriptive, Assignment and Objective type examinations. The COs are mapped against each question and CO analysis is carried out by faculty for each course and documented. The contribution of COs are assessed in high, moderate and low levels, towards the attainment of POs/PSOs.

Semester-end Examinations (70%): The grades in semester-end examinations are tested pertaining to all COs, in varying Blooms Taxonomy Levels.

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INDIRECT ASSESSMENT METHODS:

Course End survey: This is the survey taken from students on each CO of the individual courses at the completion of the course. This survey stands as the comprehensive feedback for the CO assessment.

SEMESTER END EXAMINATION (SEE) ASSESSMENT PROCESS:

External Grades

Marks Range Theory (Max – 100)	Level	Letter Grade
≥ 90	Outstanding	A+
≥80 to <89	Excellent	A
≥70 to <79	Very Good	B
≥60 to <69	Good	C
≥50 to <59	Fair	D
≥40 to <49	Satisfactory	E
≥40	Fail	F

PROCEDURE:

1. Enter the student wise external grades.
2. Calculate no.of students crossed the bench mark grade (E/D Grade).
3. Find percentage of students crossed bench mark grade (E/D Grade).
4. Find the attainment level of each question as per the Rubrics.

External Examination Assessment for Theory courses followed by the Rubrics

BENCH MARK: E– Satisfactory (≥40 to <49 marks)

RUBRICS:

If 50% of the students crossed E Grade: Attainment Level 1

If 60% of the students crossed E Grade : Attainment Level 2

If 70% of the students crossed E Grade: Attainment Level 3

External Examination Assessment for Laboratory courses followed by the Rubrics

BENCH MARK: D grade – Fair Level (≥ 50 to < 59 Marks)

RUBRICS:

If 60% of the students crossed D Grade: Attainment Level 1

If 70% of the students crossed D Grade : Attainment Level 2

If 80% of the students crossed D Grade: Attainment Level 3

Note: Rubrics & bench mark may differ from Course to Course based on the difficulty level of the course.

INTERNAL EXAMINATION ASSESSMENT:

Internal Examination Assessment procedure for Theory Courses followed by the Rubrics

PROCEDURE:

1. Enter the question wise marks for mid examinations, assignments & quiz.
2. Identify the CO of each question.
3. Calculate the maximum marks of each CO based on mid exams, assignments and quiz.
4. Calculate the CO Wise marks obtained by each student.
5. Calculate 50% of maximum marks of each CO.
6. Find number of students crossed 50% of maximum marks for each CO.
7. Find percentage of students crossed 50% of maximum marks for each CO.
8. Find the attainment level of each CO as per the Rubrics

BENCH MARK: 50% of maximum marks

RUBRICS:

If 50% of the students crossed 50% of the maximum marks: Attainment Level 1
If 60% of the students crossed 50% of the maximum marks: Attainment Level 2
If 70% of the students crossed 50% of the maximum marks: Attainment Level 3

Internal examination Assessment for Laboratory Courses followed by the Rubrics

PROCEDURE:

1. Enter the total internal marks for each student
2. Calculate the 75% of maximum marks
3. Find number of students crossed 75 % of maximum marks.
4. Find percentage of students crossed 75 % of maximum marks
5. Find the attainment level as per the Rubrics

BENCH MARK: 75% of maximum marks

RUBRICS:

If 60% of the students crossed 75% of the maximum marks: Attainment Level 1
If 70% of the students crossed 75% of the maximum marks: Attainment Level 2
If 80% of the students crossed 75% of the maximum marks: Attainment Level 3

Note: Rubrics & bench mark may differ from Course to Course based on the difficulty level of the course.

CO ATTAINMENT:

CO Attainment using Direct Assessment:

Direct CO Attainment is calculated based on internal and external examinations.

Direct CO Attainment = 30% of CIE + 70% of SEE.

CO Attainment using Indirect Assessment:

It is based on course end survey. A google form which contains COs of all the courses is created and the link is sent to all the students to take the course end survey at the end of each semester for Indirect aassessment.

Total CO Attainment:

CO Attainment = 90% of Direct CO Attainment + 10% of Indirect CO

CO Attainment using Direct Assessment:

Course assessment based on internal mid examinations:

