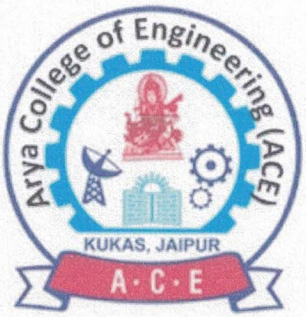


CO-PO ATTAINMENT HANDBOOK

(Dec-2023)

Department of Computer Science & Engineering

Arya College of Engineering, Kukas, Jaipur

Course Identification

- Bloom's Taxonomy
- RTU Syllabus

Preparation of Course Outcome

- Department Vission, Mission
- PO's / PSO's / PEO's

Calculations for CO Attainment

External Assessment (End Semester Exams)

- RTU Theory Exams
- RTU Practical Exams
- Project Assessment
- Practical Training Assessment

Internal Assessment (Internal Exams)

- Mid Term Exams
- Assignment / Unit Tests
- Internal Lab Assessments
- Internal Project Assessments
- Internal Practical Training/ Internship Assessment

Set Target % as per Difficulty level to achieve

CO Attainment through Attainment tools / ERP (For End Semester Exam)

External Examination Assessment

- 70% Weightage For Theory Courses
- 40% Weightage For Practical / Lab Courses

CO Attainment through Attainment tools / ERP (For Internal Exam)

Internal Examination Assessment

- 30% Weightage For Theory Courses
- 60% Weightage For Practical / Lab Courses

CO Direct Attainment

CO Indirect Assessment through End Term Survey from Stack Holders

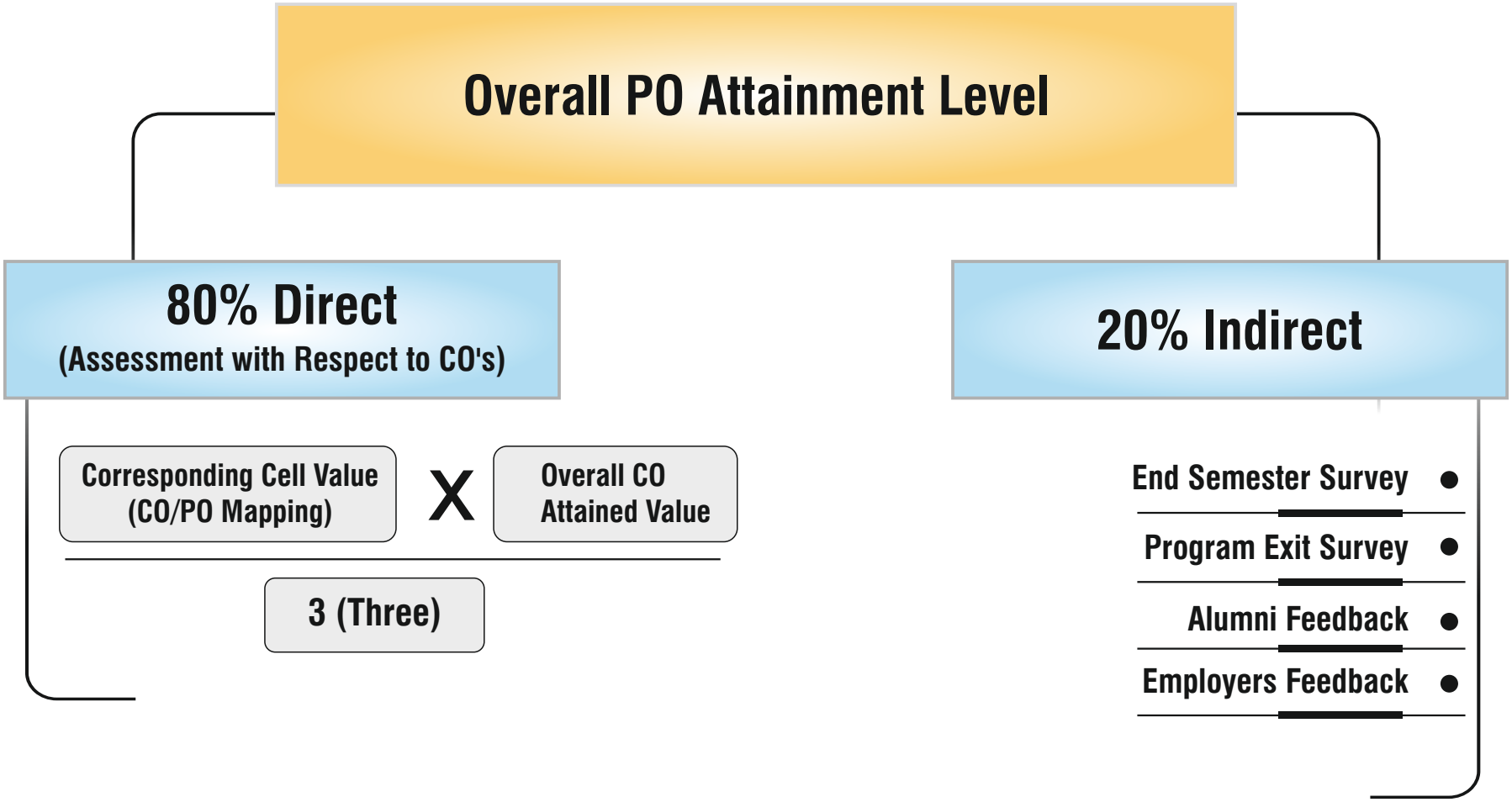
CO Attainment = 90% of Direct +10% of Indirect

CO Attainment Level

Attainment Level 1 : 60% of Student score more than 60% marks (Low)
Attainment Level 2 : 70% of Student score more than 60% marks (Moderate)
Attainment Level 3 : 80% of Student score more than 60% marks (Substantial)

CO Attainment >= Target

- Yes → Revise and Increase CO target for the Course / Subject
- No → Plan strategies for improvement and recomend action plan to Course / subject Coordinator


Overall PO Attainment Level
80% Direct
(Assessment with Respect to CO's)
Corresponding Cell Value
(CO/PO Mapping)
X
Overall CO
Attained Value
3 (Three)
20% Indirect
End Semester Survey
Program Exit Survey
Alumni Feedback
Employers Feedback

CO-PO Attainment Handbook

Content

1. Vision and Mission Statements

College Vision

To emerge as the best educational institute and Work for Excellence in imparting quality education to the students to nurture their inherent talent as Innovative Professional in technical and managerial field there by making them competitive to meet all the future challenge of global economy.

College Mission

- To create a Progressive Academic Environment by nurturing the Creativity, Ideas, Innovation and Skills in Students in order to achieve Qualitative Techno-Managerial Skills.
- To provide Excellent Ambience to enhance the Teaching-Learning processes amongst Students and Faculty members by building a determined team who are committed to the ideas of Integrity, Positive Thinking and Social Development to meet industry expectations and requirements.
- To make Students Globally Competitive by providing suitable Training, Value Added Certification Courses and Beyond Syllabus Academics in order to generate capacity to face competitions and placements and become imaginative mastermind and inventive issue solver while providing them safe and challenging environment.

Khalid Ajmeri
(IQAC coordinator)

Dr. Himanshu Arora
Principal – ACE

2. Drafting of Vision Mission of Department

The vision and mission of the department should be drafted by Departmental Advisory Committee (DAC) in consultation with all stakeholders in such a way that they are consistent with the vision and mission of the Institute. These should be reviewed every five years and may be modified if required.

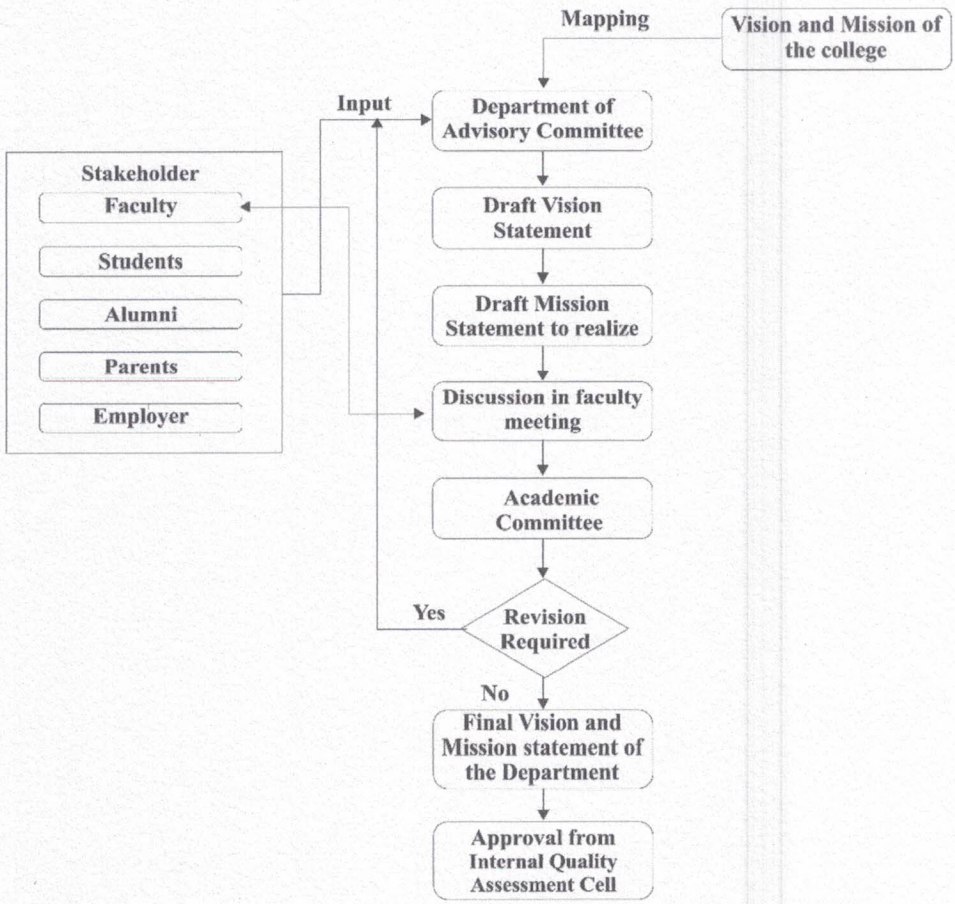


Fig 1. Drafting of Vision Mission of Department

Computer Science and Engineering Vision

To produce graduates with Strong Fundamentals in the area of Computer Science and Engineering and to meet the needs of society and industry in Self-Sustainable Manner with Ethical values.

Computer Science and Engineering Mission

1. To deliver resources in IT-enabled domains by fostering a progressive academic environment that nurtures creativity, innovation, and technical skills through effective industry interaction and project-based learning.
2. To motivate students toward employability, entrepreneurship, research, and higher education by enhancing teaching-learning processes in a collaborative and intellectually stimulating atmosphere, guided by integrity, positive thinking, and social development.
3. To equip students with excellent engineering skills by providing a state-of-the-art infrastructure, value-added certification courses, and industry-oriented training, ensuring they become globally competitive professionals capable of solving real-world challenges.

3. Drafting of Programme Educational Objectives (PEO)

Proper Procedures be followed for the drafting of PEOs by DAC and mapped with the mission statements of the department. The mapping between the mission statements and PEOs is finalized with the help of various feedback/suggestions received from all the stakeholders. These should be reviewed every five years and may be modified if required.

Mapping is defined based on the following levels: low (1), medium (2), high (3). Levels (1/2/3) should be assigned based on the extent to which keywords of mission statements are implemented and justified by various stakeholders. Example: Three mission statements are mapped with five PEO statements.

