NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE)

OUTCOME BASED EDUCATION

(OBE)



B.TECH CSE(AI) – R20 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.

DEPARTMENT VISION AND MISSION

VISION:

To be a centre of excellence in Artificial Intelligence education, research and innovation by nurturing competent professionals capable of developing intelligent and ethical solutions for the advancement of society and industry.

MISSION:

M1: Promote innovation, interdisciplinary research and industry collaboration through advanced infrastructure and a culture of continuous learning.

M2: Provide a strong foundation in Artificial Intelligence, computing, mathematics and data sciences through student-centric and experiential learning.

M3: Develop socially responsible professionals with ethical values, leadership qualities and entrepreneurial mindset to address real-world challenges using Artificial Intelligence.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

The graduates of the programme are able to

PEO 1: Be engaged as an engineer with a strong foundation in modern computing and Engineering fields such as research, design and development.

PEO 2: Apply AI concepts and multidisciplinary knowledge to design effective Engineering solutions while demonstrating technical skills and teamwork.

PEO 3 : Develop professional competence, ethical values, communication skills, and a Commitment to lifelong learning to contribute to society and adapt to emerging Technologies.

PROGRAM OUTCOMES (POs):

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

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

PO4: Conduct Investigations of Complex Problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5: Model 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 Society: 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: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

PO8: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO10: 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.

PO11: 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.

PO12: 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.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Apply knowledge of human cognition, AI, ML, and Data Engineering to analyze and solve complex real-world problems.

PSO2: Design solutions using computational skills and innovative tools in AI, ML and DL to meet specific needs for societal needs.

PSO3: Demonstrate acquired knowledge to lead teams or projects and involve in research and development problems.

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF CSE(Artificial Intelligence)

This Manual is a reference to help faculty, staff and stakeholders to understand the Outcome Based Education (OBE) system implemented at Narasaraopeta Engineering College. The manual serves as valuable guidelines for the faculty to develop an assessment plan in the process to measure the outcome of the students during their course of study and also after their graduation. The manual outlines the process involved in developing a constructive curriculum development and content delivery or teaching plan.

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-centred 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 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.

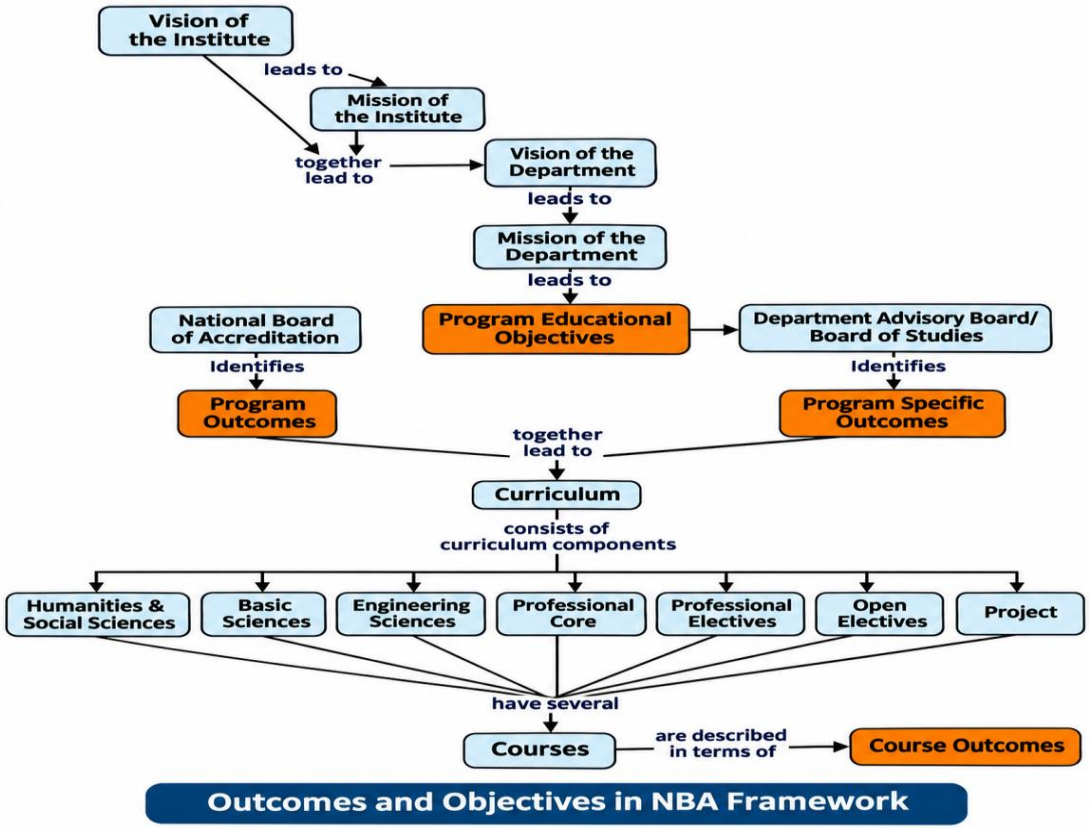
EXPANDED OPPORTUNITES:

- 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;



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.

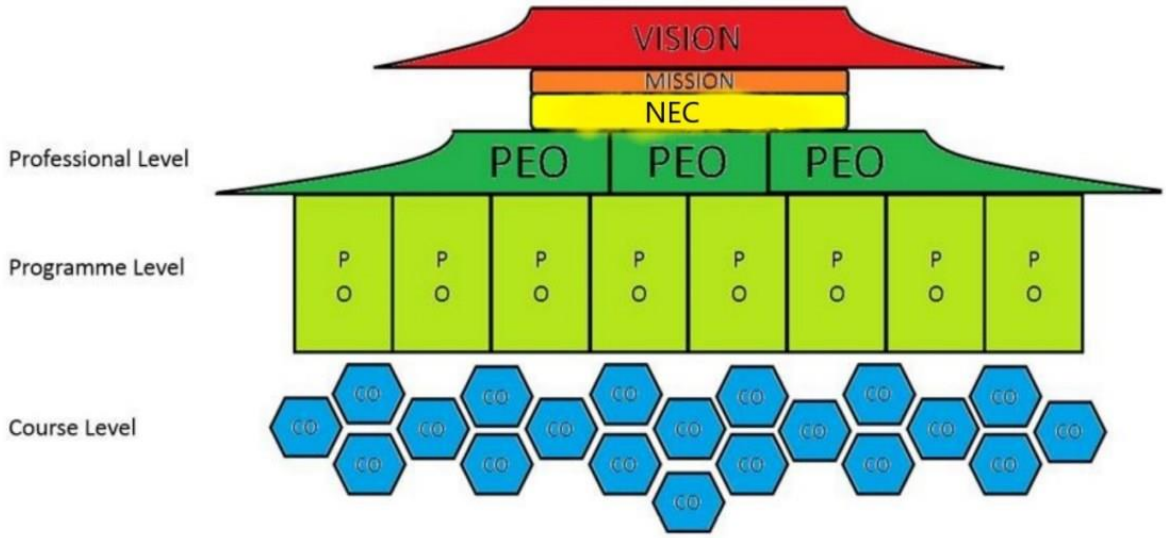
Students join an institution from different backgrounds, cultures and experiences. While studying at the institution, we want them to broaden their horizon and attitudes, and to develop their current skills and abilities and learn new ones. This is expected not only to help them in their studies and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

