Sant Dnyaneshwar Shikshan Sanstha's

ANNASAHEB DANGE COLLEGE OF ENGINEERING AND TECHNOLOGY, ASHTA

(An Empowered Autonomous Institute)

25 Years of Exellence

- Affiliated to Shivaji University, Kolhapur
- 'A++' Grade Institute Accredited by NAAC, Bangalore
- NBA Accredited courses
- An ISO 9001 : 2015 Certified Institute

OBE Implementation Manual:

(A complete guide for OBE execution)

Prepared by

The office of Dean (Quality Assurance)
and
Internal Quality Assurance Cell (IQAC)

Annasaheb Dange College of Engineering and Technology, Ashta

(An Empowered Autonomous Institute)

Ashta, Sangli, Maharashtra, 416301

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(A complete guide for OBE execution)

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I, the Director, Dr Laxman Yadu Waghmode, declare that the particulars given above are true to the best of my knowledge and belief.

Dr Laxman Yadu Waghmode
Director, ADCET, Ashta.
Publisher

PREFACE

Annasaheb Dange College of Engineering and Technology, Ashta, identified a need for an OBE implementation manual at the institute. So, with this motivation, the office of the Dean [Quality Assurance] and Internal Quality Assurance Cell [IQAC] of Annasaheb Dange College of Engineering and Technology (ADCET), Ashta, undertook a task to document a unique process we adopted in implementing OBE. This document will help in future NBA and NAAC accreditation visits, as it will be a complete policy document for all OBE-related activities.

Second, this document will help all faculty members and the programs at ADCET, Ashta, prepare their documentation, such as preparing SAR or SSR for upcoming NBA and NAAC visits.

Finally, as an induction guide, this document is required for all newly joined faculty members to understand the OBE implementation at ADCET, Ashta. As this is an initial version of the document, your comments and suggestions are highly welcome to make this document more valuable.

I would also like to thank all my colleagues for their support during this process.

[Dr. Abhijitkumar Anandrao Jadhav]

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OUR INSPIRATION

Hon. Shri. [Dr.] Annasaheb Dange
Founder President, SDSS, Islampur

Dr Annasaheb Dange [Appa] is a visionary leader, social reformer, and educationist who made significant contributions to the development of rural Maharashtra. He is the Founder President of Sant Dnyaneshwar Shikshan Sanstha, Islampur, an institution dedicated to providing quality education and fostering social upliftment. He is also the founder of one of the best spinning mills in western Maharashtra, Deendayal Spinning Mill, located in Islampur.

In addition to his educational contributions, Appa served as the Minister for Rural Development, Water Supply, and Social Welfare in the state of Maharashtra. During his tenure, he implemented impactful policies to improve the quality of life in rural areas.

He is also the author of several books and literary works.

OUR MENTORS

Adv. Rajendra R. Dange
Secretary, SDSS, Islampur

Shri. Vishwanath R. Dange
Joint Secretary, SDSS, Islampur

OUR LEADER

Dr Laxman Y. Waghmode
Director, ADCET, Ashta

Vision of the Institute

To be a leader in producing professionally competent engineers.

Mission of the Institute

We, Annasaheb Dange College of Engineering & Technology, Ashta, are committed to achieve our vision by,

M1. Imparting effective outcome-based education.

M2. Preparing students through skill-oriented courses to excel in their profession with ethical values.

M3. Promoting research to benefit the society.

M4. Strengthening relationships with all the stakeholders.

FROM THE DESK OF THE DIRECTOR,

I hope this message finds you well. As we navigate the dynamic landscape of engineering education, I'd like to highlight three pivotal areas that contribute significantly to our institution's success.

Outcome-Based Education:

OBE is no longer a mere buzzword; it's the bedrock of modern pedagogy. By focusing on learning outcomes—what our students can do—we empower them for real-world challenges. Let's continue aligning our curriculum, teaching methods, and assessments with measurable outcomes. Engage faculty in designing robust Course Outcomes (COs) and Program Outcomes (POs). Remember, OBE isn't just about ticking boxes; it's about nurturing competent, adaptable engineers. We at our institute always focus on quality and accreditation. The recent results from the NBA and NAAC highlight our commitment to implementing OBE for the betterment of students and the institute. But let's not rest; continuous improvement is our mantra.

Quality Assurance and Accreditation:

Accreditation isn't a bureaucratic hurdle; it's our compass. It ensures we're on the right track, meeting global standards. Our recent accreditation results (kudos to the team ADCET!) reflect our commitment. But let's not rest; continuous improvement is our mantra. Engage with the accrediting bodies, learn from their feedback, and address gaps. Accreditation isn't an endpoint; it's a journey.

Internal Quality Assurance Cell (IQAC):

Our IQAC plays a pivotal role. It's not just paperwork; it's about fostering excellence. Encourage faculty to participate actively. Let's use IQAC as a platform for OBE orientation, sharing best practices, and driving quality improvement. Remember, quality isn't an accident; it's a deliberate choice we make daily.

I hope that this OBE implementation manual will help our faculties in their work and serve as an induction guide for newly joined faculties at ADCET, Ashta.

Thank you....

Dr Laxman Yadu Waghmode

Director
Annasaheb Dange College of Engineering and Technology, Ashta.

FORWARD,

With great enthusiasm, I introduce this comprehensive NBA Implementation Manual (NIM) for Annsaheb Dange College of Engineering and Technology (ADCET), Ashta, as a vital resource, as it is a prestigious institute striving for excellence in technical education. In my long-term association with ADCET, Ashta, I witnessed the milestone achievements of this institute. It includes NBA accreditation of all eligible programs in tier II, receiving autonomous status, receiving an A++ grade in NAAC accreditation, and recent NBA accreditation of four UG programs in tier I. As an expert in the field of accreditation, I have also witnessed first-hand the transformative power of the National Board of Accreditation (NBA) in elevating educational standards and fostering a culture of continuous improvement.

The journey towards NBA accreditation is not merely a procedural exercise but a commitment to quality, innovation, and accountability. This manual serves as a beacon, guiding institutions through the complicated accreditation process with clarity and precision. It encapsulates the essence of the NBA's mission to promote and recognise excellence in technical education, ensuring that our graduates are well-equipped to meet the demands of a rapidly evolving global landscape.

Key Highlights of This Manual:

Comprehensive Guidelines: Detailed instructions for each process involved in the OBE. It will help to prepare the Self-Assessment Report (SAR), map Program Outcomes (POs) and Course Outcomes (COs), and align them with the institution's vision and mission.

Best Practices: Insights into effective pedagogical strategies, assessment events, assessment tools/ methods, and continuous improvement.

Tools and Templates: Assessment tools and templates of rubrics to streamline the accreditation process, ensuring that institutions can efficiently document and demonstrate their adherence to NBA and NAAC standards.

The NBA accreditation process is rigorous yet rewarding. It challenges institutions to critically evaluate their programs, identify areas for improvement, and implement strategies that enhance the overall quality of education.

As you embark on this path, remember that accreditation is not an endpoint but a continuous journey of growth and excellence. The commitment to quality education is a testament to your institution's dedication to shaping the future of our nation. I commend you for your efforts and wish you success, so that henceforth all programs applying for NBA accreditation will pursue six-year accreditation from the NBA.