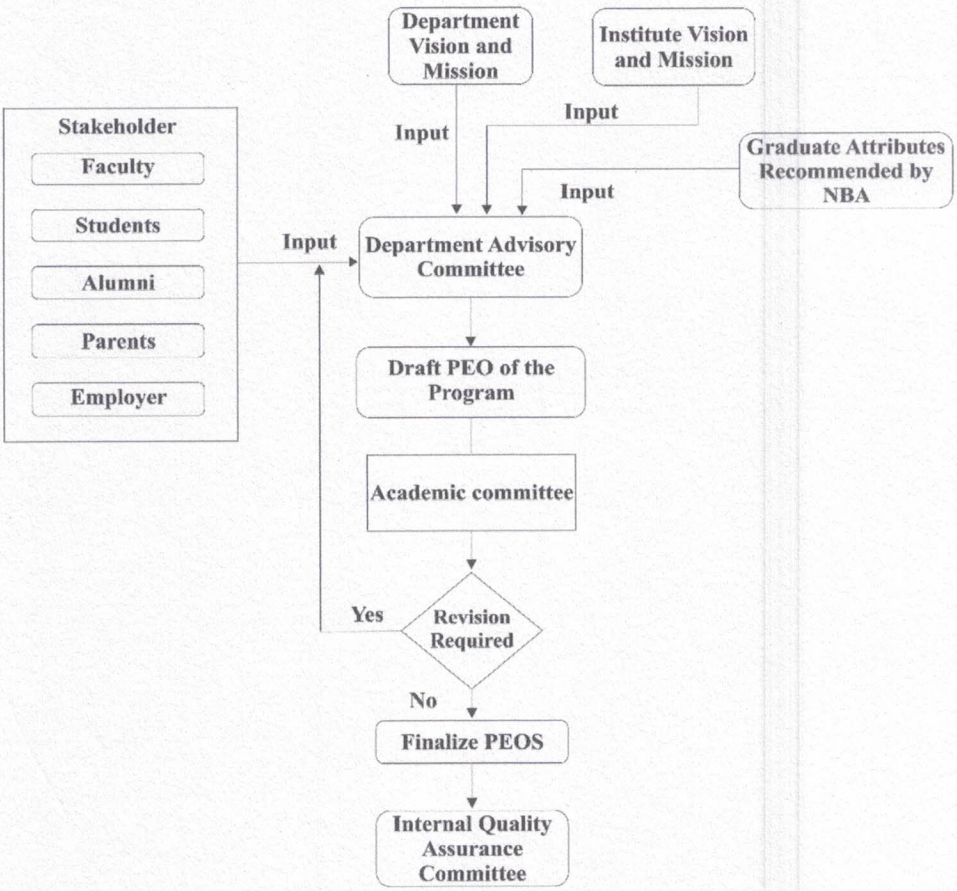


Fig 1. Drafting of Programme Educational Objectives (PEO)

PEO-1

Graduate students will have thorough knowledge in science and engineering disciplines and have broad-based education in areas of computer science, including hardware, software learning in the structural form of course and curriculum.

PEO-2

Graduates will have solid foundation in engineering field required to solve computing problems using various programming languages and software's/tools, and students can solve problems through logical and analytical thinking.

PEO-3

Graduates will be trained with good engineering breadth so as to comprehend, analyze, design, and create novel products and solutions for the real-life problem and as per the industry requirements by bridging extra certification courses.

PEO-4

To develop the professional and ethical attitude, effective communication skills and lateral learning for multidisciplinary approach, and an ability to relate engineering issues to broader social context.

PEO-5

To develop the academic environment and pursue excellence in leadership, teamwork and skills for lifelong learning needed to persue successful professional career through structured learning, independent self-studies, projects, industrial training, Seminars and Internships etc.

Department Mission& PEO	M1	M2	M3
PEO1	3	2	3
PEO2	3	2	3
PEO3	3	3	3
PEO4	2	2	2
PEO5	3	3	3

4. Drafting Programme Outcomes (PO)& Programme Specific Outcomes (PSO) Statements

POs and PSOs provide guidance at the programme level for curriculum design, delivery and assessment of student learning. POs represent high level generic goals whereas PSOs represent branch specific goals. There are 12 well defined POs for engineering disciplines by AICTE whereas PSOs are to be defined for each specific branch for Engineering which may be 2 to 3 in number. The 12 POs as defined by NBA are as under.

PO-1 Engineering Knowledge:

Apply knowledge of mathematics and science, with fundamentals of Engineering to be able to solve complex engineering problems related.

PO-2 Problem Analysis:

Identify, Formulate, review research literature and analyze complex engineering problems and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences

PO-3 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.

PO-4 Conduct Investigations of Complex problems:

Use research–based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO-5 Modern Tool Usage:

Create, Select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO-6 The Engineer and Society:

Apply Reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO-7 Environment and Sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts sustainable development.

PO-8 Ethics:

Apply Ethical Principles and commit to professional ethics and responsibilities and norms of the engineering practice

PO-9 Individual and Team Work:

Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary Settings.

PO-10 Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large such write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO-11 Project Management and Finance:

Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO-12 Life-Long Learning:

Recognize the need for and have the preparation and ability to engage in independent and life-long learning the broadest context of technological change.

Programme Specific Outcomes (PSO)

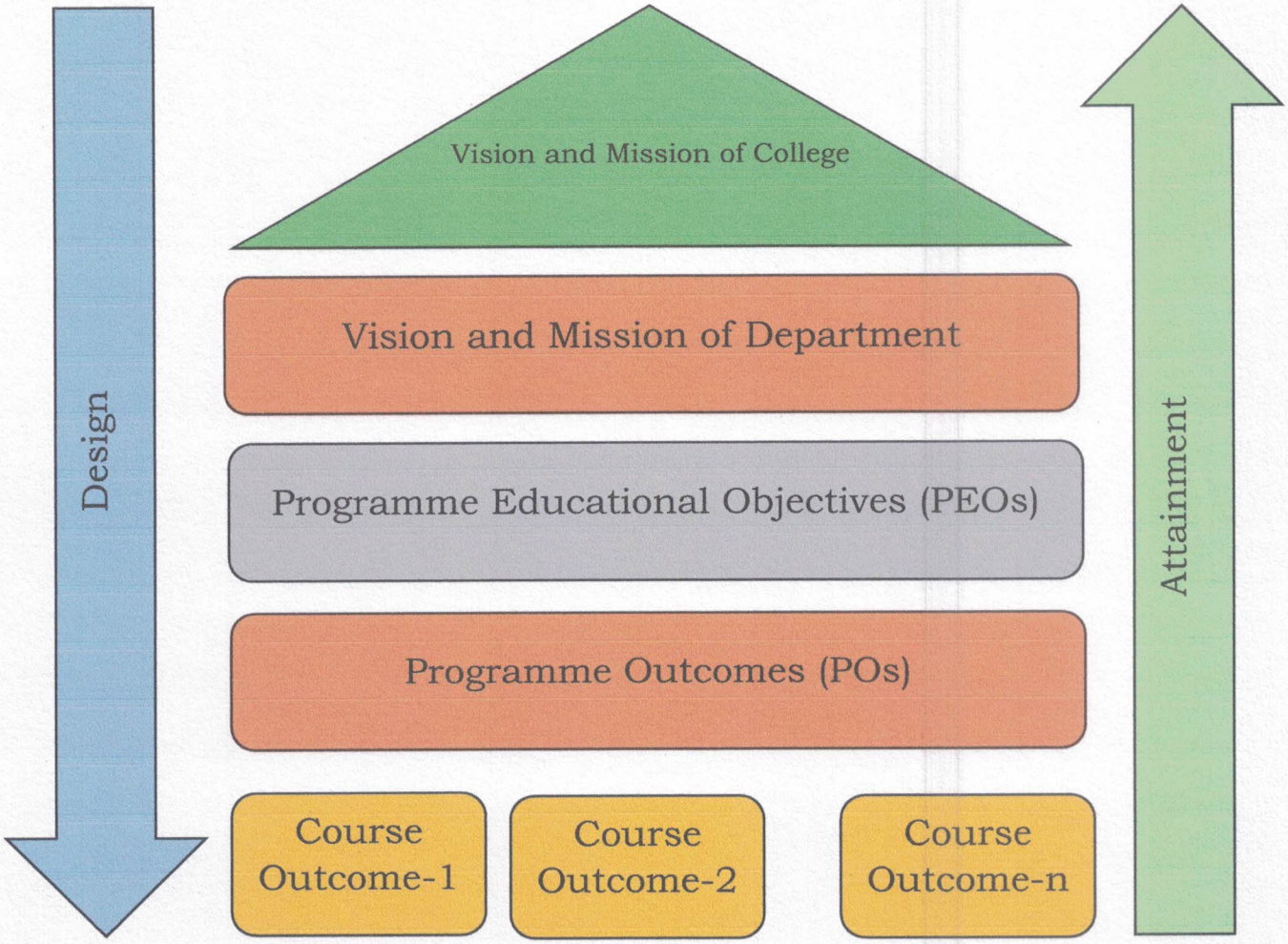
PSO-1:Knowledge Enhancement in Computing

The ability to interpret the foundation and strategy of hardware and software of computer systems. Graduates can solve the problems in the areas related to algorithms, multimedia, data analytics, cloud computing, human computer interface, robotics, artificial intelligence and networking for efficient design of computer systems.

PSO-2:Software Design and Development

The ability to understand the software development lifecycle and methodologies of software systems. Graduate will learn competent skills and knowledge of software design process. Graduate will be acquaintance to practical proficiency with a broad area of programming concepts.

Key Constituents of Outcome Based Education (OBE)



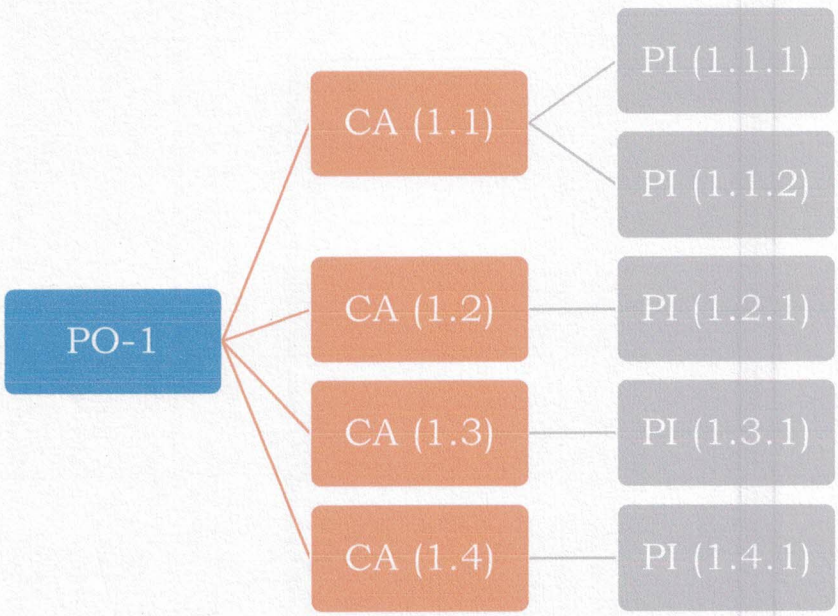
5. Defining Competences (CA) and Performance Indicators (PI) for each PO & PSO

POs & PSOs are useful guide at the programme level for curriculum design and represent high level generic goals that are not directly measurable. To map POs & PSOs with COs it is necessary to define the following two terms.

(i) Competencies (CA) and
(ii) Performance Indications (PI)

Competencies are the abilities which we wish students to achieve whereas PIs are the breakup statements of POs & PSOs.

Competencies (CA) are defined for each PO & PSO and for each competency performance indicators (PI) are defined. As an examplethreecompetencies 1.1, 1.2&1.3are defined for PO1. Performance indications 2,2 & 2 in number are defined for 1.1.1, 1.1.2, 1.2.1, 1.2.2, 1.3.1, 1.3.2 respectively. This is shown in table below:



Possible Mapping of CA and PI for PO1

Table-I Competencies and performance Indicators (PIs)

Competencies (CA)	Performance Indicators (PIs)
PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.	
1.1 Demonstrate competence in mathematical modelling	1.1.1 Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems
	1.1.2 Apply the concepts of probability, statistics and queuing theory in modelling of computer-basedsystems, data and network protocols.
1.2 Demonstrate competence in basic sciences	1.2.1 Apply laws of natural science to an engineering problem.
1.3 Demonstrate competence in engineering fundamentals	1.3.1 Apply engineering fundamentals
1.4 Demonstrate competence in specialized engineering knowledge to the program	1.4.1 Apply theory and principles of computer science engineering to solve an engineering problem

PO2:Problem Analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	
2.1 Demonstrate an ability to identify and formulate complex engineering problem	2.1.1 Evaluate problem statements and identify objectives
	2.1.2 Identifies processes/ modules/ algorithms of a computer based system and parameters to solve a problem
	2.1.3 Identifies mathematical algorithmic knowledge that applies to a given problem
2.2 Demonstrate an ability to formulate a solution plan and methodology for an engineering problem.	2.2.1 Reframe the computer based system into interconnected subsystems
	2.2.2 Identifies functionalities and computing resources
	2.2.3 Identify existing solutions/methods to solve the problem, including forming justified approximations and assumptions
	2.2.4 Compare and contrast alternative solutions/methods to select the best methods.
	2.2.5 Compare and contrast alter
2.3 Demonstrate an ability to formulate and interpret a model	2.3.1 Able to apply computer engineering principles to formulate modules of a system with required applicability and performance.
	2.3.2Identify design constraints for required performance criteria.