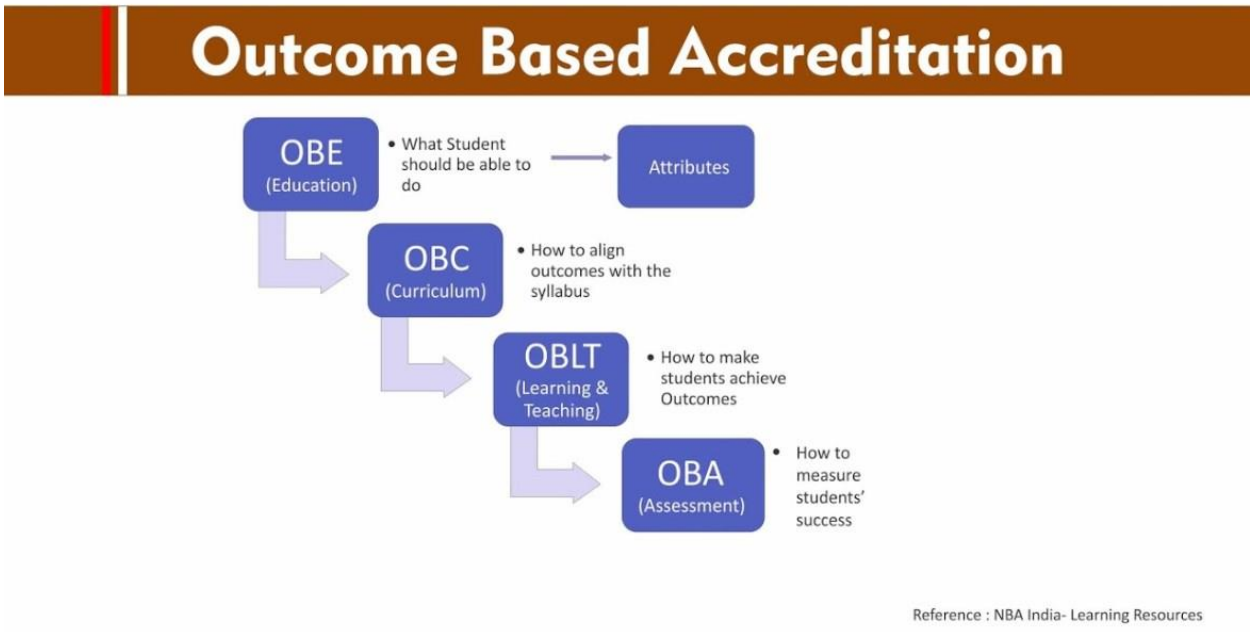
POs are not simply taught but developed through meaningful experiences and the processes of learning and reflection. They are unique to every student, yet might be able to identify some common areas that the institution wants their students to develop. Students will have their own starting points, progress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

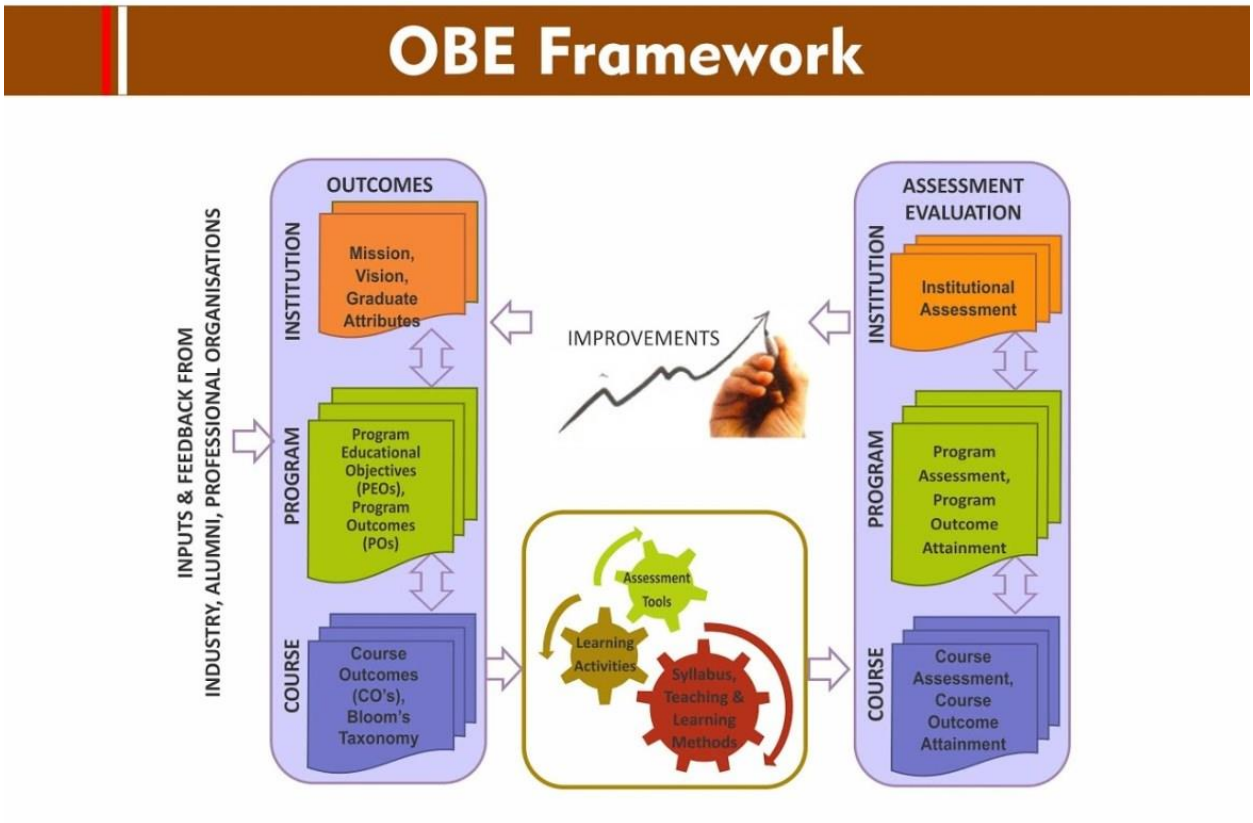
1. Engineering Knowledge
2. Problem Analysis
3. Design and Development of Solutions