S.No	Roll. No	STUDENT NAME	Test	Descriptive-1						Descriptive-2						CO I	CO II	CO III	CO IV	CO V	ASSIGNMENT-1	ASSIGNMENT-2	OBJECTIVE-1	OBJECTIVE-2
			Q.No	1		2		3		1		2		3										
				1.a	1.b	2.a	2.b	3.a	3.b	1.a	1.b	2.a	2.b	3.a	3.b	Max. Marks	Max. Marks	Max. Marks	Max. Marks	Max. Marks				
			COs	I	I	II	II	I	II	III	III	IV	IV	V	V						I	III		
			Max. Marks	10	10	10	10	10	10	10	10	10	10	10	10	15	15	10	10	10	5	5	10	10
1	25471A4301	ADDANKI KALYAN RAMU		10	-	-	10	-	10	10	-	-	10	7	-	10	20	10	10	7	5	5	10	10
2	25471A4302	AGNIHOTHRAM SARAYU SRI		10	-	10	10	6	10	10	8	9	10	8	10	16	30	18	19	18	5	5	10	10
3	25471A4303	AMANIGANTI AKASH REDDY		10	-	-	10	-	8	10	-	10	-	-	8	10	18	10	10	8	AB	5	8	10
289	23471A43AA	NAMBULA VENKATA KRISHNA		10	-	-	5	-	-	10	7	10	4	7	5	10	5	17	14	12	AB	5	7	8
																Total Number of Students Answered					275	285	285	285
																50% of maximum marks					2.5	2.5	5	5
																No. of Students crossed 50% of max. marks					248	285	268	250
																% of students crossed 50% of max. marks					90	100	94	88
																Attainment Level					3	3	3	3

FINAL INTERNAL CO ATTAINMENT

S.No	CO	ATTAINMENT LEVEL
1	C111.1	3
2	C111.2	2.4
3	C111.3	3
4	C111.4	3
5	C111.5	1.8

C111.1 = (Descriptive *50%)+(Asignment 1 *17%)+(Objective 1 *33%)
C111.2 = (Descriptive *60%)+(Objective 1 *40%)
C111.3 = (Descriptive *50%)+(Asignment 2 *17%)+(Objective 1 *33%)
C111.4 = (Descriptive*60%)+(Objective 2 *40%)
C111.5 = (Descriptive *60%)+(Objective 2 *40%)

Rubrics:

If 50% of the students crossed 50% of maximum Marks: Attainment Level 1
If 60% of the students crossed 50% of maximum Marks: Attainment Level 2
If 70% of the students crossed 50% of maximum Marks: Attainment Level 3

Course assessment based on external grades:

S.No	Roll. No	NAME OF STUDENT	External Grade
1	25471A4301	ADDANKI KALYAN RAMU	C
2	25471A4302	AGNIHOTHRAM SARAYU SRI	B
3	25471A4303	AMANIGANTI AKASH REDDY	D
288	25471A43FQ	SHAIK MUJEED UR RAHMAN	F
289	25471A43FR	NAMBULA VENKATA KRISHNA	F
		No of Students Answered	**288**
		No. Of Students Crossed "E" Grade	**153**
		Percentage of Students Crossed "E" Grade	**53**
		Attainment Level	**1**

Rubrics:
If 50% of the students crossed E Grade: Attainment Level 1
If 60% of the students crossed E Grade : Attainment Level 2
If 70% of the students crossed E Grade: Attainment Level 3

CO Attainment using Indirect Assessment:

Course end survey:

DEPARTMENT OF INFORMATION TECHNOLOGY

2023-23 I B.TECH I SEM LINEAR ALGEBRA & CALCULUS COURSE END SURVEY

S.NO	Timestamp	SECTION	YEAR	SEMESTER	LineraAlgebra & Caluclus				
					CO 1 : Solve the system of linear equations and transformations.	CO 2: Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.	CO 3: Utilize mean value theorems to real life problems.	CO 4: Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.	CO 5 : Identify the area and volume by interlinking them to appropriate double and triple integrals.
1	2023/12/07 1:23:15 PM GMT+5:30	A	I	I	3	3	3	3	3
2	2023/12/07 1:23:27 PM GMT+5:30	A	I	I	3	3	3	3	3
3	2023/12/07 1:23:50 PM GMT+5:30	A	I	I	2	2	2	2	1
4	2023/12/07 1:23:56 PM GMT+5:30	A	I	I	3	3	3	3	3
5	2023/12/07 1:23:59 PM GMT+5:30	A	I	I	3	3	3	3	3
6	2023/12/07 1:23:59 PM GMT+5:30	A	I	I	3	3	3	3	3
104	2023/12/19 11:51:16 AM GMT+5:30	B	I	I	2	1	2	2	3
105	2023/12/19 6:28:26 PM GMT+5:30	B	I	I	3	3	3	3	3
106	2023/12/19 10:18:40 PM GMT+5:30	B	I	I	3	3	3	1	1
107	2023/12/20 8:36:28 AM GMT+5:30	B	I	I	2	2	2	2	2
CO ATTIANMENT					2.57	2.64	2.58	2.37	2.40

Total CO Attainment:

CO Attainment % = 90% of Direct CO Attainment + 10% of Indirect CO Attainment.