2.4Demonstrate an ability to execute a solution process and analyze results	2.4.1 Applies engineering mathematics to implement the solution.
	2.4.2 Analyze and interpret the results using contemporary tools.
	2.4.3 Identify the limitations of the solution and sources/causes.
	2.4.4 Arrive at conclusions with respect to the objectives.

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 public health and safety, and cultural, societal, and environmental considerations.	
3.1 Demonstrate an ability to define a complex/open-ended problem in engineering terms	3.1.1 Able to define a precise problem statement with objectives and scope.
	3.1.2 Able to identify and document system requirements from stakeholders.
	3.1.3 Ability to review state-of-the-art literature to synthesize system requirements.
	3.1.4Ability to choose appropriate quality attributes as defined by ISO/IEC/IEEE standards.
	3.1.5 Explore and synthesize system requirements from larger social and professional concerns.
	3.1.6Ability to develop software requirement specifications (SRS).
3.2 Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1. Ability to explore design alternatives.
	3.2.2. Ability to produce a variety of potential design solutions suited to meet functional requirements.
	3.2.3Identify suitable non functional requirements for evaluation of alternate design solutions.
3.3 Demonstrate an ability to select optimal design scheme for further development	3.3.1 Ability to perform systematic evaluation of the degree to which several design concepts meet the criteria.
	3.3.2 Consult with domain experts and stakeholders to select candidate engineering design solution for further development
3.4 Demonstrate an ability to advance an engineering design to defined end state	3.4.1 Ability to refine architecture design into a detailed design within the existing constraints.
	3.4.2 Ability to implement and integrate the modules.
	3.4.3Ability to verify the functionalities and validate the design.

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	
4.1 Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1 Define a problem for purposes of investigation, its scope and importance
	4.1.2 Ability to choose appropriate procedure/algorithm, data set and test cases
	4.1.3 Ability to choose appropriate hardware/software tools to conduct the experiment.
4.2 Demonstrate an ability to design experiments to solve open ended problems	4.2.1 Design and develop appropriate procedures/methodologies based on the study objectives
4.3 Demonstrate an ability to analyze data and reach a valid conclusion.	4.3.1 Use appropriate procedures, tools and techniques to collect and analyze data
	4.3.2 Critically analyze data for trends and correlations, stating possible errors and limitations
	4.3.3Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions
	4.3.4Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions

PO 5:Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.	
5.1 Demonstrate an ability to identify / create modern engineering tools, techniques and resources	5.1.1 Identify modern engineering tools, techniques and resources for engineering activities
	5.1.2 Create/adapt/modify/extend tools and techniques to solve engineering problems
5.2 Demonstrate an ability to select and apply discipline specific tools, techniques and resources	5.2.1 Identify the strengths and limitations of tools for (i) acquiring information, (ii) modeling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs.
	5.2.2 Demonstrate proficiency in using discipline specific tools
5.3 Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem.	5.3.1 Discuss limitations and validate tools, techniques and resources
	5.3.2 Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use.

PO 6:The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	
6.1 Demonstrate an ability to describe engineering roles in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1 Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at global, regional and local level
6.2 Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1 Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public

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.	
7.1 Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts	7.1.1 Identify risks/impacts in the life-cycle of an engineering product or activity
	7.1.2 Understand the relationship between the technical, socio economic and environmental dimensions of sustainability
7.2 Demonstrate an ability to apply principles of sustainable design and development	7.2.1 Describe management techniques for sustainable development.
	7.2.2 Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline.

PO8:Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	
8.1 Demonstrate an ability to recognize ethical dilemmas	8.1.1 Identify situations of unethical professional conduct and propose ethical alternatives
8.2 Demonstrate an ability to apply the Code of Ethics	8.2.1 Identify tenets of the ASME professional code of ethics
	8.2.2 Examine and apply moral & ethical principles to known case studies

PO 9:Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	
9.1 Demonstrate an ability to form a team and define a role for each member	9.1.1 Recognize a variety of working and learning preferences; appreciate the value of diversity on a team.
	9.1.2 Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal.

9.2 Proficiency in collaborating within diverse and multidisciplinary teams, including the ability to lead, delegate, and manage team dynamics to achieve shared goals.	9.2.1 Demonstrate effective communication, problem solving, conflict resolution and leadership skills
	9.2.2 Treat other team members respectfully
	9.2.3 Listen to other members
9.3 Demonstrate success in a Team based project	9.3.1 Present results as a team, with smooth integration of contributions from all individual efforts

PO10:Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	
10.1 Demonstrate an ability to comprehend technical Literature and document project work	10.1.1 Read, understand and interpret technical and nontechnical information
	10.1.2 Produce clear, well-constructed, and well-supported written engineering documents
	10.1.3 Create flow in a document or presentation - a logical progression of ideas so that the main point is clear
10.2 Demonstrate competence in listening, speaking, and presentation	10..2.1 Listen to and comprehend information, instructions, and viewpoints of others
	10.2.2 Deliver effective oral presentations to technical and nontechnical audiences
10.3 Demonstrate the ability to integrate different modes of communication	10.3.1 Create engineering-standard figures, reports and drawings to complement writing and presentations
	10.3.2 Use a variety of media effectively to convey a message in a document or a presentation

PO 11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	
11.1 Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1 Describe various economic and financial costs/benefits of an engineering activity.
	11.1.2 Analyze different forms of financial statements toevaluate the financial status of an engineering project
11.2 Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1 Analyze and select the most appropriate proposal based on economic and financial considerations.

11.3 Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	11.3.1 Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks.
	11.3.2Use project management tools to schedule an engineering project so it is completed on time and on budget.

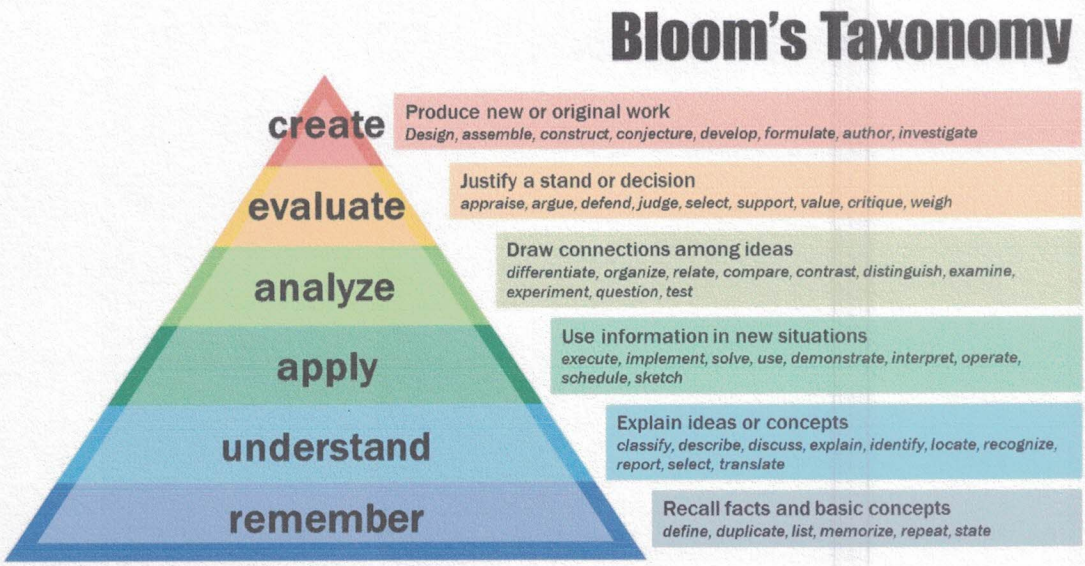
PO 12: Life-Long Learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	
12.1 Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1 Describe the rationale for requirement for continuing professional development.
	12.1.2 Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap.
12.2 Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1 Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current.
	12.2.2 Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field
12.3 Demonstrate an ability to identify and access sources for new information	12.3.1 Source and comprehend technical literature and other credible sources of information
	12.3.2 Analyze sourced technical and popular information for feasibility, viability, sustainability, etc.

PSO-1:Knowledge Enhancement in Computing: The ability to interpret the foundation and strategy of hardware and software of computer systems. Graduates can solve the problems in the areas related to algorithms, multimedia, data analytics, cloud computing, human computer interface, robotics, artificial intelligence and networking for efficient design of computer systems.	
1.1 Ability to analyze and interpret the core principles, architecture, and strategies of computer hardware and software systems for effective problem-solving and system design.	1.1.1 Demonstrates the ability to explain and apply core concepts of computer hardware and software architecture in system design tasks.
	1.1.2 Effectively analyzes real-world computing problems and selects appropriate hardware-software strategies to develop efficient and optimized solutions.
1.2 Ability to apply knowledge in algorithms, multimedia, data analytics, cloud computing, human-computer interaction, robotics, artificial intelligence, and networking to design efficient and innovative computer systems.	1.2.1 Applies appropriate algorithms, data analytics, and cloud computing techniques to develop efficient and scalable computer system solutions.
	1.2.2 Designs and implements innovative systems by integrating concepts from multimedia, HCI, robotics, AI, and networking to solve complex real-world problems.
PSO-2: Software Design and Development: The ability to understand the software development lifecycle and methodologies of software systems. Graduate will learn competent skills and knowledge of software design process. Graduate will be acquaintance to practical proficiency with a broad area of programming concepts.	
2.1 Ability to understand and apply software development life cycle (SDLC) models and methodologies for designing, developing, and managing software systems effectively.	2.1.1 Demonstrates the ability to select and apply appropriate SDLC models and methodologies based on project requirements.
	2.1.2 Effectively designs, develops, tests, and manages software systems following standard development practices and lifecycle phases
2.2 Ability to demonstrate practical proficiency in programming concepts and software design processes for building efficient and reliable software solutions.	2.2.1 Applies programming concepts, data structures, and algorithms to develop efficient and optimized software solutions.
	2.2.2 Demonstrates the ability to design, implement, and debug software applications using appropriate software design principles and coding standards.

6. Defining of COs

POs and PSOs are for the complete programme, while COs are for specific courses. They should be drafted to be achievable and measurable. They should also be linked to POs and PSOs and enhance the learners' understanding of the course. While drafting COs, it should be kept in mind that they push the learner from the first to the final order of Bloom's Taxonomy.

Example: The student should be able to understand, apply, analyse, evaluate, create, discuss, explain, develop, classify, compare and design.



7. Justification Matrix (Mapping the Relationship between POs, PSOs and COs)

The relationship between PO-PSO and CO can be classified as **low (1), medium (2), and high (3)** according to the following rubric as given in Table II

Table II – Rubric for mapping PO-PSO with CO

Ratio	Mapping
If 0 < ratio ≤ 0.33	**Low (1)**
If 0.34< ratio ≤ 0.66	**Medium (2)**
0.67< ratio ≤ 1.00	**High (3)**

Example: If CO1 of a particular course satisfies 2 PIs out of a total defined 5 PIs of PO1, then the ratio is 2/5 i.e 0.4, which lies between 0.34 & 0.66. Hence, the mapping of CO1 with PO1 is 2.

Table-III Performance Indicators mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6				PSO1	PSO2
CO1	1.2.1 1.1.1	2.1.1 2.3.1	3.2.1	4.1.1 4.2.1	All					1.3.1	2.1.1 2.3.1
CO2	1.2.2 1.3.1	2.1.1 2.2.2 2.3.2									
CO3											
CO4											
CO5											

Table-IV CO-PO/PSO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6				PSO1	PSO2
CO1	2	1	1	1	3					1	2
CO2	2	1									
CO3											
CO4											
CO5											

8. Level of Correlation and Attainment

Level of Correlation/Mapping

It indicates to what extent a certain component is mapped with the other. The correlation between CO - PO describes the level at which a particular PO is addressed through a CO. *Where*

- 3 indicates **highly mapped** *(high correlation towards attainment)*
- 2 indicates **moderate mapped** *(moderate correlation towards attainment)*
- 1 indicates **low mapped** *(low correlation towards attainment)*

CO Attainment targets

Targets are quantized into certain levels, 3 being the most common number of levels. CO Attainment targets are finalized by the course coordinator before commencing course delivery in a semester.