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

PROGRAM SPECIFIC OUTCOME: PSOs are statements that describe what the graduates of a specific engineering program should be able to do







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:



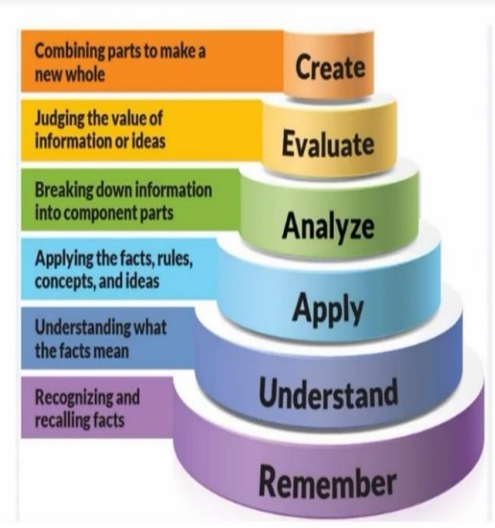
BLOOM'S TAXANOMY:

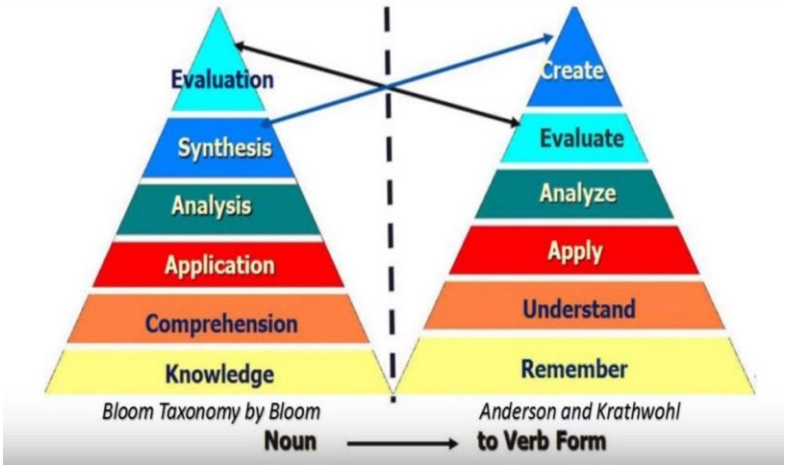
Bloom's Taxonomy provides an important framework to not only design curriculum and teaching methodologies but also to design appropriate examination questions belonging to various cognitive levels. Bloom's Taxonomy of Educational Objectives developed in 1956 by Benjamin Bloom was widely accepted by educators 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)

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

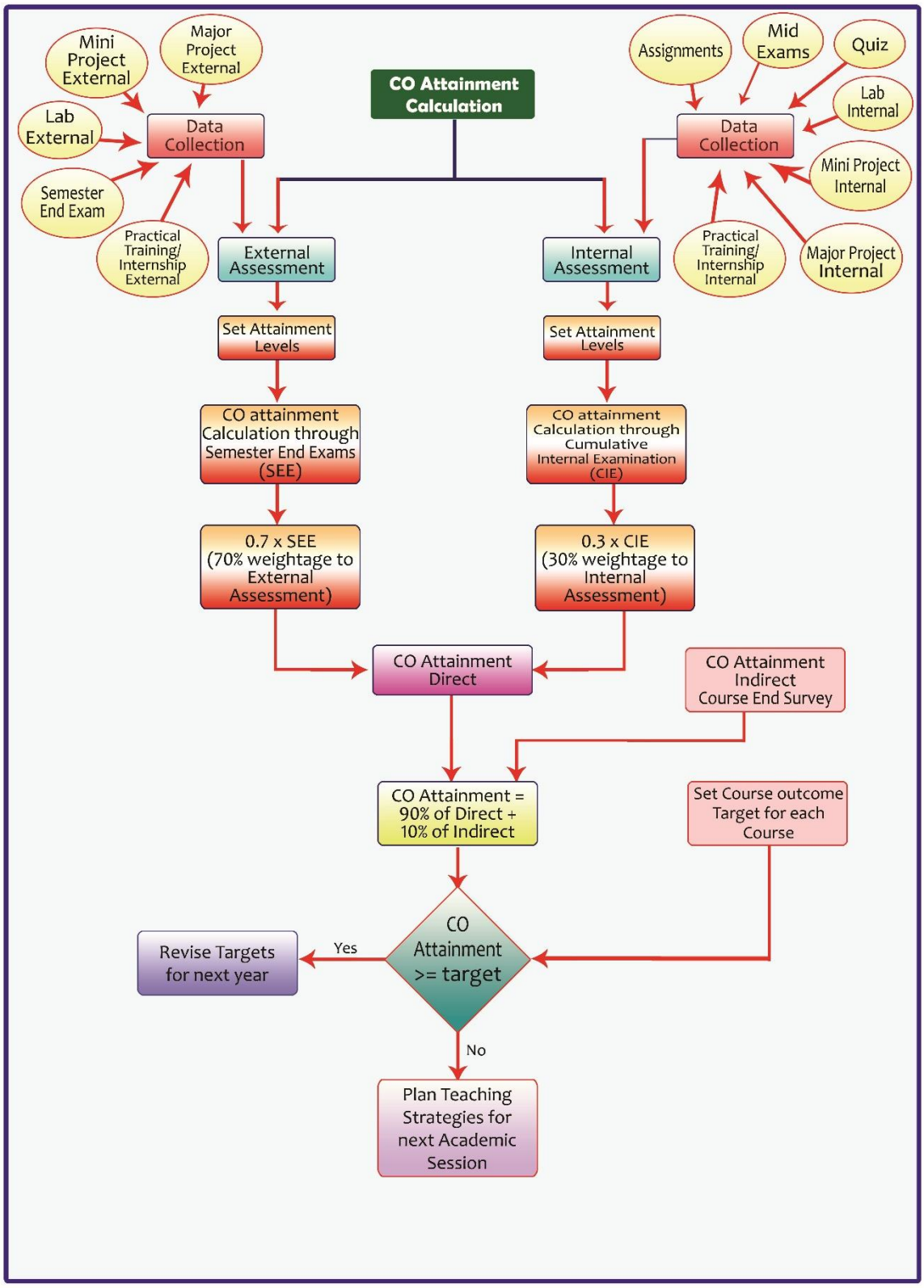
elective subjects. The course outcomes written and their mapping with POs are reviewed frequently by a committee of senior faculty members before they are finalized.

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 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).

Program Specific Outcomes (Program has to specify 2 – 4 PSOs): Program Specific Outcomes are statements that describe what the graduates of a specific engineering program should be able to do.