Warm regards,

Dr Vitthal S Bandal

[Principal]
[Government Polytechnic, Awasari (Khurd), Pune]
[14.12.2024]

ABBREVIATIONS

ABET	:	Accreditation Board for Engineering and Technology, Baltimore, USA
COs	:	Course Outcomes
GA	:	Graduate Attributes
IPR	:	Intellectual Property Rights
LOs	:	Learning Outcomes
NBA, India	:	National Board of Accreditation, India
POs	:	Program Outcomes
SAR	:	Self-Assessment Report
WA	:	Washington Accord
PSOs	:	Program Specific Outcomes
PEO	:	Program Educational Objectives
PI	:	Performance Indicators
NAAC	:	National Assessment and Accreditation Council
OBE	:	Outcome-Based Education
OBTL	:	Outcome-Based Teaching Learning
OBA	:	Outcome-Based Assessment
WK	:	Washington Accord's Knowledge Profile

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1. INTRODUCTION

Globalising the world economy and higher education is causing significant changes to the engineering education system. As a result, we must continue to dynamically adapt to these changes to remain competitive and successfully respond to the difficulties of globalisation. Nowadays, engineering graduates require holistic development rather than a constrained approach. Nowadays, the expectations of society and industries are enormous for fresh engineering graduates. They expect a multi-skilled, industry-ready human resource, which fits multidimensional tasks to be performed immediately after their inception in the profession. Thus, engineering graduates must not only be competent in their field but also possess a new set of soft, professional skills and abilities.

In recent years, Engineering Education has evolved in terms of what to teach (content), how to teach (content delivery), and how to assess students (student learning/outcome).

On the same note, it is also challenging for engineering educational institutes to engage in the all-inclusive growth of budding engineers. Therefore, the strategies adopted at these institutes must align with and be attentive to the learning outcomes (LOs): "A list of desirable competencies and skills essential among graduates." These desirable competencies and abilities should be imparted from student registration until graduation and implemented later when they engage in society and profession.

National Board of Accreditation (NBA) India, an accreditation agency that aligns with international accreditation authorities like the Accreditation Board for Engineering and Technology (ABET), supervises technical education with detailed evaluation guidelines. Graduate attributes (GAs) have been laid in the Washington Accord (WA) with ABETs' initiation, and fellow countries, including India, widely accepted them. The GAs are a set of desirable competencies or LOs of engineering graduates and are supposed to be acquired during graduation. NBA, India referred to these desirable competencies or LOs as program outcomes (POs) with predefined statements cited in its self-assessment report (SAR) (Edition: June 2015) and expected every Engineering Institute from India to follow it. Ultimately, these POs are also described as "what the student should be able to do at the end of their graduation".

Continuous and progressive monitoring of POs aligned to an undergraduate since his admission to his graduation is recommended mostly; thus, instant corrective action (if needed) during graduation may be initiated. Having continuous and progressive attainment would benefit a specific undergraduate in identifying the POs behind which they lag. It would allow him to concentrate on the lagging POs and master them by rectifying the weaknesses during the remaining graduation period. At the same time, the institute may contribute to this value addition for a particular undergraduate lagging in specific POs by providing the necessary infrastructure, the guidance of experts, training, hands-on courses, and motivation. If such competency deficiencies are exposed after graduation, it will not benefit the candidate, institute, industry, and society. Knowing the deficiencies well before graduation will always be advisable, which helps initiate corrective actions. It would boost the probability of moulding an undergraduate as an industry-ready and multidimensional human resource in line with desirable competencies. It is also possible to monitor the performance of the same undergraduate about identified lagging POs in subsequent progressive attainments until its improvement or the final (fourth) year of graduation, whichever appears earlier.

At Annasaheb Dange College of Engineering and Technology in Ashta, we are always committed to providing high-quality education and supporting student development. As a result, we have progressed in adopting Outcome-Based Education (OBE) since 2014, when we faced our first accreditation visit, thanks to

supportive management, a visionary executive director, dedicated faculty, enthusiastic students and helpful stakeholders.

Throughout these years, we have progressed by developing the OBE system autonomously, without any professional consulting agency's assistance in implementing OBE. However, we discussed with many academic experts to understand the philosophy, but we have not implemented it as it is in our institute. We developed our methodology based on the conditions suitable for our existing process. As a result, every department at ADCET, Ashta, has now specialised in OBE implementation.

However, the NBA visiting expert team noted the necessity for a formal policy on OBE implementation during their visit in April 2024; therefore, this draft of the OBE implementation manual is planned. It will also benefit the new faculty members joining ADCET, Ashta, by helping them understand our techniques and implementation process.

1.1 Outcome-Based Education (OBE): Shaping the Future of Learning

Outcome-Based Education (OBE), Outcome-Based Teaching and Learning (OBTL), and Outcome-Based Assessment contribute to a comprehensive framework that has gained popularity in modern education. This paradigm shift is centred on clearly outlining what students should know and be able to do by the end of their educational journey.

OBE is a teaching approach that emphasises learning outcomes during the curriculum-building process. Instead of focusing on what content should be covered, OBE focuses on what students should accomplish by the end of their educational journey. This approach assumes that education should be purposeful, aiming to produce competent, well-rounded individuals. Identifying and articulating learning outcomes is an essential feature of OBE. These outcomes are specific, quantitative statements that outline what students should know, comprehend, and be able to show. Defining these outcomes allows educators to develop a curriculum design, instruction, and assessment roadmap. OBE attempts to ensure that students learn and develop the necessary skills and abilities relevant to their chosen field and society's enormous demands.

Traditional education often focuses on delivering content—memorising facts and theories. However, OBE takes a different path. It emphasises mastery of specific skills and knowledge rather than mere accumulation of information. Adaptability, problem-solving, and critical thinking are prized in an ever-evolving job market. OBE aligns education with these demands, ensuring that students graduate with practical competencies that make them valuable contributors to society.

OBE encourages students to engage deeply with the material. Instead of ticking off tasks, they understand the tangible skills they are acquiring and see their progress toward achieving specific learning outcomes. Research suggests that institutions implementing OBE experience enhanced student engagement and satisfaction. When students know their learning goals and see their progress, motivation increases.

The Future of Jobs Report 2020 by the World Economic Forum highlights the growing importance of creativity and emotional intelligence. OBE ensures that graduates possess these essential skills, making them more adaptable to the changing dynamics of the job market. Critics of OBE raise concerns about standardisation and lack of flexibility in curriculum design. While OBE provides a solid framework, it should allow room for individualised learning paths. Faculty development plays a crucial role in effective OBE implementation. Continuous training helps educators design meaningful assessments aligned with desired learning outcomes.

1.2 Outcome-Based Teaching and Learning (OBTL)

OBTL is the practical implementation of OBE principles in the classroom. It involves aligning teaching methods and learning activities with predefined learning outcomes. In OBTL, the focus shifts from the traditional teacher-centric approach to a more student-centric one. Educators can design strategies that actively engage students in learning, fostering critical thinking, problem-solving, and other essential skills.

In OBTL, the teacher becomes a facilitator, guiding students through the learning journey. Various pedagogical approaches, such as project-based, collaborative, and experiential learning, are often employed to create a dynamic and interactive classroom environment. The aim is to transmit information and cultivate a deep understanding and application of knowledge.

By integrating OBTL into their teaching practices, educators tailor their methods to suit diverse learning styles and promote a deeper understanding of the subject matter. This approach encourages students to take responsibility for their learning, promoting lifelong learning skills that extend beyond the confines of the classroom.

1.3 Outcome-Based Assessment (OBA)

Assessment in the OBE framework is designed to measure the extent to which students have achieved the specified learning outcomes. Unlike traditional assessments that focus primarily on testing recall of information, outcome-based assessment evaluates a broader range of competencies, including critical thinking, problem-solving, and practical application of knowledge.

Assessment tasks are aligned with the defined outcomes, ensuring that the evaluation process is directly linked to the educational goals. These assessments can take various forms, such as examinations, projects, presentations, and portfolio developments. The emphasis is on authentic assessments that mirror real-world scenarios, allowing students to showcase their skills and knowledge in practical contexts.

Outcome-based assessment provides valuable feedback to students, educators, and institutions. It serves as a means of continuous improvement, allowing for the refinement of teaching methods and curriculum design. Educators can make informed decisions to enhance the learning experience by identifying areas where students may struggle or excel.

1.4 The interconnect between the OBE, OBTL, and OBA

The synergy among OBE, OBTL, and outcome-based assessment is crucial for the success of this educational approach. OBE sets the overarching goals and defines success in terms of student learning outcomes. OBTL translates these goals into action by shaping instructional strategies that actively engage students and promote deep learning. Outcome-based assessment then measures the attainment of these outcomes, providing feedback to students and educators and closing the loop for continuous improvement.