For Example, we can set a target as below:

Level 3: a% Students scoring >= p% of max marks allocated to CO

Level 2 : b% Students scoring >= p% of max marks allocated to CO

Level 1 : c% Students scoring >= p% of max marks allocated to CO

p% : The expected Proficiency % to attain a CO. For ex. It can be **60%**

a% : The High expected Attainment %. For ex., it can be set as **80%**

b% : The moderate expected attainment %. For ex., it can be set as **70%**

c% :The low expected attainment %. For ex., it can be set as **60%**

Rubrics and Threshold level is defined based on three categories:

1. **Theoretical**
2. **Numerical Subjects (Moderated / Hard)**
3. **Practical**

In general, for theoretical subjects has expected Proficiency % is 60% threshold, Moderate numerical subjects has expected Proficiency % is 50%, Hard numerical subjects has expected Proficiency % is 40%, and practical courses has expected Proficiency % is 60%.

9. Attainment of COs

Direct methods are used to evaluate the student's knowledge and skills from their performance in the class **internal assessment (Midterms), assignments, end semester examinations, seminars, Industrial Training, laboratory experiments/ practical, and projects, etc.**

Indirect methods such as course **exit survey** reflect on student's learning.

- Attainment of COs can be measured directly and indirectly.
- Direct attainment of COs can be determined from the performance of students in all relevant assessment instruments.

Direct CO attainment

- Direct attainment of COs is determined from the performances of students in Continuous Internal Assessment (CIA) and End Semester Examination.
- Direct attainment of a specific COs is determined from the performances of students in all the assessments like Midterms/ Assignments/ End Semester Examination related to that particular CO.
- Hence, every assessment needs to be tagged with the relevant CO.
- Continuous Internal Assessment (CIA) is conducted and evaluated by the relevant department itself. Thus, institution have access to question-wise marks in all assessmentsforContinuous Internal Assessment (CIA).
- When questions are tagged with relevant COs, the department has access to performances of students with respect to each CO.
- For the End Semester Examinations, the direct attainment is calculated from the final mark for all COs.

Direct evaluation tools:

Various direct assessment tools to evaluate the attainment of COs and the frequency of assessment is depicted in table 1:

Table-V. Direct assessment tools

Course Type	Assessment Tools	Frequency
Theory	Mid Term Exams	Twice per course
	Assignments	Unit Wise
	End Semester Exams	Once per course

Laboratory/ Practical / Industrial Training	Continuous evaluation	Every lab session
	End-semester exam	Once per course
Seminar (7thsemester)	Presentation	Once per semester
Project (8th semester)	Review	Twice per semester
	Evaluation by guide	Continuous evaluation
	Demonstration/Endsemester Evaluation	Once per course

Quality/ relevance of assessment tools

Theory: Theory courses provide the students with in-depth knowledge of various topics in engineering and allied subjects. Course are offered as core courses and elective courses. Additionally, motivated and bright students have the option to earn extra credits through MOOC/NPTEL courses.

The direct assessment of COs of theory course is done through mid-term exams and assignments conducted by the respective faculty member teaching the course in the department.

I. **Mid-Term Exam:** The mid-term exams are conducted twice per semester. These exams encourage students to keep up with the course contents covered in class. The questions satisfy Bloom's taxonomy, wherein each question is mapped to the appropriate course outcome of the respective course and assessed based on the set attainment levels. The question paper for the midterm exam set by the respective faculty member is submitted to the Module Committee comprising of a panel of faculty members. The module committee suggests necessary modifications/improvements to be incorporated into the question paper.

II. **Assignments:** Assignments are used for the continuous evaluation of the student. It can be in the form of descriptive or problem-solving assignments, oral quizzes, or MCQ. These tools are used to assess the promptness and understanding of the subject. Student's submissions are evaluated based on work quality, time limit, and originality. The questions in the assignment are mapped to the Course outcomes of the subject.

III. **End-semester Exam:** This final exam is conducted by the university once at the end of every semester to evaluate the students' performance. The questions are designed to assess students' knowledge of engineering practices, frameworks, and problem-solving skills.

Laboratory/ Practical/ Industrial Training: Lab/Practical courses provide students with first-hand experience with experiments and measurements and their application in the particular engineering field of study. Students have the opportunity to learn state-of-the-art simulation tools, get hands-on experience in measurement instruments and equipment.

I. **Continuous evaluation:** Each student is expected to be regular in the lab and practice experiments by self or in groups. Student must also develop the necessary skills to analyze the experimental data and their applications. It also facilitates interaction among the students and develops the team spirit required to solve complex problems. Performance assessment is based on the ability of the student to actively participate in the successful conduct of prescribed practical work and draw appropriate conclusions. The student submits a record of experimental work performed in each class.

II. **End-semester exam:** The final lab exam is conducted by the university to assess the ability of a student to perform a given task by integrating the knowledge gained from related theory courses and regular laboratory sessions. The exam includes viva voce and performing a given experiment.

Seminar: The seminar is a part of the seven-semester curriculum. The student makes a preliminary seminar presentation on a topic of their choice and is approved by the assigned faculty/mentor. A seminar presentation is planned for 30 minutes, including a question-answer session of 5 to 10 minutes. The seminar is evaluated based on the material presented presentation by the students before an evaluation committee consisting of three faculty members, including a senior faculty member from the department. The committee generally evaluates the seminar based on the following parameters.

I. **Relevance:** The seminar PowerPoint presentation generally covers the fundamentals and advanced topics in engineering. The importance of the topic is considered to assess the seminar.

II. **Presentation:** The flow of presentation and communication skills are essential tools to evaluate.

III. **Q&A:** At the end of the presentation, the assessment panel and the audience ask their doubts and questions about the seminar topic. The effectiveness of the student's response to these queries is also assessed.

IV. **Report and Documentation:** A seminar report is submitted at the end of the semester. This report presents the topic in a detailed manner. Students' ability to comprehend and effective writing is assessed based on the report.

Project: The project is a part of the eighth-semester curriculum. It is intended to test the innovation and engineering design abilities of the student. This tests the student's ability to apply the knowledge, experimental and analytical skills that he/she earned during the B.Tech program to solve real-world problems.

Students are expected to discuss the possible topics of interest with a faculty member and develop the final topic. The students are supposed to finalise the topic and complete the literature review within the first half of the eight semester. The students are expected to submit the proposed project's relevance, literature survey, scope, objectives, time schedule, and cost estimate during the given time. Assessment tools used to evaluate project work are:

I. **Mid-semester Evaluation**: Mid-semester evaluation is conducted at the mid of the semester, and a group panel evaluates the work based on various parameters. The feasibility and significance of the work are two major assessment criteria. The basic understanding of the topic and presentation skills are also evaluated by the panel based on their performance.

II. **End-semester Evaluation:** End-semester evaluation is conducted at the end of the semester in the form of a Power Point presentation. Detailed report submission is also compulsory. At the end of the presentation, the assessment panel and the audience ask their doubts and questions about the topic. The effectiveness of the student's response to these queries is also assessed. The submitted project report is assessed.

The weightage assigned for various assessment tools

The weightage assigned for each assessment tool for calculating the course outcome is fixed as in Table 2.

Table-VI The weightage assigned for various tools for assessment of theory and practical courses

Course Type	Assessment Tools	Marks (% Weightage)
Theory	Mid Term Exams	20 (16.67%)
	Assignments	10 (20%)
	End Semester Exams	70 (100%)
Laboratory/ Practical / Industrial Training	Continuous evaluation	60 (60%)
	End-semester exam	40 (40%)

❖ **Methodology for calculation of COs through direct assessment tools:**

The CO attainment level for a given course, for a particular batch of students is computed as follows:

In step 1, the total marks obtained by a student for a given CO in a particular evaluation tool is computed by adding the marks obtained by him/her for all questions addressing the specific CO.

MT-1, MT-2, Assignments, and University Examination are the evaluation tools used to measure the CO attainment levels for a particular theory subject. The individual weightages given to these tools are 16.67%, 16.67%, 20%, 100%.

Faculty Evaluation Process

After the university releases the semester results, each faculty member is required to fill in the marks obtained by students in:

- Mid-term examinations (MTs)
- Assignments
- End-semester examinations

Automated Excel Sheet Calculations

A customized Excel sheet has been designed to calculate the following:

1. Total number of students: The number of students who attended the examination.
2. Maximum marks (CO-wise): The highest marks achievable for each course outcome (CO).
3. Threshold value: A predefined minimum mark required to achieve a specific CO.
4. Number of students above threshold value: The count of students who have achieved the threshold mark.
5. Level of attainment: A measure of the students' achievement level based on the marks obtained.
6. Final Direct Attainment: The overall attainment percentage for each CO, calculated using the formula:

Final Direct CO Attainment = (0.7 x End-semester examination marks) + (0.3 x Internal examination marks)

This formula allocates 70% weightage to the end-semester examination marks and 30% weightage to the internal examination marks. Figure 1 and 2 shows the automated excel sheet for direct CO attainment for Subject and Lab respectively.

Department of _____

B. Tech. ___ Year ____ Semester (Session _____)

Name of the Subject with Code-

(Internal=30 + External=70) Total=100

Sr. No.	Roll No.	Student Name	Midterm-I		Midterm-II			Total		Assignment						20% of Assignment	Final CO (16.67%+20%)						External Grades	Grade Points
			CO-1	CO-2	CO-3	CO-4	CO-5	Total	16.67%	CO-1	CO-2	CO-3	CO-4	CO-5	Total		CO1	CO2	CO3	CO4	CO5	Total		
			30	30	20	20	20	120	20	10	10	10	10	10	50	10	7	7	5	5	5	30		10
1								0	0						0	0	0	0	0	0	0	0		0
2								0	0						0	0	0	0	0	0	0	0		0
3								0	0						0	0	0	0	0	0	0	0		0
4								0	0						0	0	0	0	0	0	0	0		0
5								0	0						0	0	0	0	0	0	0	0		0
6								0	0						0	0	0	0	0	0	0	0		0
7								0	0						0	0	0	0	0	0	0	0		0
8								0	0						0	0	0	0	0	0	0	0		0
9								0	0						0	0	0	0	0	0	0	0		0
10								0	0						0	0	0	0	0	0	0	0		0
11								0	0						0	0	0	0	0	0	0	0		0
12								0	0						0	0	0	0	0	0	0	0		0
13								0	0						0	0	0	0	0	0	0	0		0
No of studeuts attended			0	0	0	0	0	13	13	0	0	0	0	0	13	13	13	13	13	13	13	13		13
Maximum marks co wise			30	30	20	20	20	120	20	10	10	10	10	10	50	10	7	7	5	5	5	30		10.00
Threshold 60			18	18	12	12	12	72	12	6	6	6	6	6	30	6.00	4.20	4.20	3.20	3.20	3.20	18.00		6
No of students above threshold			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Level			####	####	####	####	####	0	0	####	####	####	####	####	0	0	0	0	0	0	0	0		0
Attainment			####	####	####	####	####	0.00	0.00	####	####	####	####	####	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00

RUBRICS
60% OF STUDENT ABOVE 60% • Level 1 (LOW)
70% OF STUDENT ABOVE 60% • Level 2 (MEDIUM)
80% OF STUDENT ABOVE 60% • Level 3 (HIGH)

Direct CO Attainment (70% of University Level + 30% of Internal Level)	CO1	CO2	CO3	CO4	CO5
	0.0	0.0	0.0	0.0	0.0

Fig 1. Direct CO Attainment of a Subject

Department of _____

B. Tech. ____Year / ____ Sem (Batch: _____)

Name of Lab with Code: _____

Sr. No.	Roll No.	Student Name	LAB Marks Co wise						60% of Lab Weighted Marks	External Marks	40% of University Weighted Marks Lab
			CO-1	CO-2	CO-3	CO-4	CO-5	Total			
			12	12	12	12	12	60	36	40	16
1								0	0		0
2								0	0		0
3								0	0		0
4								0	0		0
5								0	0		0
6								0	0		0
7								0	0		0
8								0	0		0
9								0	0		0
10								0	0		0
11								0	0		0
12								0	0		0
13								0	0		0
No of students attended			0	0	0	0	0	13	13	0	13
Maximum marks co wise			12	12	12	12	12	60	36	40	16.0
Threshold 60/.			7	7	7	7	7	36	22	16	6.4
No of students above threshold			0	0	0	0	0	0	0	0	0
Level			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0	#DIV/0!	0
Attainment			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00	0.00	#DIV/0!	0.00