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 students 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:

Continuous Assessment: COs are assessed through Sessional & Assignment Examinations and Lab records. 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 Theory Examinations: The questions in semester-end examinations are tested pertaining to all COs, in varying Blooms Taxonomy Levels.

Laboratory Records: Both continuous and semester-end examinations are conducted to test the COs attainment.

INDIRECT ASSESSMENT METHODS:

Programme Exit survey: This survey taken from the final year students at the completion of their B.Tech programme, stands as the comprehensive feedback for the PO/PSO assessment

Alumni Survey: This survey is conducted annually through Google link or mail with the Alumni to obtain the inputs and suggestions on PO attainment in the real time societal environment

Employer Survey: This survey is taken from the employer to measure the PO attainments.

EXTERNAL EXAMINATION ASSESSMENT PROCESS:

NOTE:

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

RUBRICS:

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

External Examination Assessment for Laboratory subjects followed by the Rubrics

RUBRICS:

If 60% of the students crossed C Grade: Attainment Level 1
If 70% of the students crossed C Grade : Attainment Level 2
If 80% of the students crossed C Grade: Attainment Level 3

PROCEDURE:

1. Enter the question wise external marks.
2. Identify the CO of each question.
3. Calculate 50% of maximum marks of each question.
4. Find number of students crossed 50% of maximum marks for each question.
5. Find percentage of students crossed 50% of maximum marks for each question.
6. Find the attainment level of each question as per the above Rubrics.
7. Finally calculate CO attainment level by consolidating the question wise attainment levels.

INTERNAL EXAMINATION ASSESSMENT:

Internal Examination Assessment for Theory subjects followed by the Rubrics

RUBRICS:

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

Internal Examination Assessment for Laboratory subjects followed by the Rubrics

RUBRICS:

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

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 above Rubrics

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 is created to take the course end survey at the end of each semester for Indirect Assessment.

Total CO Attainment:

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

EXAMPLE:

COURSE NAME: INTRODUCION TO ARTIFICIAL INTELLIGENCE

TARGET VALUE: 2

CO Attainment					
	CO Attainment Level (Internal)	CO Attainment Level (External)	Direct CO Attainment Level (Internal * 30%) + (External * 70%)	Indirect CO Attainment Level	Total CO Attainment Level (Direct CO Attainment * 90% + Indirect CO Attainment * 10%)
C225.1	3	2	2.3	2.6	2.33
C225.2	3	2	2.3	2.62	2.33
C225.3	2.51	2	2.15	2.63	2.20
C225.4	1.51	2	1.85	2.6	1.93
C225.5	1.51	2	1.85	2.62	1.93
C225					2.14

COURSE ASSESSMENT BASED ON INTERNAL MID EXAMINATIONS

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	CO I	CO II	CO III	CO III	CO IV	CO V	ASSIGNMENT-1	ASSIGNMENT-2	OBJECTIVE-1	OBJECTIVE-2
			Q.No	1		2		3	1	2			3						1	2	3	1	2	3				
				1.a	1.b	2.a	2.b	3.a	1.a	2.a	2.b	3.a	3.b	Max. Marks	Max. Marks	Max. Marks	Max. Marks	Max. Marks	1.a	2.a	3.a	1.a	2.a	3.a				
			COs	I	I	II	II	III	III	IV	IV	V	V						I	II	III	III	IV	V				
			Max. Marks	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10	10	10	10	10	2	2	1	1	2	2	5	5	10	10
1	21471A4301	ADDAGADA VENU GOPAL	25	4	4	5	4	5	3	3	3	3	3	8	9	8	6	6	1.6	1.6	0.8	1	2	2	4	5	9	4
2	21471A4302	AMUDALA BHARGAV RAGHURAM	25	5	5	5	5	5	5	4	5	5	4	10	10	10	9	9	2	2	1	1	2	2	5	5	9	6
70	22475A4304	AVULA SRIKANTH	25	5	4	5	4	4						9	9	4	0	0	1.2	1.2	0.6	0	0	0	3		7	
71	22475A4305	MARRI GOPI	25	4	4	3	3	4	2	3	2	2	3	8	6	6	5	5	1.6	1.6	0.8	1	2	2	4	5	8	
72	22475A4306	KURAPATI DINESH GUPTA	25	4	4	3	3	3	3	3	2	2	2	8	6	6	5	4	1.6	1.6	0.8	0.8	1.6	1.6	4	4	10	5
Total Number of Students Answered														72	72	72	72	72	72	72	72	72	72	72	71	70	71	65
50% of maximum marks														5	5	5	5	5	1	1	0.5	0.5	1	1	2.5	2.5	5	5
No. of Students crossed 50% of max. marks														59	60	57	48	45	71	71	71	67	67	67	71	67	69	26
% of students crossed 50% of max. marks														82	83	79	67	63	99	99	99	93	93	93	100	96	97	40
Attainment Level														3	3	3	2	2	3	3	3	3	3	3	3	3	3	0

The Attainment Levels as per the Bench Mark set for Cos of all courses is 50% maximum marks for each CO

Total internal Marks:Descriptive(15M)+Assignment(5M)+Objective (10M)=30M

FINAL INTERNAL CO ATTAINMENT

S.No	CO	ATTAINMENT LEVEL
1	C225.1	3
2	C225.2	3
3	C225.3	2.51
4	C225.4	1.51
5	C225.5	1.51

C225.1=3*50% of (15/30) (mid)+3*17%of (5/30)(ass)+3*33% of (10//30)(quiz)= 1.5+0.51+0.99=3

C222.4=2*50% of (15/30) (mid)+3*17%of (5/30)(ass)+0*33% of (10//30)(quiz)= 1+0.51+0=1.51

C225.4=Descriptive (CO1 attaintment Level)*0.5+Assignment(CO1 Attainment Level)*0.17 +Objective(CO1 Attainment Level)*0.33

Rubrics:

If 40% of the students crossed 50% of maximum Marks: Attainment Level 0

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	21471A4301	ADDAGADA VENU GOPAL	C
2	21471A4302	AMUDALA BHARGAV RAGHURAM	B
3	21471A4303	AREPALLI AMARAJYOTHI	B
70	22475A4304	AVULA SRIKANTH	D
71	22475A4305	MARRI GOPI	E
72	22475A4306	KURAPATI DINESH GUPTA	D
No of Students Answered:			72
No. Of Students Crossed "C" Grade			44
Percentage of Students Crossed "C" Grade			61
Attainment Level			2

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

Rubrics:

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

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

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

CO Attainment using Indirect Assessment:

It is based on course end survey. A google form is created to take the course end survey at the end of each semester for Indirect Assessment.