The interconnectedness ensures a coherent and purposeful educational experience. Learning outcomes guide instructional design, which in turn informs the development of assessments. This cyclical relationship promotes a holistic approach to education that goes beyond the mere transmission of information and focuses on developing relevant skills and competencies in the real world.

1.5 OBE and Accreditation in the Indian Context

National Board of Accreditation (NBA):

The NBA was established in 1994 by the All India Council for Technical Education (AICTE). Initially, it operated under the AICTE's umbrella. In January 2010, the NBA became an independent autonomous body. This transition allowed it to operate flexibly and focus on ensuring quality and relevance in technical education.

Its primary role is to assess the quality and competence of technical programs offered by educational institutions—from diploma to postgraduate levels—in fields such as engineering, technology, management, pharmacy, architecture, and related disciplines.

NBA accredits specific programs rather than entire institutes. It evaluates these programs' curriculum, teaching methodologies, infrastructure, and learning outcomes.

Notably, in 2014, the NBA achieved a significant milestone by gaining full membership status in the Washington Accord. This recognition enhances the global acceptance of Indian engineering programs. In 2014, the NBA started accrediting only the programs running with OBE.

National Assessment and Accreditation Council (NAAC):

The NAAC is an autonomous body funded by the University Grants Commission (UGC). It was established to assess and accredit Higher Education Institutions (HEIs) in India. NAAC was established in 1994 in response to the recommendations of the National Policy on Education (1986) and the Programme of Action (1992) under the umbrella of UGC. These policies aimed to address the deterioration in the quality of education and called for establishing an independent national accreditation body.

NAAC evaluates colleges and universities across various dimensions, including teaching-learning processes, research, infrastructure, governance, and student support services.

Headquartered in Bangalore, NAAC ensures quality standards and continuous improvement in higher education. With the implementation of the National Educational Policy (NEP) 2020, NAAC also expects the implementation of OBE in higher education while accrediting the institution.

Benefits of OBE:

Outcome-Based Education (OBE) offers students and educational institutions several significant benefits. A few of them are described here:

1. **Clear Learning Objectives:**

   OBE defines specific learning outcomes for each course or program. Students know exactly what they are expected to achieve, fostering clarity and purpose in their education.

2. **Alignment with Industry Needs:**

   OBE ensures graduates possess the skills and competencies relevant to the job market. Focusing on practical outcomes bridges the gap between academia and industry.

3. **Holistic Development:**

   OBE emphasizes technical knowledge, soft skills, critical thinking, and problem-solving abilities, and students graduate as well-rounded individuals.

4. **Assessment and Accountability:**

   OBE encourages continuous assessment. Faculties evaluate students based on specific outcomes, leading to better accountability and improvement.

5. **Flexibility and Adaptability:**

   OBE allows customization. Students can choose electives aligned with their interests, fostering adaptability and lifelong learning.

6. **Quality Enhancement:**

   Institutions implementing OBE focus on improving teaching methods, curriculum design, and infrastructure. This leads to overall quality enhancement.

2. ACCREDITATION HISTORY AT ADCET

At Annasaheb Dange College of Engineering and Technology (ADCET), Ashta, we are committed to providing quality higher education, fostering students' overall holistic development, and implementing quality initiatives. Hence, we have been striving to reach certain OBE implementation and accreditation milestones since its inception.

The OBE implementation in the institute started in 2013, and the following table represents the accreditation history of ADCET, Ashta.

Table No. 01 Accreditation history at ADCET, Ashta.

Sr.	Accrediting Agency	Type of Application	Validity and period	Programs Accredited /Score
1.	NBA	SAR- 2013 (2014)	1st Oct. 2014 to 30th June 2016 (2-years)	• UG Mechanical Engineering • UG Electrical Engineering • UG Information Technology
2.	NAAC	First Cycle (2015)	6th July 2021 (6-years)	Accreditation with an A grade (with 3.01 on the scale of 4)
3.	NBA	SAR 2015 (2017)	10th April 2017 to 30th June 2020 (3-years)	• UG Computer Science and Engineering • UG Electronics and Telecommunication Engineering • UG Civil Engineering • UG Automobile Engineering
4.	NBA	NBA Compliance (2018)	23th September 2020 to 30th June 2021 (2-years)	• UG Mechanical Engineering • UG Electrical Engineering
5.	NBA	SAR 2015 (2019)	29th April 2019 to 30th June 2022 (3-years)	• UG Aeronautical Engineering
6.	NBA	NBA Compliance (2020)	05th March 2020 to 30th June 2023 (3-years)	• UG Computer Science and Engineering

Sr.	Accrediting Agency	Type of Application	Validity and period	Programs Accredited /Score
7.	NBA	Reaccreditation	10th September 2021 to 30th June 2023 (3-years)	• UG Mechanical Engineering • UG Electrical Engineering • UG Civil Engineering
8.	NBA	NBA Compliance (2020)	26th August 2022 to 30th June 2025 (3-years)	• UG Aeronautical Engineering
9.	NAAC	Second Cycle (2023)	07th July 2028 (5- Years)	Accreditated with an A ++ grade (with 3.52 on the scale of 4)
10.	NBA [Tier I Institute]	SAR 2021	4th June 2024 to 30th June 2027 (3-years)	• UG Mechanical Engineering • UG Electrical Engineering • UG CSE • UG Civil Engineering

In addition to the accreditation process, there are a few additional quality milestones under the crown of ADCET, Ashta, like,

1. Conferred with Autonomous status by UGC, New Delhi and Shivaji University, Kolhapur (2017). [2017-18 to 2023-24] for the first 6 years.
2. Extension of Autonomous status by UGC, New Delhi and Shivaji University, Kolhapur (2024). [till 2032-33] for 10 years.
3. Conferred with Empowered Autonomous status by Shivaji University, Kolhapur (2024).

3.VISION, MISSION AND PEOs

A vision statement is another public declaration used by schools or educational organizations. It describes their high-level goals for the future—what they expect to achieve if they successfully fulfil their organizational purpose. A mission statement outlines the practical actions and commitments necessary to fulfil the organization's vision.

Vision and mission statements are integral to an organization's identity, providing a sense of purpose and direction. While they are related, they serve distinct roles in articulating the essence and goals of an entity.

Vision Statement Philosophy:

- **Definition:** A vision statement outlines an organization's long-term aspirations and the future state. It is a concise and inspiring declaration that communicates the desired impact or outcome the organization aims to achieve.
- **Purpose:** The primary purpose of a vision statement is to motivate and guide internal stakeholders (students, faculties, management) and external stakeholders (society, industry, parents, and alumni) by presenting a compelling picture of what the organization aims to become.

Mission Statement Philosophy:

- **Definition:** A mission statement articulates the fundamental purpose of an organization, explaining why it exists, what it does, and for whom. It concisely expresses the organization's core values, activities, and overall reason for being.
- **Purpose:** The mission statement is a guiding principle for daily operations and decision-making. It provides a framework for aligning actions with the organization's values and objectives.

In essence, the vision statement looks forward and paints a picture of success in the long run, while the mission statement focuses on the present and describes the organization's fundamental purpose and activities. Together, these statements contribute to a comprehensive understanding of an organization's identity, helping to communicate its values, aspirations, and commitment to stakeholders.

3.1 Process for articulating the vision and mission of the institute

We articulated the institute's existing vision and mission in 2016 using a well-defined approach and brainstorming. The institute's vision and mission are established using the following procedure, and the same process is used to confirm its achievement every six years. Any modification in the vision and mission of the institute will be performed with a similar methodology,

1. The Executive Director chairs and constitutes a high-level committee composed of senior professors, administrative staff, and management representatives.
2. The committee reviews institute goals and achievements, as well as feedback from stakeholders, and prepares drafts of vision and mission statements with well-organized brainstorming sessions within that group.
3. A pre-final draft is presented to other stakeholders for review and comments.
4. The committee reviews the suggestions received on the draft and prepares the final draft for approval by the core committee, IQAC, Academic Council (AC), and Governing Body (GB).