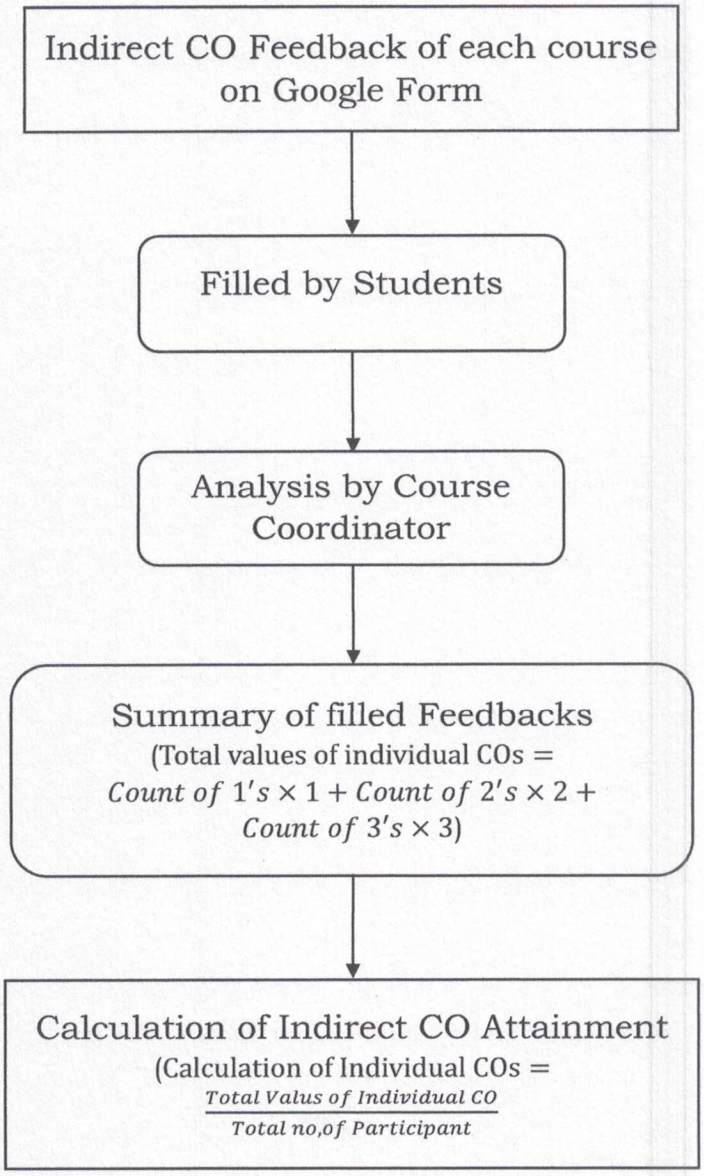
RUBRICS
60% OF STUDENT ABOVE 60% • Level 1 (LOW)
70% OF STUDENT ABOVE 60% • Level 2 (MEDIUM)
80% OF STUDENT ABOVE 60% • Level 3 (HIGH)

LAB CO Attainment (40% of University Level + 60% of Internal Level)	CO1	CO2	CO3	CO4	CO5
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Fig 2. Direct CO Attainment of a Lab

Indirect CO attainment

- Indirect attainment of COs can be determined from the course exit survey.
- The exit survey form should be designed to get feedback from students on all the COs.



10. Calculation of Attainment of Course Outcomes

Outcome Based Education (OBE) requires that the desired outcomes of each course be specified and at the end of the course, evaluation has to be done to determine whether these outcomes have been achieved. The process for finding the attainment of Course Outcomes (CO's) use various tools/methods. These methods are classified into two types: Direct methods and indirect methods.

Step 1: For every course, **4-6 course outcomes (generally 5)**are defined and mapped to **Program outcomes (PO)** and on a scale of **1 to 3**. The average of each **POs** are calculated. CO attainment targets are finalized by the course coordinators before commencement of the course delivery.***(Follow point 5 and 6)***

3CS4-05 Data Structures and Algorithms

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	2	1	3	-	-	-	-	2	-	-	3	2
CO2	-	2	2	1	3	-	-	-	-	-	-	-	3	2
CO3	2	2	2	2	3	-	3	2	2	2	2	2	3	3
CO4	2	2	2	3	3	-	3	2	2	2	2	2	3	3
CO5	2	2	2	2	3	-	3	2	2	2	2	2	3	3

Step 2: For every CIA, Enter **maximum marks** for each CO in the relevant columns. Enter mark for each student **CO-Wise.**

Department of Computer science Engineering
B. Tech. II Year III Semester 2022-23
Name of the Subject -(3CS4-05-I) Data Structures and Algorithms
(Internal=30 + External=70) Total=100

Sr. No.	Roll No.	Student Name	Midterm-I		Midterm-II			Total		Assignment						20% of Assignment	Final CO (16.67%+20%)						Final 100%	External Marks
			CO-1	CO-2	CO-3	CO-4	CO-5	Total	16.67%	CO-1	CO-2	CO-3	CO-4	CO-5	Total		CO1	CO2	CO3	CO4	CO5	Total		
			30	30	20	20	20	120	20	10	10	10	10	10	50	10	7	7	5	5	5	30	30	70
1	21EAICS001	AAKASH	26	25	19	20	19	109	18	7	8	5	5	6	31	6	6	6	4	4	4	24	24	36
2	21EAICS002	AAKASH TAILOR	22	21	12	11	13	79	13	4	5	6	5	6	26	5	4	5	3	3	3	18	18	23
3	21EAICS003	AARCHI GERA	30	30	18	20	20	118	20	10	9	10	10	9	48	10	7	7	5	5	5	29	29	63
5	21EAICS005	ABHIJEET SINGH PANWAR	29	30	14	18	13	101	17	2	3	2	3	2	12	2	5	6	3	3	3	19	19	15
6	21EAICS006	ABHINANDAN SINGH	28	29	18	20	19	114	19	10	10	9	9	10	48	10	7	7	5	5	5	29	29	31
8	21EAICS008	ABHISHEK JANGID	30	30	20	20	20	120	20	10	10	10	10	9	49	10	7	7	5	5	5	30	30	26
9	21EAICS009	ABHISHEK KUMAR JHA	20	19	10	12	11	72	12	7	6	5	5	6	29	6	5	4	3	3	3	18	18	27

Maximum CO Marks Marks earned by students Total CO Marking

Step 3: Compute the **"Number of students attempted"** the questions for each CO. For ex. Content of cell **D198 = COUNTA(D8:D196)** Here, Column D represent the marks earned by the students for CO1.

192	22EAICS210	ROHIT RANJAN	23	24	18	17	19	101	17	6	5	4	5	5	25	5	5	5	4	4	4	22	22	16
193	22EAICS211	SHAMSE ALAM	22	27	16	18	19	102	17	7	6	7	5	6	31	6	5	6	4	4	4	23	23	34
194	22EAICS212	SHUBHAM RAJ SHARMA	22	21	12	11	13	79	13	4	5	6	5	6	26	5	4	5	3	3	3	18	18	
	No. of Students Attended		187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187
	Maximum Marks CO Wise			30	20	20	20	120	20	10	10	10	10	10	50	10	7	7	5	5	5	30	30	70
	Threshold 40%		12	12	8	8	8	48	8	4	4	4	4	4	20	4	3	3	2	2	2	12	12	28
	No. of Students Above Threshold		187	187	187	187	187	187	187	176	166	174	175	168	171	171	187	187	187	187	187	187	187	131
	Level		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Attainment		3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.82	2.66	2.79	2.81	2.70	2.74	2.74	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.10

RUBRICS
60% OF STUDENT ABOVE 40% • Level 1 (LOW)
70% OF STUDENT ABOVE 40% • Level 2 (MEDIUM)
80% OF STUDENT ABOVE 40% • Level 3 (HIGH)

Final CO Attainment (70% of University Level + 30% of Internal Level)	CO1	CO2	CO3	CO4	CO5
	2.4	2.4	2.4	2.4	2.4

Total number of students attended the CO1

Step 4: Compute the **"Number of students who score >= p% marks"** for each CO. For ex. Content of cell D201 = COUNTIF(D8:D196,">=12") Here, We compute the numbers of students who scores >=60% for CO1

18 is the threshold value (60%) of maximum marks (30) of CO1

193	22EAICS211	SHAMSE ALAM	22	27	16	18	19	102	17	7	6	7	5	6	31	6	5	6	4	4	4	23	23	34
194	22EAICS212	SHUBHAM RAJ SHARMA	22	21	12	11	13	79	13	4	5	6	5	6	26	5	4	5	3	3	3	18	18	
		No. of Students Attended	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187
		Maximum Marks CO Wise	30	30	20	20	20	120	20	10	10	10	10	10	50	10	7	7	5	5	5	30	30	70
		Threshold 40%	12	12	8	8	8	48	8	4	4	4	4	4	20	4	3	3	2	2	2	12	12	28
		No. of Students Above Threshold	187	187	187	187	187	187	187	176	166	174	175	168	171	171	187	187	187	187	187	187	187	131
		Level	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Attainment	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.82	2.66	2.79	2.81	2.70	2.74	2.74	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.10

RUBRICS
60% OF STUDENT ABOVE 40% • Level 1 (LOW)
70% OF STUDENT ABOVE 40% • Level 2 (MEDIUM)
80% OF STUDENT ABOVE 40% • Level 3 (HIGH)

Final CO Attainment (70% of University Level + 30% of Internal Level)	CO1	CO2	CO3	CO4	CO5
	2.4	2.4	2.4	2.4	2.4

No of students above threshold **D201 = COUNTIF(D8:D196,">=12")**

Step 6: Find the **Level of attainment** (students who scores >=p%) for each CO

D202 = IF(((D201/COUNT(D8:D196))*100)>=80,"3",
IF(AND(((D201/COUNT(D8:D196))*100)<80,
((D201/COUNT(D8:D196))*100)>=70),"2",
IF(AND(((D201/COUNT(D8:D196))*100)<70,
((D201/COUNT(D8:D196))*100)>=60),"1","0")))

193	22EAICS211	SHAMSE ALAM	22	27	16	18	19	102	17	7	6	7	5	6	31	6	5	6	4	4	4	23	23	34
194	22EAICS212	SHUBHAM RAJ SHARMA	22	21	12	11	13	79	13	4	5	6	5	6	26	5	4	5	3	3	3	18	18	
		No. of Students Attended	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187
		Maximum Marks CO Wise	30	30	20	20	20	120	20	10	10	10	10	10	50	10	7	7	5	5	5	30	30	70
		Threshold 40%	12	12	8	8	8	48	8	4	4	4	4	4	20	4	3	3	2	2	2	12	12	28
		No. of Students Above Threshold	187	187	187	187	187	187	187	176	166	174	175	168	171	171	187	187	187	187	187	187	187	131
		Level	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Attainment	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.82	2.66	2.79	2.81	2.70	2.74	2.74	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.10

RUBRICS
60% OF STUDENT ABOVE 40% • Level 1 (LOW)
70% OF STUDENT ABOVE 40% • Level 2 (MEDIUM)
80% OF STUDENT ABOVE 40% • Level 3 (HIGH)

Final CO Attainment (70% of University Level + 30% of Internal Level)	CO1	CO2	CO3	CO4	CO5
	2.4	2.4	2.4	2.4	2.4

$$Level\ of\ attainment = \frac{No.\ of\ students\ who\ got\ more\ than\ p\%\ of\ marks}{No.\ of\ students\ attented\ the\ question}$$

Level =

= 3, if (the avg. % of students who got >=p% for each CO) >=a

= 2, if (the avg. % of students who got >=p% for each CO) >=b

= 1, if (the avg. % of students who got >=p% for each CO) >=c

Step 7:Repeat steps 2 to 6 for each CIA components.

Step 8: Enter the Grades / marks earned by the students in **End Semester Examinations.** Calculate its corresponding numeric grades in the next column.

For example, **grade "A++"** will be converted as **10 in numeric**. Also compute the percentage of students who got more than p% of marks in End Semester Examinations.