COURSE END SURVEY:

NARASARAOPETA ENGINEERING COLLEGE: NARASARAOPET

DEPARTMENT OF CSE(ARTIFICIAL INTELLIGENCE)

COURSE END SURVEY

Faculty Name:G. MAHESH BABU **Academic Year: 2022-2023**

Course: AI **Regulation:R20**

Year: II **Sem-II**

S.NO	Roll_No	Student Name	CO1:Summarize the characteristics of AI that make it useful to real-world problems. [K2]	CO2:Analyse different search techniques and predicate logic in artificial Intelligence. [K4]	CO3:Interpret knowledge representation and symbolic reasoning using different rules. [K2]	CO4:Apply the basic knowledge on learning and reinforcement learning. [K3]	CO5:Make use of the power of AI in Natural language processing as an advanced Application of AI. [K3]
1	21471A4301	VENU GOPAL	Very Good	Very Good	Very Good	Very Good	Very Good
2	21471A4302	BHARGAV RAGHURAM	Good	Good	Good	Good	Good
69	22475A4304	SRIKANTH	Good	Good	Good	Good	Good
70	22475A4305	GOPI	Very Good	Very Good	Very Good	Very Good	Very Good
71	22475A4306	DINESH GUPTA	Good	Good	Good	Good	Good
		Average Value	2.6	2.62	2.63	2.6	2.62

The following rating scale is used:

- **Very Good – 3**
- **Good – 2S**
- **Satisfactory – 1**

Total CO Attainment:

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

CO Overall Attainment			
CO'S	**Direct CO Attainment Level -90%**	**Course Exit Survey (Indirect CO attainment level)-10%**	**TOTAL ATTAINMENT LEVEL(90%+10%)**
C225.1	**2.3**	**2.6**	**2.33**
C225.2	**2.3**	**2.62**	**2.33**
C225.3	**2.15**	**2.63**	**2.20**
C225.4	**1.85**	**2.6**	**1.93**
C225.5	**1.85**	**2.62**	**1.93**
OVERALL COURSE ATTAINMENT			**2.14**

Model Calculation: C225.2=2.3*90%+2.62*10%=2.07+0.26=2.33

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.

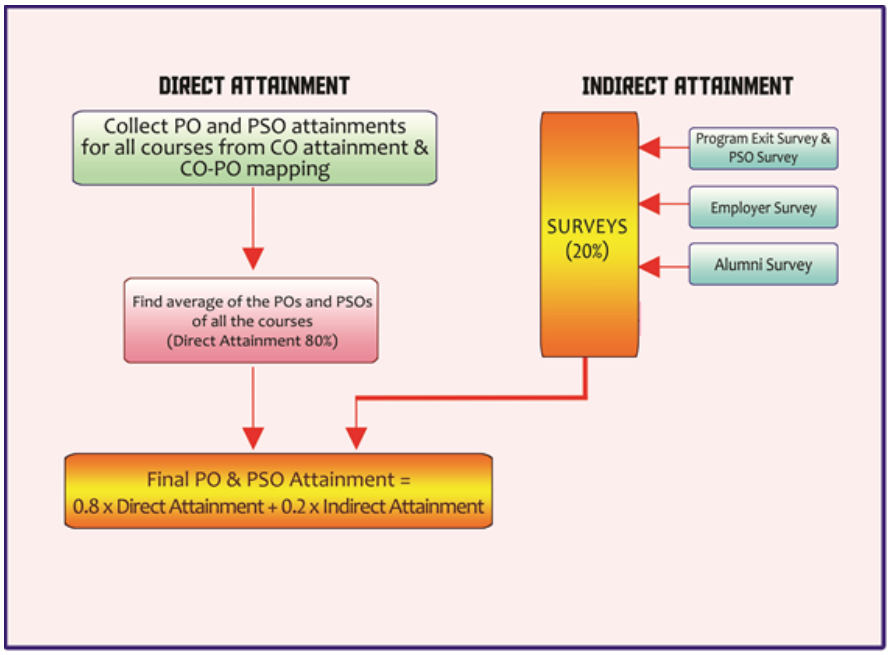
A typical CO-PO mapping and CO-PSO mapping table is shown below.

CO	COURSE OUTCOME	PO'S												PSO'S		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C225.1	Analyse different search techniques and predicate logic in artificial Intelligence.	3	2	-	-	2	-	-	-	-	-	-	1	3	2	-
C225.2	Summarize the characteristics of AI that make it useful to real-world problems.	2	3	2	2	3	-	-	-	-	-	-	1	3	3	1
C225.3	Interpret knowledge representation and symbolic reasoning using different rules.	2	3	2	2	2	-	-	-	-	-	-	1	3	3	-
C225.4	Make use of the power of AI in Natural language processing as an advanced Application of AI.	2	2	3	2	3	-	-	-	-	-	-	2	3	3	2
C225.5	Analyze the program and minimize the code by using optimizing techniques which helps in reducing the no. of instructions in a program	2	2	3	2	3	1	-	1	1	2	-	2	3	3	2
	AVERAGE C225	2.2	2.4	2.5	2	2.6	1	-	1	1	2	-	1.4	3	2.8	1.67

ATTAINMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

ASSESSMENT TOOLS & PROCESSES:

Programme outcome (PO) attainment process and Programme specific outcome (PSO) attainment process is done through direct and indirect assessment tools. 80% of direct attainment and 20% of indirect attainment is considered for calculation of PO attainment and PSO attainment. The PO and PSO Attainment process is diagrammatically shown in the below figure

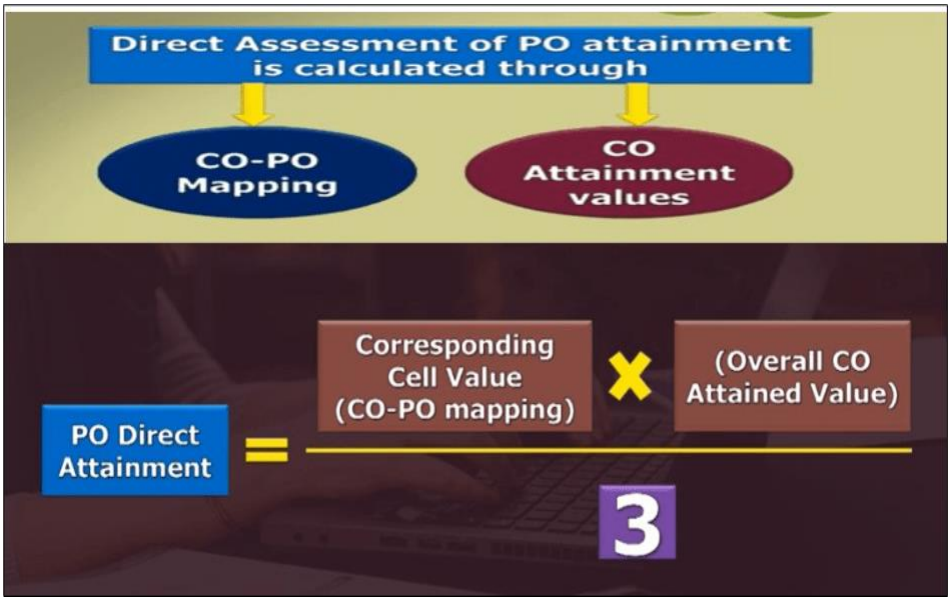


PO AND PSO ATTAINMENT PROCESS

Assessment tools and process used for evaluation of Program Outcomes and Program Specific Outcomes are presented below. Two different tools namely direct and indirect assessment tools are used.