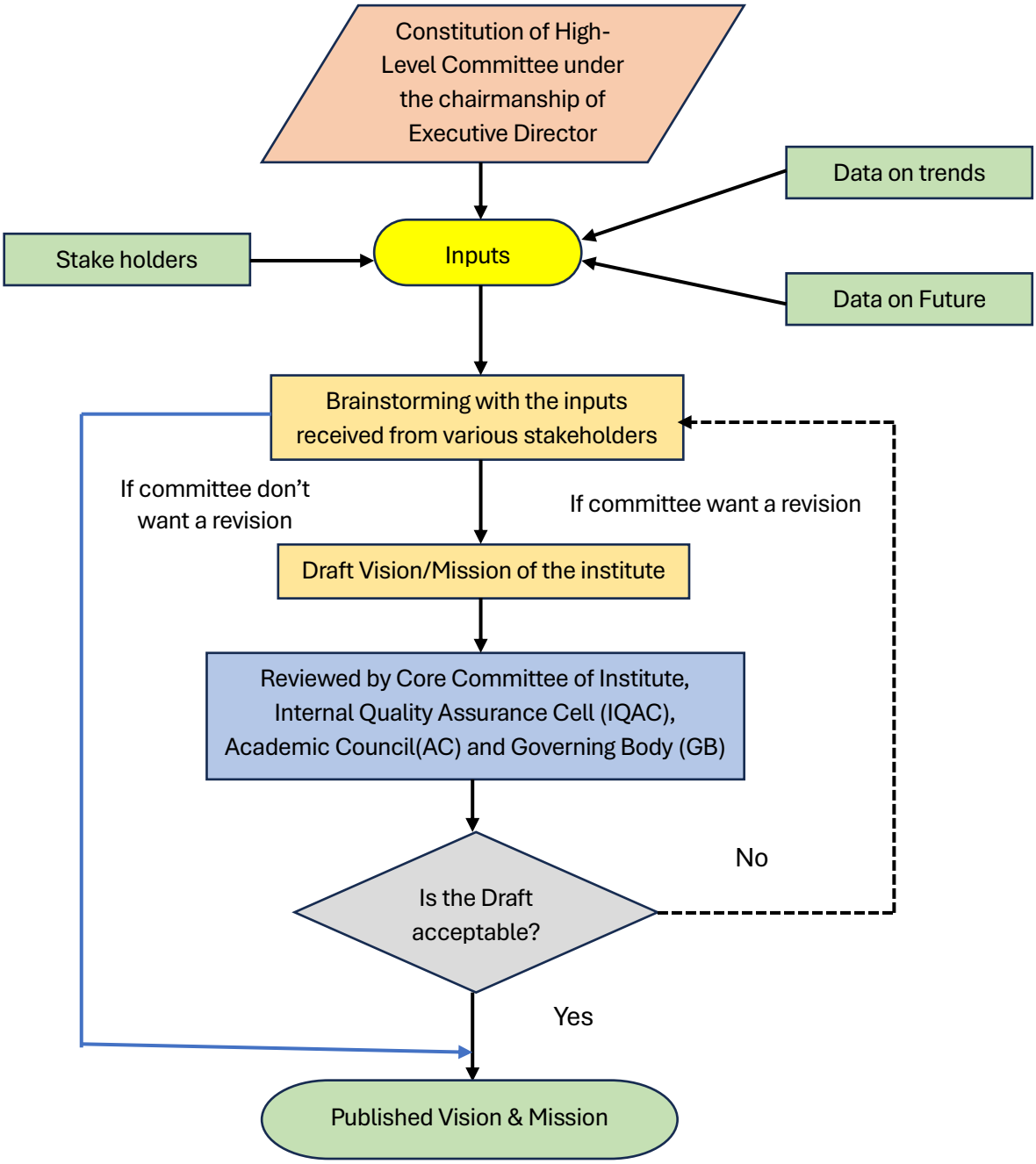


Fig 01: Process for articulating and reviewing the Vision and Mission of the Institute

5. After getting approval from all statutory committees, the vision and mission statements of the institute will be displayed to stakeholders for the next six years.
6. If the committee concludes that the present vision and mission have not been achieved to date, it will continue for the specific period mentioned by the committee until the following review.

3.2 Vision of the Institute

The present version of the vision and mission of the institute was articulated in 2016.

Vision of Institute

To be a leader in producing professionally competent engineers.

Description:

"To be a leader in producing professionally competent Engineers" encapsulates a powerful vision for an educational institution like ADCET, Ashta. Let's break the above statement into pieces.

1. **"To Be a Leader":**

   This phrase implies aspiring to be at the forefront, set an example, and positively influence others. As an educational institution, being a leader means not merely following existing norms but actively shaping the future of engineering education.

2. **"Producing":**

   Here, "producing" goes beyond imparting knowledge. It signifies a commitment to nurturing and developing engineers ready to face real-world challenges. It implies a focus on practical skills, application, and outcomes.

3. **"Professionally Competent Engineers":**

   Professionally competent Engineers possess a blend of technical expertise, soft skills, and ethical values.

   They can:

   - ***Apply theoretical knowledge:*** Translate classroom learning into practical solutions.
   - ***Collaborate effectively:*** Work in teams, communicate, and lead.
   - ***Adapt to changing contexts:*** Stay current with industry trends and emerging technologies.
   - ***Uphold ethical standards:*** Act with integrity and social responsibility.

Overall Implications:

By aiming to be a leader in producing professionally competent Engineers, an institution (Annasaheb Dange College of Engineering and Technology, Ashta) committed to:

- ***Quality Education:*** Striving for teaching, research, and industry engagement excellence.
- ***Holistic Development:*** Focusing on both technical skills and character-building.
- ***Industry Relevance:*** Aligning curricula with industry needs.
- ***Continuous Improvement:*** Adapting to evolving educational paradigms.

This vision is accomplished with the institute mission as mentioned as follows,

3.3 Mission of the Institute

We, Annasaheb Dange College of Engineering & Technology, Ashta, are committed to achieve our vision by,

M1. Imparting effective outcome-based education.

M2. Preparing students through skill-oriented courses to excel in their profession with ethical values.

M3. Promoting research to benefit the society.

M4. Strengthening relationships with all the stakeholders.

3.4 Process of articulating the vision and mission of the Department

Articulating the Vision and Mission of a department is done as a collaborative approach, engaging internal and external stakeholders to ensure a comprehensive perspective. The Department's vision aligns with the institution's vision and actively involves faculty, students, industry partners, alumni, and other key contributors associated with respective departments. The process navigates through stakeholder interactions, quality assurance reviews, and institutional approvals, ultimately leading to the official publication and dissemination of the departments' Vision and Mission statements.

The process of defining the Vision and Mission of the Department is outlined with the help of the following steps:

1. **Stakeholder Identification:** The stakeholders are identified and categorized into internal (faculty and students) and external (industry/employers, parents/society, alumni, professional bodies).
2. **Consistency Check:** It is ensured that the draft vision and mission statements align with the vision and mission of the institute.
3. **Articulating draft of Vision and Mission:** Draft vision and mission statements are articulated, incorporating insights from internal and external stakeholders. The unique strengths, values, and goals of the Department are considered.
4. **Interaction with External Stakeholders:** External stakeholders are engaged through various platforms such as parent meetings, alum meetings, recruitment drives, and industry visits to understand industry needs, societal expectations, and the perspectives of alums and parents.
5. **Feedback and Suggestions:** Feedback and suggestions are invited during interactions with stakeholders to ensure that the draft statements reflect the aspirations and expectations of those connected to the Department.
6. **Internal Quality Assurance:** The draft vision and mission statements are presented to the Department Internal Quality Assurance Cell (DIQAC) for a thorough review to ensure they align with the institute's vision and mission. Draft vision and mission statements and stakeholder feedback are further presented to the Internal Quality Assurance Cell (IQAC) and Board of Studies (BOS) for approval.
7. **Review and Approval:** The IQAC and BOS members review the draft statements, offering insights and modifications as needed. Approval in a meeting signifies that the proposed vision and mission align with academic standards.