=IF(Z8="F","0",IF(Z8="A++","10",IF(Z8="A+","9",IF(Z8="A","8.5",IF(Z8="B+","8",IF(Z8="B","7.5",IF(Z8="C+","7",IF(Z8="C","6.5",IF(Z8="D+","6",IF(Z8="D","5.5",IF(Z8="E+","5",IF(Z8="E","4")))))))))))

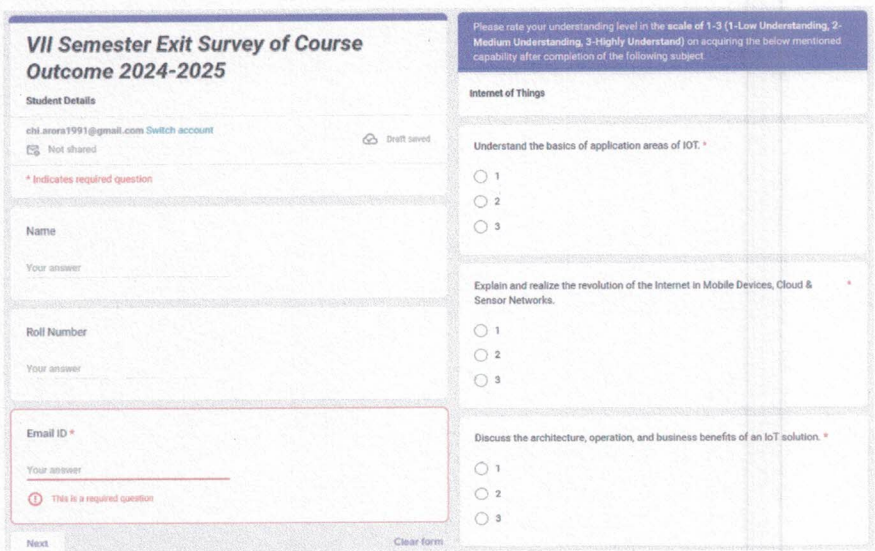
Department of Computer science Engineering
B. Tech. III Year V Semester 2021-22
Name of the Subject -(5CS3-01-Information Theory & Coding(9341))
(Internal=20 + External=80) Total=100

Sr. No.	Roll No.	Student Name	Midterm-I		Midterm-II			Total		Assignment						20% of Assignment	Final CO (16.67%+20%)						Final 100%	External Grades	Grade Points
			CO-1	CO-2	CO-3	CO-4	CO-5	Total	8.33%	CO-1	CO-2	CO-3	CO-4	CO-5	Total		CO1	CO2	CO3	CO4	CO5	Total			
			30	30	20	20	20	120	10	10	10	10	10	10	50	10	4	4	4	4	4	20	20		10
1	19EAICS001	ABHAY AGARWAL	18	10	16	19	18	81	7	7	6	8	8	7	36	7	3	2	3	3	3	14	14	C+	7
2	19EAICS002	ABHAY SHARMA	24	22	18	20	19	103	9	10	7	7	6	5	35	7	4	3	3	3	3	16	16	C	6.5
3	19EAICS003	ABHISHEK KUMAR GUPTA	18	21	13	16	18	86	7	9	7	9	5	8	38	8	3	3	3	2	3	15	15	F	0
4	19EAICS005	ABHISHEK YADAV	10	24	16	20	14	84	7	10	9	7	9	8	43	9	3	4	3	3	3	16	16	C	6.5
5	19EAICS006	ADARSH KUMAR GUPTA	18	10	14	17	16	75	6	9	8	4	4	5	30	6	3	2	2	2	2	12	12	D	5.5
6	19EAICS007	ADITYA JASRAI	29	25	20	20	16	110	9	9	10	9	10	10	48	10	4	4	3	4	3	19	19	C+	7
7	19EAICS008	ADITYA RAJ ARYAN	19	20	14	15	20	88	7	7	7	10	10	7	41	8	3	3	3	3	3	16	16	F	0
8	19EAICS009	ADITYA TANWAR	20	18	12	12	17	79	7	8	7	7	7	0	29	6	3	3	2	2	1	12	12	F	0
9	19EAICS012	ALOK ARYAN	20	23	16	15	13	87	7	9	9	8	9	7	42	8	3	4	3	3	2	16	16	F	0

Grade and its numeric value which student get in End Semester Examination.

Step 9:Course Exit Survey will be conducted among students for Indirect CO attainment. The exit survey feedback must include questionnaire for all COs.

Course exit survey is used to collect the responses of the student about his own student's evaluation on each of the course outcome in the online mode such as Google form. Figure 3 shows the appearance of google form. The questions framed corresponds to each CO. Students can choose an indicator among Low understanding (1), MediumUnderstanding(2), and Highly Understand (3), to rate his/her own ability.



Step 10: Calculate Consolidated **Continuous Internal Assessment (CIA)** for each CO as

Indirect CO attainment for a given CO =

$$COn = \frac{\sum Total\ count\ of\ COn}{Total\ No.of\ Students}$$

Where n is 1 to 5 or no. of course outcomes of the subject.

Timestamp	Name	Roll Number	Email ID	Understand the basics of application areas of IOT	Explain and realize the revolution of the internet in Mobile Devices	Discuss the architecture, operation, and business benefits of	Examine the potential business opportuniti es that IoT	Explore the relationship between IoT cloud computing, and big data and
##########	Devraj Singh	21EAICS053	devrajsinghxd@gma	3	3	1	3	1
##########	Md Saquib Ansari	22EAICS205	saquibchiksi786@g	3	3	3	3	3
##########	Saloni jain	21eaycs123	jainsaloni1522@gm	3	3	2	2	2
##########	Mohd Iliyas	21EAYCS087	Ilyasbalkhi977@gm	3	3	3	3	3
##########	Rishab Agarwal	21EAICS131	rishabagarwal444@	2	2	2	2	2
##########	Ashutosh Goyal	21EAICS040	ashutoshgoyal725@	1	2	1	2	3
##########	anupam kumar	21EAIAD005	anupamkumar7802(	1	1	1	1	1
##########	Jeetu kumar meen	21EAYCS066	mr.jeetumeena066@	3	3	3	3	3
##########	Karan Kumar	21EAYCS069	2610.kumar.karan@	2	3	3	2	2
##########	Harsh tiwari	21eaycs058	Harshcyber56@gma	3	3	3	3	3
##########	Deeksha Agrawal	21EAYCS039	deeksha13d@gmail	1	1	1	1	1
##########	SACHIN CHOUDH	21EAIAD036	sac072003@gmail.(	1	2	1	1	2
##########	Vrinda Bansal	21EAIT033	vrinda14bansal@gm	1	1	1	1	1
##########	Virendra Singh	21EAICS178	vrathode1109@gm	2	3	2	3	3
##########	Shivang Baranwal	21EAICS151	shivangbaranwal4@	3	3	3	3	3
##########	Ayushman Sharm	21EAYCS031	ayushman332200@	3	2	3	2	3
##########	Nitesh jangir	21EAYCS100	jangirnitesh2003@g	3	3	1	2	3
##########	Vikrant	21EAYCS144	vikrantmitharwal123	3	2	2	3	2
##########	Shaizan alam	21EAICS149	ishizan19@gmail.c(	3	3	2	2	3
##########	pankaj kumar	21EAYCS102	pankajjangir1034@g	2	2	3	3	3
##########	Jaideep Singh	21eaycs064	sjaideep863@gmail	2	2	2	1	1
##########	Naveen Soni	21EAICS102	naveensoni378@gm	3	3	3	3	3
##########	Sanju Saini	21EAYCS125	sanjusaini9765@gm	2	2	2	3	2
##########	Prity Kumari	22EAICS209	pritykumari6105@g	3	2	2	2	2
##########	NITIN ANAND	21EAICS105	anandnitin462@gm	3	2	2	3	2
##########	Arpit Saraswat	21EAICS035	arpitsaraswat001@g	1	1	1	1	1
##########	Kaushal Sharma	21EAYCS070	kaush004@gmail.c(	2	3	2	2	1
##########	Purnima Chauhan	21EAICS120	khushi8chauhan00(	3	3	3	3	3
##########	Nishit Paliwal	21EAICS104	paliwalnishit2001@g	3	3	3	3	3
##########	Tanishk	21EAIAD047	tanishk7775@gmail	2	2	2	2	2
##########	Mohd Rehan	21EAYCS089	khokharriyaz30@gr	3	3	3	2	2
##########	Lavnesh dhaked	21EAYCS074	dhakedl640@gmail.	2	2	2	2	3
##########	Aaradhya Agarwal	21EAIAD001	aaradhya.agarwal2(	1	1	1	1	1
##########	Rajashree Das	21EAIAD027	dasrajashree981@g	1	1	1	1	1
##########	Digvijay	21EAYCS045	digvijayrathore4554(	1	1	1	1	1
##########	Ankit Jangid	21EAYCS014	ankit960239@gmail	2	2	2	3	1
##########	Dhruv Vyas	21EAYCS044	dhruvyas805@gmai	3	3	3	3	3
##########	Nikita chaturvedi	21EAYCS097	chaturvedinikita657(	3	2	3	2	3

Fig 3. Appearance of Google Form

Name of Department- Computer Science & Engineering
B. Tech. II Year III Semester 2022-23
Name of the Subject -3CS4-05-I) Data Structures And Algorithms
Indirect CO Attainment

Total No. of Students Opted for CO Exit Survey			117		
COs	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Sum of Marking CO Wise	265	260	276	275	258
Indirect Level (Sum of Marking / Total no. of Students Opted for CO Exit Survey)	**2.26**	**2.22**	**2.36**	**2.35**	**2.21**

Fig 4. Calculation of indirect CO attainment

Step 11: Final CO Attainment score is calculated as follows:

After calculating the indirect attainment of CO we finally calculate the Final CO attainment of a Subject / Lab by using the following formula

$$\textit{Final CO Attainment of given CO} = (0.9 \times \textit{Direct attainment of given CO}) + (0.1 \times \textit{Indirect attainment of given CO})$$

For Ex : Final CO Attainment of CO1 = (0.9 x 2.4)+(0.1 x 2.26) = 2.4

Name of Department- Computer Science & Engineering
B. Tech. II Year III Semester 2022-23
Final CO Attainment
(0.9*Direct CO of Given CO)+(0.1*Indirect CO of Given CO)

Name of the Subject - 3CS1-02-I Technical Communication

Final CO Attainment (90% of Direct Level + 10% of Indirect Level)	CO1	CO2	CO3	CO4	CO5
	2.75	2.75	2.74	2.75	2.76

Name of the Subject - 3CS2-01 Advanced Engineering Mathematics

Final CO Attainment (90% of Direct Level + 10% of Indirect Level)	CO1	CO2	CO3	CO4	CO5
	2.28	2.28	2.28	2.29	2.28

Name of the Subject -(3CS3-04 Digital Electronics

Final CO Attainment (90% of Direct Level + 10% of Indirect Level)	CO1	CO2	CO3	CO4	CO5
	2.29	2.30	2.29	2.30	2.31

Name of the Subject -3CS4-05- Data Structures And Algorithms

Final CO Attainment (90% of Direct Level + 10% of Indirect Level)	CO1	CO2	CO3	CO4	CO5
	2.36	2.36	2.37	2.37	2.35

Name of Department- Computer Science & Engineering
B. Tech. II Year III Semester 2022-23
CO Gap Analysis

S. No.	Name of Subject		Attainment	Target	Difference	Attained or Not Attained	Next Traget for Batch 2023-24
1	TC 3CS1-02	CO1	2.75	2.67	0.08	Attained	2.72
		CO2	2.75	2.67	0.08	Attained	2.72
		CO3	2.74	2.65	0.09	Attained	2.70
		CO4	2.75	2.65	0.10	Attained	2.70
		CO5	2.76	2.65	0.11	Attained	2.70
2	AEM 3CS2-01	CO1	2.28	2.47	-0.19	Not Attained	2.47
		CO2	2.28	2.47	-0.19	Not Attained	2.47
		CO3	2.28	2.47	-0.19	Not Attained	2.47
		CO4	2.29	2.47	-0.18	Not Attained	2.47
		CO5	2.28	2.47	-0.19	Not Attained	2.47
3	DE 3CS3-04	CO1	2.29	2.346	-0.05	Not Attained	2.35
		CO2	2.30	2.295	0.00	Attained	2.34
		CO3	2.29	2.3358	-0.04	Not Attained	2.34
		CO4	2.30	2.346	-0.04	Not Attained	2.35
		CO5	2.31	2.295	0.01	Attained	2.34
4	DSA 3CS4-05	CO1	2.36	2.652	-0.29	Not Attained	2.65
		CO2	2.36	2.652	-0.30	Not Attained	2.65
		CO3	2.37	2.6418	-0.27	Not Attained	2.64
		CO4	2.37	2.652	-0.28	Not Attained	2.65
		CO5	2.35	2.6316	-0.28	Not Attained	2.63

Fig 5. Gap Identification and Target Setting for Next Year

11. Calculation of PO/PSO Attainment

Step 1 : To calculate PO attainment, we refer the following values.