DIRECT ASSESSMENT:

Direct assessment of programme outcomes and programme specific outcomes are based on the logical mapping of cognitive levels of course outcomes with programme outcomes and programme specific outcomes and the following formula are used to calculate programme outcomes and program specific outcomes of the respective courses.



PO attainment is calculated with the following formula:

PO Attainment = POi * Total CO attainment Level / 3 where 'i' ranges from 1 to 12

Where POi is average of all COs correlated with the i^{th} PO.

Ex: **PO1 * Total CO attainment Level / 3**

PSO attainment is calculated with the following formula:

PSO Attainment = PSOi * Total CO attainment Level / 3 where 'i' ranges from 1 to 3

Where PSOi is average of all COs correlated with the i^{th} PSO.

Ex: **PSO2 * Total CO attainment Level / 3**

Program Outcome(PO) Assessment

CO'S	CO Attainment Level (Mid)	CO Attainment Level (External)	Course Exit Survey (Indirect CO attainment level)	TOTAL ATTAINMENT LEVEL
C225.1	**3**	**2**	**2.6**	**2.33**
C225.2	**3**	**2**	**2.62**	**2.33**
C225.3	**3**	**2**	**2.63**	**2.20**
C225.4	**1.51**	**2**	**2.6**	**1.93**
C225.5	**1.51**	**2**	**2.62**	**1.93**
OVERALL COURSE ATTAINMENT				**2.14**

CO-PO MAPPING

	CO'S	PO'S											PSO'S		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	C225.1	3	2			2							1	3	2	
	C225.2	2	3	2	2	3							1	3	3	1
	C225.3	2	3	2	2	2							1	3	3	
	C225.4	2	2	3	2	3							2	3	3	2
	C225.5	2	2	3	2	3	1		1	1	2		2	3	3	2
	C225	2.2	2.4	2.5	2	2.6	1		1	1	2		1.4	3	2.8	1.67

PO ATTAINMENT

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
OVERALL	C225.1	2.33	1.55			1.55							0.78	2.33	1.55	
	C225.2	1.55	2.33	1.55	1.55	2.33							0.78	2.33	2.33	0.78
	C225.3	1.47	2.20	1.47	1.47	1.47							0.73	2.20	2.20	
	C225.4	1.28	1.28	1.93	1.28	1.93							1.29	1.93	1.93	1.28
	C225.5	1.28	1.28	1.93	1.28	1.93	0.64		0.64	0.64	1.29		1.29	1.93	1.93	1.28
	Attainment	1.58	1.73	1.72	1.4	1.84	0.64		0.64	0.64	1.29		0.97	2.14	1.99	1.12

Model Calculation:C225.1=C20*F10/3=3*2.33/3=2.33

PO & PSO ATTAINMENT OF COURSE															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Attainment	1.58	1.7	1.72	1.4	1.8	0.64	-	0.64	0.64	1.29	-	0.97	2.14	1.99	1.12

INDIRECT ASSESSMENT:

Indirect assessment is performed through the following surveys.

1. **Program Exit Survey.**
2. **Employer Survey.**
3. **Alumni Survey.**

Program Exit Survey.

It is based on Program exit survey A google form is created to take the end of the program and Assessment.

NARASARAOPETA ENGINEERING COLLEGE
DEPARTMENT OF CSE(ARTIFICIAL INTELLIGENCE)
R20 2021 BATCH CSE(AI) PROGRAM EXIT SUREVY 2024-2025

Roll Number	Name Of The Student	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2.	PSO3
21471A4301	VENU GOPAL	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree
21471A4302	BHARGAV RAGHURAM	Strongly Agree	Agree	Strongly Agree	Agree	Strongly Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Strongly Agree	Agree	Agree
22475A4304	SRIKANTH	Agree	Satisfactory	Agree	Strongly Agree	Agree	Strongly Agree	Strongly Agree	Satisfactory	Agree	Satisfactory	Agree	Strongly Agree	Agree	Satisfactory	Agree
22475A4305	GOPI	Strongly Agree	Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Agree	Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree
22475A4306	DINESH GUPTA	Strongly Agree	Strongly Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Strongly Agree	Agree	Agree
	AVERAGE	2.46	2.35	2.39	2.39	2.41	2.46	2.38	2.38	2.33	2.28	2.42	2.38	2.45	2.33	2.39

Employer Survey:

PDF
EMPLOYER SURVEY
[20-BATCH] - Google

Alumni Survey:

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)
Department of CSE (Artificial Intelligence)
ALUMNI SURVEY

Student Name: Syed Asadulla h
Year of Passing: 2025-26
Branch: CSE (AI)
Company Name/Higher Studies: M-Tech

Roll Number: 22471A4305
Contact Number: 9059975498
Email ID: syedasadh401@gmail.com
Designation/University: JNTUK

1. Extent of curriculum meeting the industry needs.
1. POOR [ ] 2. AVERAGE [ ] 3. GOOD [ ] 4. VERY GOOD [ ] 5. EXCELLENT [ ]

2. Your ability to apply knowledge and design computer system or process to meet desired Specifications and needs.
1. POOR [ ] 2. AVERAGE [ ] 3. GOOD [ ] 4. VERY GOOD [ ] 5. EXCELLENT [ ]

3. Benefit from value added certifications, workshops and training programmers conducted During your course.
1. POOR [ ] 2. AVERAGE [ ] 3. GOOD [ ] 4. VERY GOOD [ ] 5. EXCELLENT [ ]

4. Your ability to use techniques, skills and modern engineering tools necessary for Engineering practice.
1. POOR [ ] 2. AVERAGE [ ] 3. GOOD [ ] 4. VERY GOOD [ ] 5. EXCELLENT [ ]

5. Benefit from communication skills, presentation skills and leadership qualities gained From the co-curricular and extracurricular activities.
1. POOR [ ] 2. AVERAGE [ ] 3. GOOD [ ] 4. VERY GOOD [ ] 5. EXCELLENT [ ]

6. Your ability to engage in, to resolve contemporary issues and acquire lifelong learning.
1. POOR [ ] 2. AVERAGE [ ] 3. GOOD [ ] 4. VERY GOOD [ ] 5. EXCELLENT [ ]