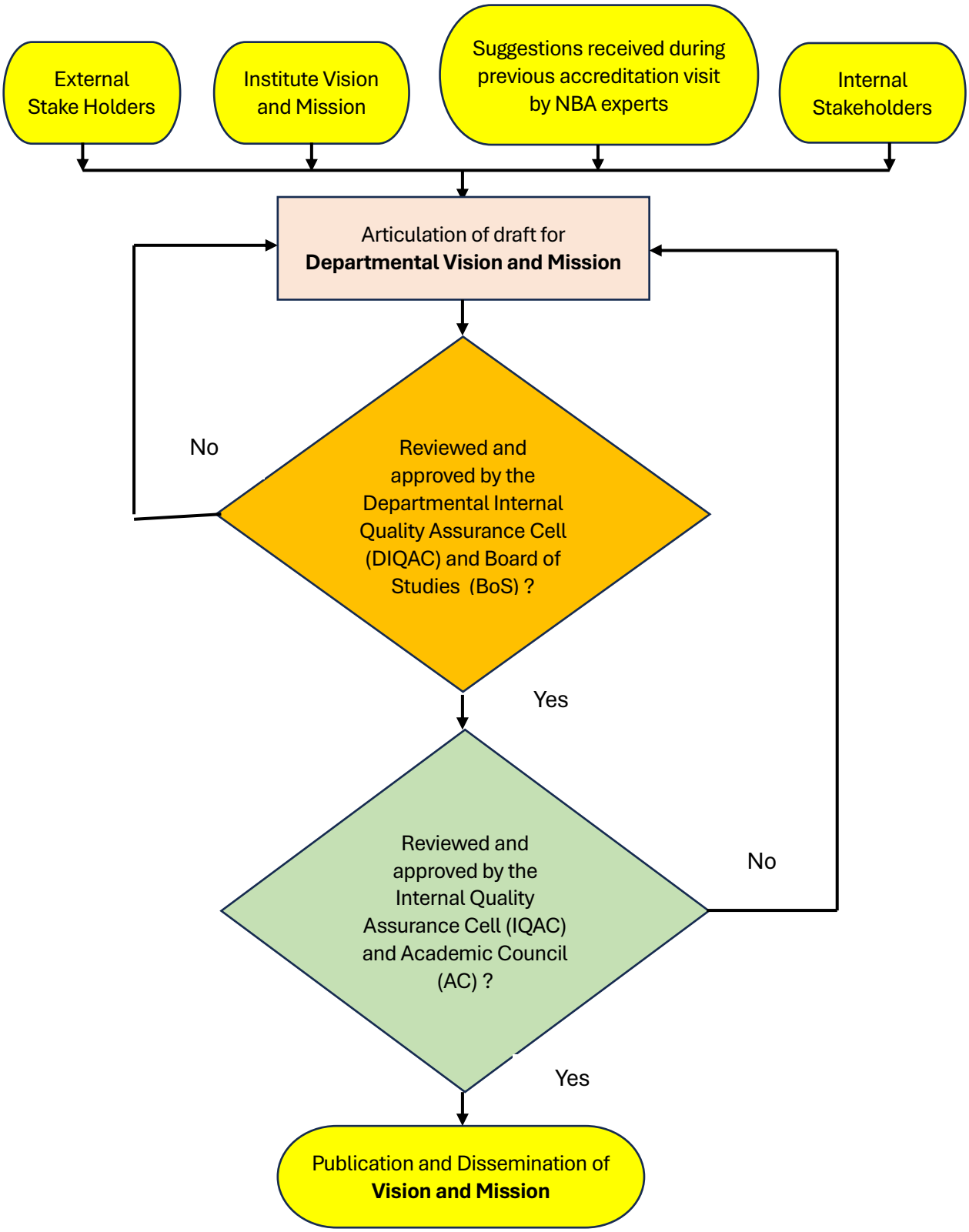


Fig. 02: Process for articulating and reviewing the vision and mission of the Department

8. **Academic Council Approval:** The approved statements are submitted to the Academic Council (AC). The AC, composed of senior faculty and administrators, evaluates the statements in the context of the institution's vision and mission.

9. **Communication and Dissemination:** The statements are published and disseminated. Upon receiving final approval, This step marks the official endorsement of the statements. The finalized vision and mission statements are communicated to all stakeholders using appropriate communication channels. These include official publications, websites, and communication within the academic community.
10. **Periodic Review:** Periodic review and update of the vision and mission statements happen at PAC and DIQAC. Regular reviews ensure that the statements remain relevant and aligned with the evolving needs of the Department, industry, and society.

With the steps mentioned above, the Department ensures a thorough and inclusive process for defining its vision and mission, fostering alignment with the expectations of internal and external stakeholders.

3.5 Vision and mission of the Department

The vision and mission of all eight departments are drafted and finalized as per the process mentioned in the previous section. The final versions of the vision and mission of all departments are mentioned below,

- **Mechanical Engineering**

Vision	To be a leader in developing mechanical engineering graduates with knowledge, skills and ethics.
Mission	We at the Department of Mechanical Engineering are committed to achieve our vision by, • M1: Imparting effective outcome-based education. • M2: Preparing students to serve the society with professional skills and ethical values. • M3: Cultivating skills and attitude among students and faculties to promote research. • M4: Strengthening relationships with stakeholders for continuous development.

- **Computer Science and Engineering**

Vision	To be a leader at serving society by producing professionally competent computer engineers.
Mission	We at the Department of Computer Science and Engineering are committed to achieve our vision by, • M1: Imparting academic excellence through outcome-based education. • M2: Transforming students through skill oriented courses with ethical values. • M3: Grooming students for employment, higher studies and entrepreneurial ventures. • M4: Strengthening relationship with stakeholders for continuous development.

- **Electrical Engineering**

Vision	To be a leader in developing Electrical Engineering graduates with knowledge, skills & ethics.
Mission	We at the Department of Electrical Engineering are committed to achieve our vision by: • M1: Facilitating learning through outcome-based education. • M2: Cultivating skills & attitude among graduates to excel in their career. • M3: Motivating research approach of graduates to solve real-time problems for benefit of the society. • M4: Strengthening relationship with all stakeholders for continuous improvement.

- **Civil Engineering**

Vision	To develop graduates in the field of Civil Engineering with pre-eminence on technical competency, research, employability, entrepreneurial skills, and ethics.

Mission We at the Department of Civil Engineering are committed to achieve our vision by,

- M1: Providing consistent activities and programs for promoting academic excellence.
- M2: Preparing students to serve the society with professional ethics.
- M3: Encouraging the students for research, innovation, and higher education.
- M4: Strengthening relationship with stakeholders for the overall development of the Department.

- **Aeronautical Engineering**

Vision To be a leader in preparing competent aeronautical engineers to meet the present and future needs of the aeronautical and allied industries.

Mission We at the Department of Aeronautical Engineering, ADCET Ashta, are committed to achieve our vision by,

- M1: Preparing the students with good fundamental knowledge of aeronautics through outcome-based education.
- M2: Imparting technical knowledge in tune with the current industry requirements through skill-oriented courses.
- M3: Promoting research culture among the faculty and students through sponsored and consultancy projects with industries and research establishments.
- M4: Establishing relationships with all the stakeholders for the benefit of students.

3.6 Process for articulating the Program Educational Objectives (PEOs).

Program Educational Objectives (PEOs) are broad statements describing career and professional accomplishments. These objectives are based on the needs of the program's stakeholders, such as employers, alumni, and faculty members.

Articulating the Program Educational Objectives (PEOs) is a collaborative process involving internal stakeholders like faculty and students. The PEOs are crafted to align with the Department's vision and mission, ensuring a unified direction. Interactions during parent meetings, alumni meetings, and industry visits are pivotal in gathering insights for formulating measurable and realistic PEOs.