(i) Final Attainment Level of COs [Refer Step 11 in the previous section]
(ii) CO-PO mapping correlations. [Refer Step 1 in the previous section]
(iii) Maximum Correlation Value. ie; 3

Name of Department- Computer Science & Engineering
Semester wise and Overall CO Average Attainment
2020-2024 Batch

S. No.	Sem	Course No.	Course Name	CO-1	CO-2	CO-3	CO-4	CO-5	Average
1	III SEM	3CS1-02	MEFA	2.82	2.82	2.82	2.82		2.82
2	III SEM	3CS2-01	AEM	2.70	2.70	2.70	2.70		2.70
3	III SEM	3CS3-04	DE	2.69	2.69	2.69	2.69	2.69	2.69
4	III SEM	3CS4-05	DSA	2.75	2.75	2.75	2.75	2.75	2.75
5	III SEM	3CS4-06	OOP	2.65	2.65	2.65	2.65	2.65	2.65
6	III SEM	3CS4-07	SE	2.65	2.65	2.65	2.65	2.65	2.65
7	III SEM	3CS4-21	DSA LAB	2.90	2.91	2.88	2.84	2.88	2.88
8	III SEM	3CS4-22	OOPS LAB	2.92	2.90	2.92	2.85	2.89	2.90
9	III SEM	3CS4-23	SE LAB	2.90	2.93	2.93	2.85	2.93	2.91
10	III SEM	3CS4-24	DE LAB	2.94	2.97	2.97	2.90	2.94	2.94
11	III SEM	3CS7-30	INDUSTRIAL TRAINING	2.89	2.95	2.95	2.88	2.93	2.92
Average of III Sem CO				2.80	2.81	2.81	2.78	2.81	2.80

Fig 6. Average CO Attainment

Step 2 : The PO attainment for each CO is calculated as follows:

$$PO \text{ and } PSO \text{ Attainment} = \frac{\sum_{CO1}^{n} Product\ of\ Respective\ Final\ CO\ Attainment\ Level\ and\ Respective\ CO}{Average\ Correlation\ value\ of\ respective\ PO}$$

i.e, Final Attainment for CO1 is 2.90, CO1-PO1 mapping is 3, So the PO1 attainment w.r.to CO1 to 5 is = $\frac{[3\times2.8+2\times2.81+3\times2.81+3\times2.78+2\times2.81]}{[3+2+3+3+2]} = 2.8$

Department of Computer Science and Engineering
All PO-CO Mapping Average
Batch 2020-24

SUB: Code/Name:- 3CS4-05 DSA

COURSE OBJECTIVE	PROGRAM OUTCOME												PSO	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
I	3	2	1	1						1	1	1	3	
II	2	2	1									1	2	1
III	3	2	3		1							3	3	2
IV	3	1				3					2	2	1	
V	2	1		2						1	1	2	2	1
AVG	2.8	2.8	2.8	2.8	2.8	2.8				2.8	2.8	2.8	2.8	2.8

S. No.	CO's No.	CO Attainments
1	CO1	2.80
2	CO2	2.81
3	CO3	2.81
4	CO4	2.78
5	CO5	2.81

CO-PO Mapping Correlation Value

CO Wise Final Attainment

Step 3 : Repeat the calculation for all POs/PSOs

Step 4 : Compute the average PO attainment for each POs/PSOs

Step 5 : The PO attainments of all the courses are listed and the average PO attainments are calculated. Then the average PO attainments are compared with the target PO to check whether the POs are attained at programme level or not.

Department of Computer Science and Engineering
PO Target Level
Batch 2020-24

PO Target Level				PO 1		PO 2		PO 3		PO 4		PO 5		PO 6		PO 7		PO 8		PO 9		PO 10		PO 11		PO 12		PSO 1		PSO 2	
				Target Level	Att Level	Target Level	Att Level	Target Level	Att Level	Target Level	Att Level	Target Level	Att Level	Target Level	Att Level	Target Level	Att Level	Target Level	Att Level	Target Level	Att Level	Target Level	Att Level	Target Level	Att Level	Target Level	Att Level	Target Level	Att Level	Target Level	Att Level
S. No.	Sem	Code	Course		PO1		PO2		PO3		PO4		PO5		PO6		PO7		PO8		PO9		PO10		PO11		PO12		PSO 1		PSO 2
1	III SEM	3CS1-03	MEFA		2.80		2.81		2.80	2.65	2.81	2.67	2.80	2.66	2.78			2.65	2.81	2.65	2.81	2.70	2.81	2.67	2.78	2.68	2.80	2.70	2.80	2.71	2.81
2	III SEM	3CS2-01	AEM	2.70	2.80	2.72	2.80	2.70	2.80	2.65	2.81									2.69	2.81			2.71	2.80	2.65	2.80	2.65	2.80	2.70	2.81
3	III SEM	3CS3-01	DE	2.65	2.80	2.67	2.80	2.68	2.81	2.65	2.80	2.66	2.80													2.64	2.80	2.67	2.81		
4	III SEM	3CS4-05	DSA	2.70	2.80	2.80	2.80	2.71	2.81	2.72	2.81	2.72	2.81	2.65	2.78							2.70	2.81	2.69	2.79	2.70	2.80	2.72	2.81	2.72	2.81
5	III SEM	3CS4-06	OOP	2.71	2.80	2.71	2.80	2.72	2.81	2.71	2.81	2.67	2.81	2.70	2.78							2.67	2.81	2.73	2.79	2.70	2.80	2.73	2.81	2.73	2.81
6	III SEM	3CS4-07	SE	2.70	2.81	2.68	2.81	2.71	2.80	2.68	2.80	2.69	2.81							2.74	2.81	2.71	2.81	2.71	2.81	2.70	2.80	2.71	2.81	2.72	2.80
7	III SEM	3CS4-21	DSA LAB	2.72	2.80	2.72	2.80	2.70	2.80			2.71	2.79	2.72	2.81					2.73	2.80			2.72	2.79	2.73	2.80	2.74	2.80	2.70	2.80
8	III SEM	3CS4-22	OOPS LAB	2.69	2.81	2.70	2.81	2.71	2.81			2.68	2.80					2.69	2.80	2.71	2.81					2.72	2.80	2.71	2.80	2.70	2.80
9	III SEM	3CS4-23	SE LAB	2.70	2.80	2.68	2.80	2.73	2.81	2.72	2.81	2.72	2.81			2.70	2.81	2.72	2.81	2.68	2.81	2.72	2.80	2.72	2.81	2.74	2.80	2.71	2.80	2.70	2.80
10	III SEM	3CS4-24	DE LAB	2.67	2.80	2.67	2.80	2.69	2.80	2.70	2.80	2.70	2.80	2.70	2.80	2.71	2.80	2.70	2.80	2.73	2.80	2.71	2.80	2.70	2.80	2.68	2.80	2.70	2.80		
11	III SEM	3CS7-30	INDUSTRIAL TRAINING	2.65	2.80	2.71	2.80	2.68	2.81	2.69	2.80	2.68	2.81			2.68	2.80	2.70	2.81	2.73	2.79	2.70	2.81			2.70	2.79	2.68	2.80	2.72	2.79
12	IV SEM	4CS1-02	TC	2.72	2.85									2.73	2.86							2.70	2.83			2.71	2.82	2.74	2.90		
13	IV SEM	4CS2-01	DMS	2.70	2.84	2.68	2.84	2.66	2.84	2.69	2.83	2.67	2.86					2.70	2.78			2.68	2.86	2.66	2.86	2.68	2.84	2.70	2.86	2.70	2.84
14	IV SEM	4CS3-04	MPI	2.68	2.83	2.80	2.84			2.67	2.86	2.70	2.90													2.66	2.82	2.70	2.86		
15	IV SEM	4CS4-05	DBMS	2.71	2.84	2.71	2.84	2.70	2.81	2.70	2.82	2.73	2.82	2.70	2.85							2.72	2.86	2.72	2.85	2.67	2.84	2.68	2.84	2.71	2.83
16	IV SEM	4CS4-06	TOC	2.72	2.84	2.70	2.84	2.72	2.80			2.72	2.82															2.73	2.89	2.70	2.85
17	IV SEM	4CS4-07	DCCN	2.70	2.83	2.72	2.80	2.69	2.85			2.73	2.78			2.72	2.86			2.70	2.86					2.71	2.84	2.70	2.84	2.70	2.84
18	IV SEM	4CS4-21	MPI LAB	2.71	2.84	2.71	2.85			2.70	2.86															2.71	2.85	2.70	2.86	2.70	2.85
19	IV SEM	4CS4-22	DBMS LAB	2.72	2.84	2.70	2.84	2.70	2.84	2.70	2.82	2.71	2.84	2.71	2.86	2.73	2.86	2.70	2.86	2.71	2.84	2.73	2.80	2.71	2.86	2.70	2.84	2.70	2.84	2.72	2.84
20	IV SEM	4CS4-23	NP LAB	2.73	2.85	2.72	2.85	2.71	2.80	2.71	2.80	2.72	2.90							2.69	2.80			2.71	2.80	2.72	2.84	2.72	2.80	2.69	2.85
21	IV SEM	4CS4-24	LSP LAB	2.70	2.84	2.71	2.86	2.72	2.86	2.72	2.86	2.71	2.86							2.65	2.86			2.69	2.86	2.70	2.83	2.68	2.86	2.70	2.85
22	IV SEM	4CS4-25	JAVA LAB	2.72	2.85	2.68	2.82	2.70	2.84	2.70	2.84	2.72	2.84	2.72	2.82					2.72	2.83	2.70	2.84			2.68	2.86	2.71	2.85	2.70	2.86
23	V SEM	5CS3-01	ITC	2.73	2.78	2.75	2.77	2.74	2.77	2.73	2.78			2.80	2.78							2.83	2.78			2.82	2.78				
24	V SEM	5CS4-02	CD	2.72	2.78	2.70	2.78	2.71	2.77	2.74	2.78	2.68	2.80													2.80	2.78	2.78	2.78		
25	V SEM	5CS4-03	OS	2.74	2.78	2.73	2.78					2.70	2.78			2.73	2.78									2.81	2.78	2.72	2.78	2.75	2.78
26	V SEM	5CS4-04	CGM	2.72	2.77	2.70	2.78	2.73	2.77																			2.78	2.78	2.76	2.79
27	V SEM	5CS4-05	AOA	2.70	2.78	2.73	2.77	2.74	2.80			2.70	2.77															2.77	2.78		
28	V SEM	5CS5-11	WC	2.70	2.78	2.70	2.78	2.72	2.78	2.73	2.78	2.69	2.78	2.81	2.78	2.75	2.79	2.73	2.80	2.77	2.79	2.82	2.79	2.73	2.78	2.82	2.79	2.81	2.77	2.79	2.76
29	V SEM	5CS4-21	CGM LAB	2.75	2.77	2.71	2.78	2.72	2.78			2.72	2.76															2.72	2.78		
30	V SEM	5CS4-22	CD LAB	2.76	2.78	2.73	2.78	2.71	2.78			2.73	2.75													2.84	2.78	2.77	2.78		
31	V SEM	5CS4-23	AOA LAB	2.72	2.77	2.73	2.78	2.70	2.78	2.74	2.78	2.71	2.78	2.81	2.78	2.74	2.78					2.83	2.78			2.85	2.79	2.75	2.78	2.79	2.78
32	V SEM	5CS4-24	AJ LAB	2.76	2.78	2.74	2.78					2.72	2.78													2.83	2.78	2.74	2.78		
33	V SEM	5CS7-30	INDUSTRIAL TRAINING	2.73	2.78	2.72	2.79	2.73	2.78	2.75	2.79	2.71	2.78			2.77	2.80	2.77	2.77	2.80	2.78	2.82	2.75			2.86	2.80	2.81	2.79	2.79	2.79
34	VI SEM	6CS3-01	DIP	2.72	2.80	2.76	2.80	2.71	2.79	2.74	2.80	2.73	2.79	2.74	2.81	2.75	2.78									2.82	2.80	2.74	2.80		
35	VI SEM	6CS4-02	ML	2.70	2.81	2.75	2.81	2.72	2.81	2.75	2.80									2.78	2.80	2.81	2.80	2.81	2.80	2.80	2.80	2.77	2.81	2.82	2.81
36	VI SEM	6CS4-03	ISS	2.70	2.80	2.70	2.80	2.76	2.80	2.75	2.81							2.75	2.81							2.83	2.81	2.81	2.80		
37	VI SEM	6CS4-04	CAO	2.73	2.80	2.70	2.80	2.71	2.80	2.70	2.81			2.74	2.81											2.84	2.80	2.72	2.80		
38	VI SEM	6CS4-05	AI	2.71	2.81	2.70	2.81	2.76	2.80	2.70	2.80	2.69	2.81	2.75	2.79	2.82	2.80					2.83	2.81			2.81	2.80	2.77	2.80		
39	VI SEM	6CS4-06	CC	2.71	2.80							2.70	2.79					2.77	2.81									2.80	2.80	2.81	2.80
40	VI SEM	6CS5-11	DS	2.75	2.80	2.71	2.80			2.75	2.80															2.79	2.80	2.76	2.80		
41	VI SEM	6CS4-21	DIP LAB	2.75	2.80	2.74	2.80			2.75	2.80	2.75	2.80	2.80	2.80	2.82	2.80			2.78	2.81					2.82	2.80	2.82	2.81	2.74	2.80
42	VI SEM	6CS4-22	ML LAB	2.74	2.81	2.76	2.81	2.74	2.81	2.75	2.80									2.78	2.80	2.79	2.80	2.82	2.80	2.85	2.80	2.74	2.81	2.76	2.81
43	VI SEM	6CS4-23	PYTHON LAB	2.69	2.80	2.71	2.80	2.75	2.80	2.75	2.80	2.74	2.80													2.84	2.80	2.81	2.80		
44	VI SEM	6CS4-24	MAD LAB	2.72	2.80	2.74	2.80	2.73	2.78	2.75	2.81	2.75	2.80									2.79	2.80					2.75	2.80	2.77	2.80
45	VII SEM	7CS4-01	IOT	2.74	2.77	2.71	2.80	2.76	2.77	2.72	2.79	2.74	2.77			2.76	2.80	2.76	2.77			2.76	2.73			2.74	2.80	2.71	2.78	2.75	2.78
46	VII SEM	7ME6-60.2	QM	2.72	2.77	2.71	2.81	2.74	2.77	2.71	2.80	2.76	2.77			2.70	2.81	2.70	2.77			2.74	2.75			2.72	2.81	2.73	2.79	2.75	2.78
47	VII SEM	7CS4-21	IOT LAB	2.75	2.77	2.72	2.77	2.70	2.80	2.72	2.79									2.70	2.80			2.72	2.80	2.70	2.77	2.78	2.79	2.74	2.80
48	VII SEM	7CS4-22	CS LAB	2.72	2.77	2.76	2.77	2.70	2.77	2.76	2.77	2.70	2.77													2.73	2.77	2.76	2.77		
49	VII SEM	7CS7-30	IT LAB	2.72	2.77	2.74	2.80	2.76	2.77	2.71	2.80	2.73	2.77			2.75	2.81	2.75	2.77	2.72	2.76	2.72	2.73			2.76	2.80	2.70	2.79	2.74	2.76
50	VII SEM	7CS7-40	SEMINAR	2.71	2.77	2.73	2.80	2.75	2.77	2.71	2.79	2.75	2.77			2.71	2.80	2.71	2.77			2.75	2.73			2.74	2.80	2.73	2.78	2.71	2.78
51	VIII SEM	8CS4-01	BDA			2.75	2.67			2.75	2.71	2.88	2.67	2.67	2.67	2.65	2.67	2.65	2.67	2.65	2.66			2.69	2.70	2.65	2.67	2.70	2.67	2.65	2.66
52	VIII SEM	8EE6-60.2	SC			2.72	2.67			2.70	2.69	2.71	2.67	2.65	2.66	2.71	2.66	2.71	2.67	2.69	2.66			2.66	2.70	2.68	2.65	2.64	2.69	2.67	2.67
53	VIII SEM	8CS4-21	BDA LAB	2.74	2.67	2.71	2.67	2.75	2.66	2.76	2.67	2.70	2.67															2.65	2.68	2.67	2.68
54	VIII SEM	8CS4-22	STV LAB	2.75	2.67	2.71	2.67	2.74	2.67	2.71	2.66									2.71	2.62			2.65	2.62	2.65	2.66	2.68	2.67	2.70	2.67
55	VIII SEM	8CS7-50	PROJECT LAB	2.72	2.71	2.72	2.67	2.69	2.67	2.69	2.64	2.67	2.67			2.70	2.67	2.70	2.65	2.69	2.68	2.70	2.69	2.68	2.67	2.65	2.65	2.69	2.69	2.67	2.62