7. Competence to function on multidisciplinary teams.
1. POOR [ ] 2. AVERAGE [ ] 3. GOOD [ ] 4. VERY GOOD [ ] 5. EXCELLENT [ ]

8. Skills attained to create, select and apply appropriate techniques, resources and modern Engineering and IT tools.
1. POOR [ ] 2. AVERAGE [ ] 3. GOOD [ ] 4. VERY GOOD [ ] 5. EXCELLENT [ ]

9. Extent of ethical, social and environmental values inculcated, helping you to relate Computer science engineering issues with societal needs.
1. POOR [ ] 2. AVERAGE [ ] 3. GOOD [ ] 4. VERY GOOD [ ] 5. EXCELLENT [ ]

Signature of the Student

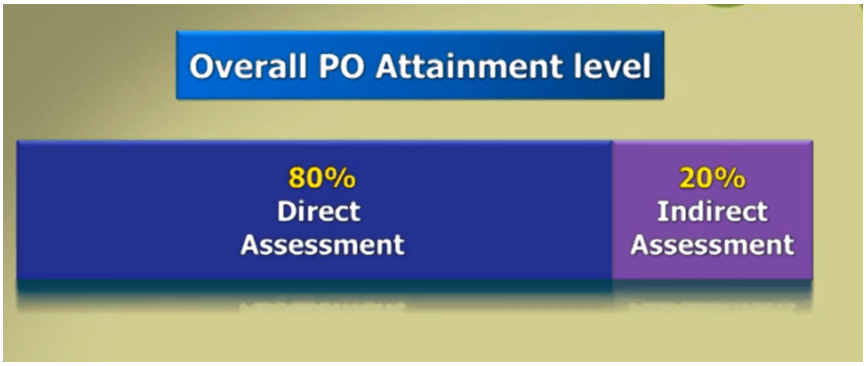
NARASARAOPETA ENGINEERING COLLEGE

DEPARTMENT OF CSE(ARTIFICIAL INTELLIGENCE)

R20 2021 BATCH CSE(AI) ALUMINI SUREVY A.Y- 2024-2025

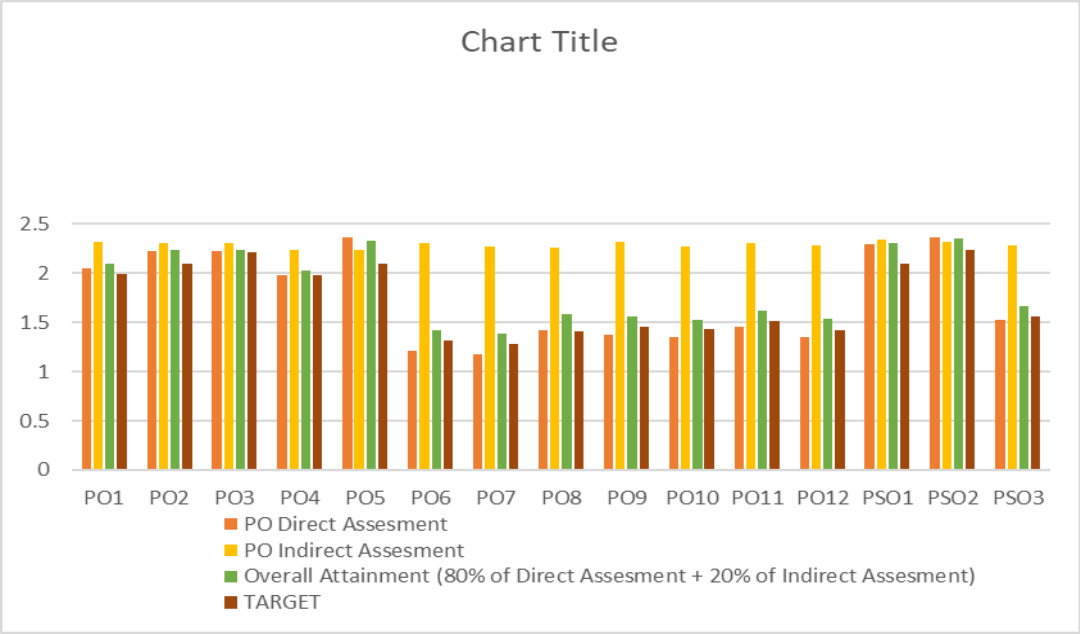
Student Name	Roll Number	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Any other comments
21471A4301	VENU GOPAL	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	NO
21471A4302	BHARGAV RAGHURAM	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Develop team work
21471A4303	AMARAJYOTHI	Agree	Satisfactory	Agree	Satisfactory	Agree	Satisfactory	Agree	Agree	Agree	Agree	Satisfactory	Agree	Agree	Agree	Agree	No
21471A4306	LALITHA	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	Strongly Agree	learn more content from practical things
22475A4305	GOPI	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	Agree	NO
22475A4306	DINESH GUPTA	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Agree	Satisfactory	Satisfactory	Agree	Agree	Satisfactory	Satisfactory	Satisfactory	Satisfactory	Agree	Satisfactory	NO
	AVERAGE	2.28	2.23	2.26	2.1	2.19	2.23	2.29	2.14	2.35	2.28	2.19	2.26	2.23	2.25	2.3	

OVERALL LEVELS OF ATTAINMENT:



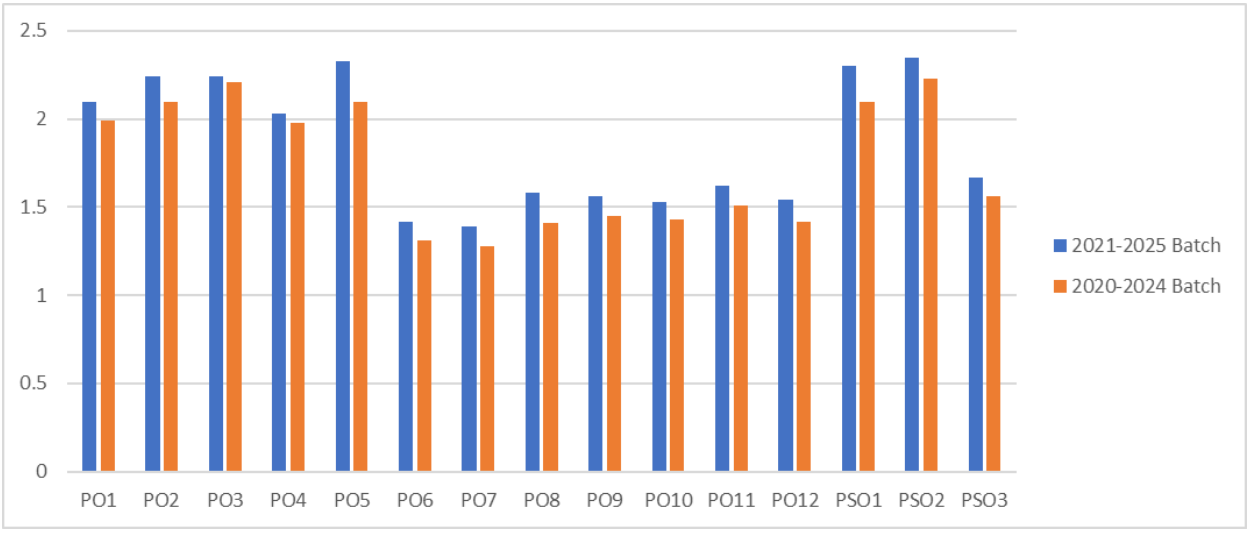
OVERALL LEVELS OF PO ATTAINMENTS & PSO ATTAINMENTS