The process of defining the PEOs of the Department is outlined with the help of the following steps,

1. **Stakeholder Identification:** The process starts with identifying internal stakeholders (faculty and students) and external stakeholders (industry/employers, parents/society, alumni, and professional bodies).
2. **Consistency Check:** It ensures that the PEOs align with the Department's vision and mission statements.
3. **Drafting PEOs:** Draft PEO statements are formulated, considering the input received from all stakeholders. The expected achievements of graduates after three to four years of graduation are clearly articulated.
4. **Interaction with External Stakeholders**: External stakeholders are engaged during periodic meetings, such as parent meetings, alumni meetings, recruitment drives, and industry visits. This interaction helps identify potential statements for the PEOs based on real-world needs and expectations.
5. **Feedback and Suggestions:** Feedback and suggestions are invited from stakeholders during the interaction sessions to refine and improve the draft PEOs.

6. **Internal Quality Assurance:** The draft PEOs are presented to the Departmental Internal Quality Assurance Cell (DIQAC) and Board of Studies (BOS) for thorough review to ensure the objectives are measurable, realistic, and aligned with the Department's vision and mission. DIQAC and BOS members review and approve the draft PEOs in a meeting, with or without modifications. The approved PEOs are presented to the Internal Quality Assurance Cell (IQAC) and Academic Council (AC) for further review and approval.
7. **Publication and Dissemination:** Once approved, the PEOs are published and disseminated to all stakeholders through various media, including departmental academic booklets, notice boards, industry interaction brochures, and the Department's web page.
8. **Periodic Review:** Periodic review and update of the PEOs is carried out to ensure ongoing relevance and alignment with industry and societal needs.

This structured process ensures that the Program Educational Objectives (PEOs) are well-defined, transparent, and reflective of the expectations of engineering graduates, thereby contributing to the continuous improvement of the program.

The abovementioned process is elaborated well through the following flowchart for better understanding. (Fig. 03)

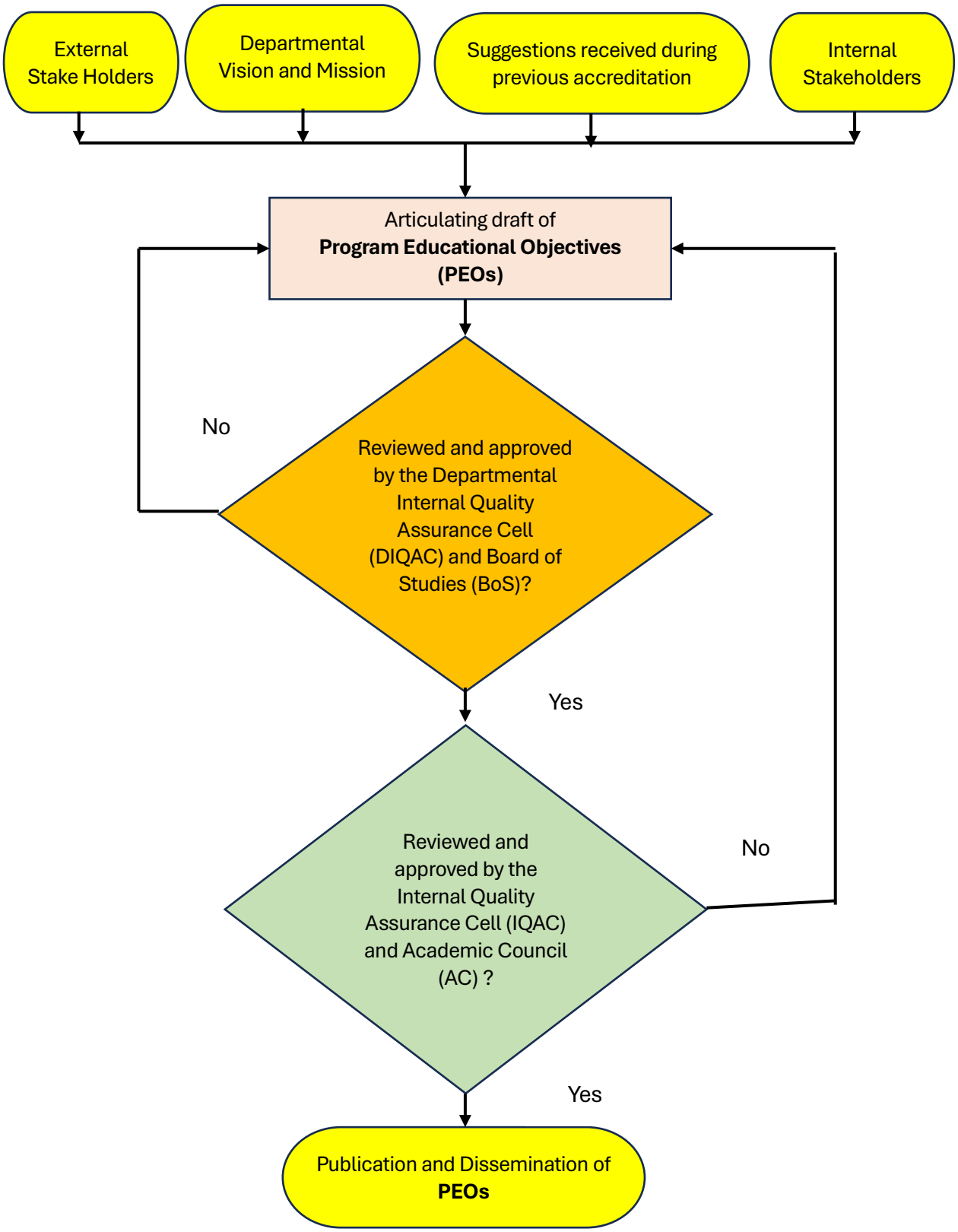


Fig. 03: Process for articulating and reviewing the PEOs of the Department

3.7 Publication and dissemination of Vision, Mission and PEOs.

The Vision, Mission, and Program Educational Objectives (PEOs) are prominently displayed and accessible to all stakeholders at significant locations at the institute. The dissemination strategy ensures that these guiding principles are effectively communicated to students, industry experts, parents, and alumni through diverse channels. The comprehensive dissemination plan includes the following:

Publication and Display:

At Annasaheb Dange College of Engineering and Technology, Ashta, we always believe in connecting with stakeholders, so we displayed the vision, mission and PEOs for the Institute and Department at prominent places, events, and brochures. A tentative list of places where these vision, mission and PEOs are displayed is as follows,

1. Institute Administrative Wing
2. COE office
3. Hostels
4. Sport complex
5. Canteen
6. Director Office
7. Board Room
8. Dean Office
9. Office of the Head of Department
10. Departmental Corridors
11. Library
12. Departmental Library
13. Classrooms
14. Laboratories
15. Seminar Hall
16. Notice Boards
17. Department Academic Booklets
18. Institute booklets
19. College Annual Magazine
20. Brouchers (Conferences / Workshop)
21. Department Newsletters, Technical Magazines
22. Institute website
23. Course files
24. Social Media platforms

Dissemination among Students:

1. Student Orientation Session
2. Induction programs
3. Course Orientation/Introduction Lectures

Dissemination among Industry Experts:

1. Industry Institute Interactions / Meet
2. Guest Lectures/Campus Recruitment Meetings
3. PAC and BOS Meetings

4. DIQAC Meeting
5. IQAC Meeting
6. AC Meeting
7. GB Meeting

Dissemination among Parents:

1. Parent Meetings

Dissemination among Alumni:

1. Alumni Meetings

Additional Channels:

1. College Website and Email Correspondence
2. WhatsApp Correspondence

3.8 Establish consistency of PEOs with the mission of the Department

The following steps can be implemented to establish consistency between Program Educational Objectives (PEOs) and the Department's mission.