Target Level	2.72		2.72		2.72		2.72		2.71		2.74		2.74		2.71		2.71		2.75		2.71		2.74		2.74		2.72	
Indirect Attainment Level		2.58		2.54		2.60		2.53		2.60		2.47		2.62		2.53		2.48		2.51		2.54		2.51		2.51		2.59
Direct Attainment Level		2.80		2.79		2.79		2.79		2.79		2.79		2.78		2.77		2.78		2.79		2.79		2.79		2.79		2.79
80% of Direct + 20% of Indirect		2.75		2.74		2.75		2.74		2.75		2.73		2.75		2.73		2.72		2.73		2.74		2.74		2.74		2.75
		Achieved		Achieved		Achieved		Achieved		Achieved		Achieved		Achieved		Achieved		Achieved		Not Achieved		Achieved		Not Achieved		Achieved		Achieved	

Direct Attainment: PO attainments of all the courses are listed in the above table and its average is computed. So Direct attainment is the average PO attainment of all the courses of a programme.

Indirect Attainment: Programme exit survey like students' exit survey, faculty survey, industrial feedback and alumni survey will be conducted similar to course exit survey. These survey questionnaires will verify the attainment of all POs of a programme.

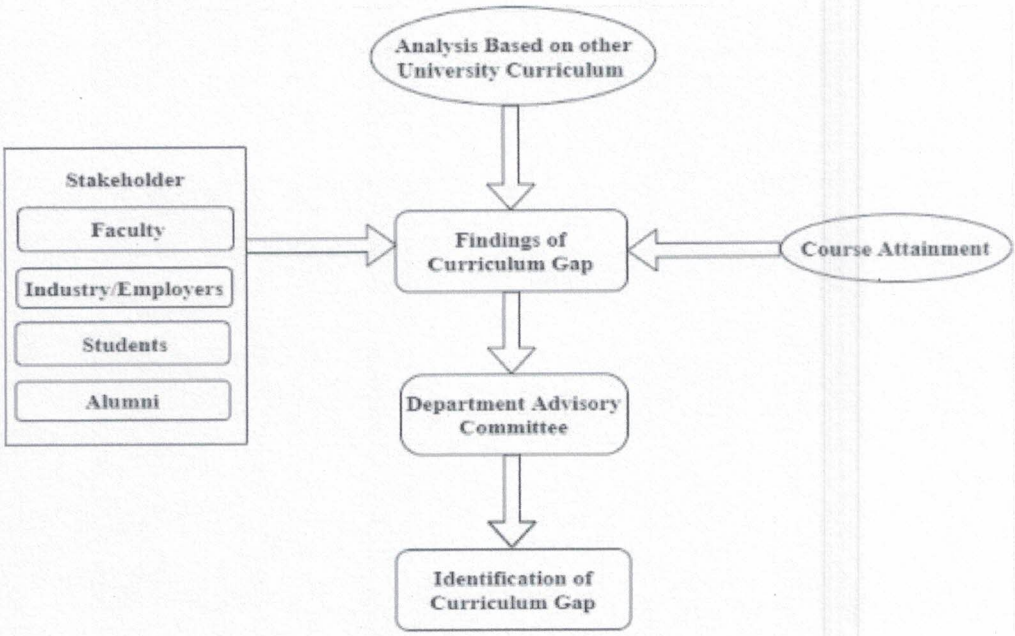
Final Attainment: **80% of direct attainment and 20% of indirect attainments** are added to find the final PO attainment of a programme.

Name of Department- Computer Science & Engineering
B. Tech. 2020-24 Batch
Gap Analysis of PO

S. No.	PO/PSO	Attainment	Target	Difference	Attained or Not Attained	Next Traget for Batch 2021-25
1	PO1	2.75	2.72	0.04	Attained	2.77
2	PO2	2.74	2.72	0.02	Attained	2.77
3	PO3	2.75	2.72	0.04	Attained	2.77
4	PO4	2.74	2.72	0.02	Attained	2.77
5	PO5	2.75	2.71	0.04	Attained	2.76
6	PO6	2.73	2.73	0.00	Attained	2.78
7	PO7	2.75	2.73	0.02	Attained	2.79
8	PO8	2.73	2.71	0.01	Attained	2.77
9	PO9	2.72	2.71	0.01	Attained	2.77
10	PO10	2.73	2.75	-0.01	Not Attained	2.75
11	PO11	2.74	2.71	0.03	Attained	2.76
12	PO12	2.74	2.74	-0.01	Not Attained	2.74
13	PSO1	2.74	2.73	0.01	Attained	2.78
14	PSO2	2.75	2.72	0.03	Attained	2.78

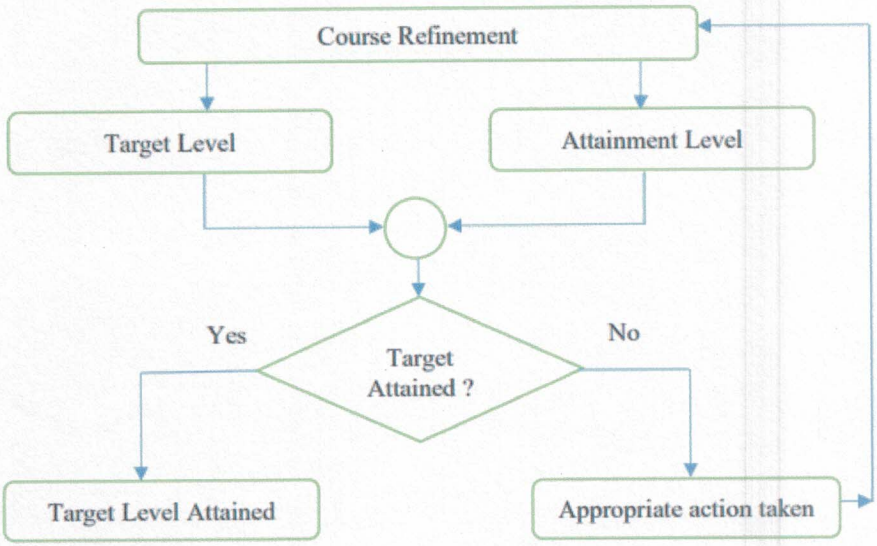
12. GAP ANALYSIS

- If targets are achieved for that year, higher targets can be set **(increase the target by 2% to 5%)** for the following academic year as a part of continuous improvement.
- If targets are not achieved, an **action plan** should be performed to attain the target in the subsequent years.



13. Continuous Improvement in PO/PSO Attainment

Based on the PO/PSO Attainment for a course, we take appropriate action to refine the course if target is not achieved. Also, we can suggest to refine the PO/PSO attainment target in future.



Every Faculty needs to compute two main attainment values as mentioned below. Based on that if target is not attained then appropriate actions should be taken.

- CO attainment
- PO attainment w.r.to CO

Course audit professor will analysis the PO/PSO attainment section-wise and recommends for further actions.

Arya College of Engineering (ACE)

(Previously known as Arya Institute of Engineering & Technology - AIET)

Approved by AICTE, New Delhi

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ATTAINMENT PROCEDURE