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
PO&PSO Direct Assesment	2.05	2.22	2.22	1.98	2.36	1.21	1.17	1.42	1.37	1.35	1.45	1.35	2.29	2.36	1.52
PO & PSO Indirect Assesment	2.32	2.3	2.3	2.23	2.23	2.31	2.27	2.26	2.32	2.27	2.3	2.28	2.34	2.32	2.28
Overall Attainment PO & PSO (80% of Direct Assesment + 20% of Indirect Assesment)	2.1	2.24	2.24	2.03	2.33	1.42	1.39	1.58	1.56	1.53	1.62	1.54	2.3	2.35	1.67
TARGET	1.99	2.1	2.21	1.98	2.1	1.31	1.28	1.41	1.45	1.43	1.51	1.42	2.1	2.23	1.56



OVERALL TWO BATCHES OF PO ATTAINMENTS & PSO ATTAINMENTS

Batch	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
2021-2025 Batch	2.10	2.24	2.24	2.03	2.33	1.42	1.39	1.58	1.56	1.53	1.62	1.54	2.30	2.35	1.67
2020-2024 Batch	1.99	2.10	2.21	1.98	2.1	1.31	1.28	1.41	1.45	1.43	1.51	1.42	2.1	2.23	1.56



The eleven steps towards validation of POs are as follows:

Step 1: Defining the Vision and Mission of the Department.

Step 2: Defining Program Educational Objectives (PEOs) of the Department.

Step 3: Establishing POs to setup target level of PO attainment.

Step 4: Defining relation between Course Outcomes (COs) and POs for each course to obtain overall CO mapping with each POs.

Step 5: Development of overall CO-PO mapping matrix for all courses.

Step 6: Computation and construction of overall CO attainment matrix for each course using course assessment tools.

Step 7: Calculation and construction of direct PO attainment matrix using overall CO-PO mapping matrix and overall CO attainment matrix.

Step 8: Calculation of overall direct PO attainment.

Step 9: Calculation of indirect PO attainment.

Step 10: Computation of overall PO attainment.

Step 11: Comparison of target level and obtained PO attainment.

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF CSE(ARTIFICIAL INTELLIGENCE)

List of Courses for R20 Regulation and their Codes

CODE	COURSE	CODE	COURSE
I YEAR I SEMESTER		**I YEAR II SEMESTER**	
C111	TECHNICAL AND COMMUNICATIVE ENGLISH-I	C121	NUMERICAL METHODS AND STATISTICS
C112	LINEAR ALGEBRA &CALCULUS	C122	ENGINEERING CHEMISTRY
C113	APPLIED PHYSICS	C123	PROBLEM SOLVING USING PYTHON
C114	PROBLEM SOLVING USING C	C124	ELECTRONIC DEVICES AND LOGIC DESIGN
C115	SOFT SKILLS & COMMINICATION SKILLS LAB	C125	ENGINEERING CHEMISTRY LAB
C116	PROBLEM SOLVING USING C LAB	C126	R PROGRAMMING LAB
C117	APPLIED PHYSICS LAB	C127	LINUX PROGRAMMIN4G
C118	IT WORKSHOP	C128	PROBLEM SOLVING USING PYTHON LAB
		C129	ENVIRONMENTAL STUDIES
II YEAR I SEMESTER		**II YEAR II SEMESTER**	
C211	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	C221	TECHNICAL AND COMMUNICATIVE ENGLISH-II
C212	OOPS THROUGH JAVA	C222	DATABASE MANAGEMENT SYSTEMS
C213	DATA STRUCTURES	C223	AUTOMATA AND COMPILER DESIGN
C214	DATA SCIENCE	C224	SOFTWARE ENGINEERING
C215	FRONT END WEB TECHNOLOGIES	C225	INTRODUCTION TO ARTIFICIAL INTELLIGENCE
C216	DATA STRUCTURES LAB	C226	DATA BASE MANAGEMENT SYSTEMS LAB
C217	OOPS THROUGH JAVA LAB	C227	MOBILE APPLICATION DEVELOPMENT LAB

C218	FRONT END WEB TECHNOLOGIES LAB	C228	ARTIFICIAL INTELLIGENCE LAB
C219	DATA SCIENCE TOOLS	C229	IOT LAB
III YEAR I SEMESTER		**III YEAR II SEMESTER**	
C311	OPERATING SYSTEMS	C321	DEEP LEARNING
C312	COMPUTER NETWORKS	C322	NATURAL LANGUAGE PROCESSING
C313	MACHINE LEARNING	C323	ADVANCED JAVA AND WEB TECHNOLOGIES
C314	COMPUTER ORGANIZATION	C324	CLOUD COMPUTING
C315	DESIGN AND ANALYSIS OF ALGORITHEMS	C325	CRYPTOGRAPHY & NETWORK SECURITY
C316	CN&OS LAB	C326	ADVANCED JAVA AND WEB TECHNOLOGIES LAB
C317	MACHINE LEARNING LAB	C327	DEEP LEARNING LAB
C318	ENGLISH EMPLOYABILITY SKILLS LAB	C328	NATURAL LANGUAGE PROCESSING LAB
C319	INTERNSHIP/COMMUNITY SERVICE PROJECT	C329	DESIGN THINKING AND INNOVATION
C3110	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	C3210	PROFESSIONAL ETHICS AND HUMAN VALUES
IV YEAR I SEMESTER		**IV YEAR II SEMESTER**	
C411	ARTIFICIAL NEURALNETWORKS	C421	INTERNSHIP AND PROJECT WORK
C412	HUMAN COMPUTER INTERACTION		
C413	E-COMMERCE		
C414	CYBER SECURITY		
C415	DIGITAL MARKETING		
C416	ENTERPRENEURSHIP AND INNOVATION		
C417	AGILE WITH SCRUM		
C418	INTERNSHIP/COMMUNITY SERVICE PROJECT		
C419	MOOCS		