1. **Understand the Department's Mission:** Clearly define the department's mission statement. This statement should reflect the department's core values, goals, and overall vision for its graduates.
2. **Identify Stakeholder Needs:** Engage with key stakeholders, such as employers, alums, faculty, and students, to understand their expectations and requirements. This helps ensure that the PEOs align with real-world demands.
3. **Develop PEOs:** Draft PEOs that reflect the department's mission. Ensure these objectives are broad, measurable, and achievable within a few years of graduation. They should cover career achievements, professional development, and societal contributions.
4. **Align PEOs with Mission:** Cross-check each PEO to ensure it supports the department's mission. For example, if the mission emphasizes innovation and leadership, the PEOs should include objectives related to these areas.
5. **Review and Revise:** Regularly review the PEOs and the Department's mission to ensure they remain aligned. This can involve feedback from stakeholders and adjustments based on changes in industry trends or educational standards.
6. **Communicate and Implement:** Clearly communicate the PEOs and their alignment with the department's mission to all stakeholders. Implement strategies and curricula that support the achievement of these objectives.

Following these steps can ensure that the PEOs are consistent with the department's mission, providing a clear and cohesive direction for the program and its graduates.

At the departmental level, brainstorming sessions were conducted, and a correlation between mission and PEO statements at the departmental level was prepared. When assigning the levels, proper justification is expected for every value recorded in the matrix.

The following levels are used to identify the correlation.

Sr	Correlation	Correlation Value	Description
1	***Strongly Mapped***	3	*(Correlation greater than 70 %)*
2	***Moderately Mapped***	2	*(Correlation between 50 % to 70 %)*
3	***Weakly Mapped***	1	*(Correlation between 30 % to 50 %)*
4	***Not Mapped***	-	*(Correlation is below a threshold value)*

As a sample, Table 02 represents the Department's mission and the PEOs Correlation Matrix. While Table 03 mentions the sample justifications.

Table 02: Mission and the PEOs Correlation Matrix

PEOs	The mission of the Department			
	M1	**M2**	**M3**	**M4**
PEO1	3	2	1	1
PEO2	2	2	1	1
PEO3	2	3	2	2
PEO4	1	2	2	1

Table 03: Justification of PEO Correlation Matrix

Program Educational Objective	M1	M2	M3	M4	Justification with Mission Statements
PEO-1 Provide solutions to the problems of mechanical and relevant engineering disciplines using the knowledge of fundamental science and skills developed during graduation studies.	3	2	1	1	**PEO-I** is strongly consistent with M1, as the Department follows OBE to prepare students with good fundamental knowledge; this provides the outcome of the ability of students to apply knowledge in basic sciences, mathematics, and mechanical engineering for a prosperous career. **PEO-I** is moderately consistent with **M2**, as the technical skills required by the industry are offered through skill-oriented courses, which enable students to acquire skills for a prosperous career. **PEO-I** is weakly consistent with **M3**, as promoting research in the Department through sponsored and consultancy projects helps students gain the knowledge and skills required for research. **PEO-I** is weakly consistent with **M4**; establishing relationships with all stakeholders enables students to solve the problems of mechanical and relevant engineering disciplines using the knowledge of fundamental science and skills

3.9 Program Educational Objectives (PEOs)

The program educational objectives (PEOs) for every department were published and listed as follows,

- **Mechanical Engineering**

The Programme Educational Objectives for Mechanical Engineering are,

PEO1: Provide solutions to the problems of mechanical and relevant engineering disciplines using the knowledge of fundamental science and skills developed during graduation studies.

PEO2: Demonstrate an understanding about selected specific areas of mechanical engineering in career development.

PEO3: Communicate and function effectively using professional ethics, social and environmental awareness.

PEO4: Engage in lifelong learning, for effective adaptation to technological changes.

- **Computer Science and Engineering**

Graduates of Computer Science and Engineering possess

PEO1: Knowledge of Computer Science that will act as a foundation for solving real-life problems with the help of teamwork, critical thinking and effective communication.

PEO2: Ability to solve hardware and software engineering problems by their knowledge in core computer science and allied engineering.

PEO3: Awareness of environmental and societal issues in computer science and engineering while they get engaged into employment, higher studies or entrepreneurial ventures.

PEO4: Ability to adapt to changing environment by making use of contemporary technologies and tools.

- **Electrical Engineering**

The graduate of the electrical engineering program will:

PEO1: Solve problems related to Electrical Engineering by applying its principles, tools and practices.

PEO2: Solve problems related to Electrical Engineering by applying its principles, tools and practices.

PEO3: Engage in lifelong learning for effective adaptation to technological challenges.

PEO4: Demonstrate leadership skills at workplace and function professionally in competitive environment.

- **Civil Engineering**

Graduates of the Civil Engineering Department will be able to :

PEO1: Apply acquired skills in developing safe, sustainable, economical, and environmentally sound solutions to Civil Engineering problems. (Domain Knowledge)

PEO2: Demonstrate technical competency by solving problems in diverse areas of Civil Engineering. (Core Competency)

PEO3: An ability to engage in lifelong learning for effective adaptation of technological developments. (Lifelong Learning)

PEO4: Display leadership skills at the workplace and function ethically in the professional world. (Professionalism).

- **Aeronautical Engineering**

The graduates of the Department of Aeronautical Engineering at ADCET, Ashta, will be able to,

PEO1: Pursue successful career in technical profession, entrepreneurship, research and higher studies in the field of aeronautical and allied engineering.

PEO2: Demonstrate technical competency in aeronautical engineering by offering best possible engineering solutions.

PEO3: Work effectively as an individual and as a team member with professional ethics, social and environmental concern.

PEO4: Engage in lifelong learning and adapt to the changing professional requirements.

3.6 Assessment of PEOs

Assessing the success of Program Educational Objectives (PEOs) involves evaluating how well graduates meet the intended outcomes a few years after completing the program. Here are some effective methods to assess the success of PEOs:

1. **Alumni Surveys:** Conduct surveys with graduates to gather feedback on their career achievements, professional development, and how well the program prepared them for their careers.
2. **Employer Feedback:** Collect feedback from employers regarding the performance and competencies of graduates. This can provide insights into how well the program's objectives align with industry needs.
3. **Career Tracking:** Monitor the career progression of graduates, including job placements, promotions, and further education. This helps them understand the program's long-term impact on their professional lives.
4. **Professional Certifications and Licenses:** Track the number of graduates who obtain relevant professional certifications or licenses, as these can be indicators of the program's effectiveness in preparing students for their careers.

5. **Performance Metrics:** Use specific performance metrics such as job satisfaction, salary levels, and job retention rates to gauge the success of graduates in their respective fields.
6. **Focus Groups:** Organize focus groups with alumni, employers, and faculty to discuss the relevance and effectiveness of the PEOs. This qualitative data can provide deeper insights into areas of improvement.
7. **Benchmarking:** Compare the performance of your graduates with those from similar programs at other institutions. This can help identify strengths and areas for improvement.
8. **Accreditation Reviews:** Utilize feedback from accreditation bodies, which often assess the alignment of PEOs with industry standards and educational best practices.

By combining these methods, you can comprehensively understand how well your PEOs are being met and identify areas for continuous improvement.

At present, we at ADCET, Ashta, follow only three assessment criteria from the above list, which consist of a) Alumni, b) Employer Feedback and c) Accreditation Review. However, the department has the freedom to select any other options from the available list to assess the attainment/ achievement of PEOs.