CO Target Value:

CO Direct Attainment

CO's	COURSE OUTCOME	CO Attainment Level (Mid)	CO Attainment Level (External)	Direct CO Attainment Level
C1207.1	CO 1 : Solve the system of linear equations and transformations.	3	1	1.6
C1207.2	CO 2: Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.	2.4	1	1.42
C1207.3	CO 3: Utilize mean value theorems to real life problems.	3	1	1.6
C1207.4	CO 4: Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.	3	1	1.6
C1207.5	CO 5 :Identify the area and volume by interlinking them to appropriate double and triple integrals.	1.8	1	1.24

Direct CO Attinment level = (Internal*0.3) + (External *0.7)

CO Overall Attainment

CO'S	Direct CO Attainment Level	Indirect CO attainment level (Course Exit Survey)	TOTAL ATTAINMENT LEVEL
C111.1	1.6	2.89	1.73
C111.2	1.42	2.84	1.56
C111.3	1.6	2.85	1.73
C111.4	1.6	2.77	1.72
C111.5	1.24	2.72	1.39
OVERALL COURSE ATTAINMENT			1.63

Total Attinment level = (Direct Attinment *0.9) + (Indirect Attainmentl *0.1)

FORMULATION OF COURSE ARTICULATION MATRIX:

Course Articulation Matrix correlates the individual COs of a course with POs and PSOs. The Course Outcomes are mapped with POs and PSOs in the scale of 1 to 3.

The strength of correlation is indicated as 3 for **substantial (high)** 2 for correlation, **moderate (medium)** correlation, and 1 for **slight (low)** correlation.

A typical CO-PO mapping and CO-PSO mapping table is shown below.

CO-PO MAPPING

CO'S	PO'S											PSO'S		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C111.1	3	3	2	2	1									
C111.2	3	3	3	2	1									
C111.3	3	3	2	2	1									
C111.4	3	2	2	1	1									
C111.5	3	3	2	1	1									

PO ATTAINMENT:

Based on CO-PO/PSO mapping, and total CO attainment of individual COs, PO attainment will be calculated.

Attainment of Program Outcomes from first year courses

Programme outcome (PO) attainment process and Programme specific outcome (PSO) Attainment Process

The procedure used for evaluation of PO attainment from course attainment and mapping strength is as below.

1. The PO/PSO attainment is based on over all CO attainment and Mapping of COs with POs/PSOs.
2. The attainment level for each of the courses will be tabulated
3. CO-PO/PSO mapping should be taken for each CO on the scale of 1,2,3
4. PO/PSO attainment level is calculated based on **Total Co attainment** and **Mapping Level of that particular CO** and **Average Mapping level of that particular PO/PSO**
5. Final attainment of a PO/PSO is the average of attainment of particular PO/PSO for all COs

PO attainment is calculated using the following formula:

$$\text{PSO Attainment} = \frac{[(\text{CO Attainment}) \times (\text{Level of Mapping of CO with PO})]}{\text{Average Level of Mapping of CO with PO}}$$

PSO attainment is calculated with the following formula:

$$\text{PSO Attainment} = \frac{[(\text{CO Attainment}) \times (\text{Level of Mapping of CO with PSO})]}{\text{Average Level of Mapping of CO with PO}}$$

The attainment process of PO and PSO is as shown in the following figures

Sample PO Attainment & PSO Attainment

NARASARAOPETA ENGINEERING COLLEGE: NARASARAOPET

DEPARTMENT OF CSE(AI)

Program Outcome Assessment

OVERALL CO ATTAINMENT

CO'S	Direct CO Attainment Level	Indirect CO attainment level (Course Exit Survey)	Total CO Attainment level
C111.1	2.3	2.89	2.36
C111.2	2.12	2.84	2.19
C111.3	2.3	2.85	2.36
C111.4	2.3	2.77	2.35
C111.5	2.12	2.72	2.18
OVERALL COURSE ATTAINMENT			2.29

CO-PO MAPPING

CO'S	PO'S											PSO'S		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C111.1	3	3	2	2	1									
C111.2	3	3	3	2	1									
C111.3	3	3	2	2	1									
C111.4	3	2	2	1	1									
C111.5	3	3	2	1	1									
Average	3	2.8	2.2	1.6	1									

PO ATTAINMENT

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C111.1	2.4	2.5	2.1	3.0	2.4									
C111.2	2.2	2.3	3.0	2.7	2.2									
C111.3	2.4	2.5	2.1	3.0	2.4									
C111.4	2.4	1.7	2.1	1.5	2.4									
C111.5	2.2	2.3	2.0	1.4	2.2									
Attainment C125	2.29	2.28	2.28	2.29	2.29									

C111.1 - PO1 = [(MAPPING VALUE OF C111.1 - PO1) * (TOTAL CO ATTAINMENT OF C111.1)] / Average

C111.1 - PO2 = [(MAPPING VALUE OF C111.1 - PO2) * (TOTAL CO ATTAINMENT OF C111.1)] / Average

C111.4 - PO3 = [(MAPPING VALUE OF C111.4 - PO3) * (TOTAL CO ATTAINMENT OF C111.4)] / Average

C111.5 - PO5 = [(MAPPING VALUE OF C111.5 - PO5) * (TOTAL CO ATTAINMENT OF C111.5)] / Average