4. CURRICULUM DESIGN IN THE CONTEXT OF OBE

In Outcome-Based Education (OBE), the curriculum ensures that students achieve specific learning outcomes by the end of their educational program. The list advantages of an OBE-aligned curriculum are listed as follows,

- **Defined Learning Outcomes:** The curriculum starts with clearly defined learning outcomes that specify what students should know, be able to do, and value by the end of the program. These outcomes guide the entire educational process.
- **Recessive Design:** The curriculum is developed using a backward design approach, where the desired outcomes are identified first, and then the curriculum is planned to achieve those outcomes.
- **Alignment of Teaching and Assessment:** Teaching methods and assessment strategies are aligned with the learning outcomes. This ensures that the instructional activities and assessments directly support the achievement of the outcomes.
- **Student-Centred Learning:** The focus is student-centred learning, where students are actively engaged in learning. This includes collaborative projects, problem-based learning, and other interactive teaching methods.
- **Continuous Improvement:** The curriculum is continuously reviewed and improved based on feedback from students, faculty, and other stakeholders. This ensures that the curriculum remains relevant and effective in achieving the desired outcomes.
- **Flexibility and Adaptability:** The curriculum is designed to be flexible and adaptable to meet the diverse needs of students. This includes offering different pathways for students to achieve the learning outcomes.

OBE ensures that the curriculum effectively prepares students for future careers and life challenges by focusing on these aspects. As ADCET, Ashta conferred autonomous status in 2017, and since then, an outcome-based curriculum approach has been adopted. Before autonomous status, we offered the curriculum prescribed by Shivaji University Kolhapur. The curriculum development at ADCET, Ashta, offers several advantages, enhancing the quality and relevance of education.

1. **Greater Academic Freedom:** We offer to design and update our curriculum based on industry trends and technological advancements. This flexibility allows us to tailor courses to meet the specific needs of students and employees.
2. **Enhanced Quality of Education:** We maintained higher academic standards by innovating and implementing modern teaching methods. This often leads to improved student outcomes and better preparation for professional careers.
3. **Responsive Academic Governance**: We made swift decisions regarding curriculum changes, assessment methods, and academic policies without waiting for approval from a central authority. This agility helps students quickly adapt to new educational demands.
4. **Promotion of Research and Innovation:** ADCET, Ashta foster a culture of research and innovation by offering specialized courses and encouraging faculty and students to engage in research projects. This contributes to the overall intellectual growth and critical thinking skills of students.

5. **Skill-Oriented Education:** We, ADCET, Ashta, enjoy the freedom to design skill-oriented courses aligned with local and global job market requirements. This ensures that graduates possess the necessary skills and competencies to succeed.
6. **Community and Industry Engagement:** By having the freedom to collaborate with local industries and communities, we have developed programs that address regional needs and promote community service and extension activities.
7. **Use of Modern Educational Tools**: Integrate modern educational technologies and innovative teaching practices into their curriculum, enhancing the learning experience and making education more interactive and engaging.

These advantages collectively contribute to the overall development of students, making them well-equipped to face the challenges of the modern workforce and society.

4.1 History of the curriculum development in the context of ADCET, Ashta (Post Autonomy)

As mentioned, ADCET, Ashta, was conferred autonomous status in 2017 by UGC, New Delhi and Shivaji Univerisity, Kolhapur. Since 2017, three revisions of the curriculum have taken place. The details about the curriculum revisions are mentioned in Table 04.

Table No. 04 Summary of Curriculum Revisions

Sr.	Name of Revision	Year of Implementation	Credits	Reference documents
1.	0th Revision	2017	192	Bridge the gap with the SUK curriculum
2.	1st Revision	2019	168-172	AICTE Model Curricula
3.	2nd Revision	2023	170	NEP-2020

4.2 Process of curriculum development

The curriculum for any program is developed through a well-defined process involving all stakeholders. It also undergoes periodic evolution, guided by a robust framework. The program curriculum is designed by considering the institutional and departmental vision, mission, and guidelines provided by apex bodies from time to time, such as the AICTE (Model Curriculum), UGC, and NEP-2020 guidelines. To ensure a comprehensive curriculum, active involvement and feedback are sought from diverse stakeholders, including faculty, students, alumni, and recruiters. This inclusive approach integrates insights from both industrial and academic experts. The GATE examination syllabus is also referred to during the curriculum development process.

The curriculum development for any program is the responsibility of the respective department, which is then endorsed by institute-level statutory bodies. The departments always ensure that the curriculum meets the requirements of apex bodies, such as AICTE and UGC. The AICTE has provided national credit framework guidelines for the inclusion of various courses in the curricula of engineering; these course categories include multiple types of courses in humanities and social sciences, including management courses, basic science courses, engineering science courses, professional core courses, open elective courses, mandatory courses, project work, seminar and internships. Which has been implemented in the previous curriculum revision, i.e. 1st revision.

The National Education Policy- 2020(NEP-2020) has brought significant reforms to the Indian education system, particularly in higher education. NEP-2020 emphasizes a holistic, flexible, and multidisciplinary curriculum development approach for autonomous engineering institutes. Here are the key components and advantages of this new curriculum framework:

Critical Components of NEP- 2020 Curriculum Development

1. **Multidisciplinary Approach:** Engineering programs now include courses in humanities, social sciences, and liberal arts to foster a well-rounded education.
2. **Choice-Based Credit System (CBCS):** Students can choose from a wide range of elective courses, allowing them to tailor their education to their interests and career goals.
3. **Flexibility and Multiple Entry/Exit Options**: Students can enter and exit the program at different stages, earning certificates, diplomas, or degrees based on the duration of their study.
4. **Academic Bank of Credits (ABC):** This system allows students to accumulate and transfer credits across different institutions, promoting lifelong learning.
5. **Focus on Skill Development:**
    a. **Industry-Relevant Skills:** The curriculum is designed to meet the evolving needs of the industry, with a strong emphasis on practical skills and hands-on experience.
    b. **Internships and Apprenticeships:** Mandatory internships and apprenticeships are integrated into the curriculum to provide real-world experience.
6. **Use of Technology:**
    a. **Digital Learning:** Extensive use of technology in teaching and learning, including online courses, virtual labs, and digital resources.
    b. **Blended Learning**: A mix of traditional classroom teaching and online learning to enhance the educational experience.
7. **Holistic and Value-Based Education:**
    a. Responsible and ethical engineers.
    b. **Environmental Education**: Emphasis on sustainability and environmental awareness as part of the curriculum.
    c. **Ethics and Values**: Courses on ethics, human values, and professional ethics are included to develop.

The 2nd revision of the curriculum at ADCET, Ashta, aligns with the curriculum referring to the NEP-2020 guidelines. This multidisciplinary curriculum framework is essential in setting the right direction for a degree program, as it considers how much and what kind of knowledge a student must acquire to qualify for a specific degree. In addition, it helps assign credits to each course, sequence the courses semester-wise, and determine the total number of courses a student must study to fulfil a particular degree requirement.

The NEP- 2020 curriculum framework offers,

- Having the freedom to switch between disciplines;
- The ability for learners to choose the courses of their interest across all disciplines;
- It offers multiple entry and exit options, with awards ranging from UG certificates, UG diplomas and three-year degrees;
- Flexibility to move between institutions so that learners can acquire multi- and/or interdisciplinary knowledge;
- Learners can switch between alternative learning modes (offline, online, and blended).

Table 05: Framework for B. Tech Program showing Category-wise Credit Distribution (One Major, Multidisciplinary Minor)

Verticals		Total Credits by AICTE	Credits framed at ADCET
Basic Science Course	BSC/ESC	14 - 18	**14 – 16**
Engineering Science Course		12 - 16	**12 – 14**
Programme Core Course	Program Courses	44 - 56	**74 – 80**
Programme Elective Course		20	
Multidisciplinary Minor	Multidisciplinary Courses	14	**14**
Open Elective		08	**08**
Vocational & Skill Enhancement	Skill Courses	08	**08**
Ability Enhancement Courses	Humanities, Social Science and Management	04	**14**
Entrepreneur / Management Courses		04	
Indian Knowledge System		02	
Value Education Course		04	
Internship	Experiential Learning Courses	08	**18**
Research Methodology & Project		08	
CEP/F. P.		02	
Co-curricular & EC (CCA)	Liberal Learning Courses	06	**04**
Total Credits		**160-176**	**170**

A minimum of 50% of total credits through Core Courses are confirmed.

Curriculum Design

All departments at ADCET, Ashta, always ensure that the curriculum meets the requirements of apex bodies, such as AICTE and UGC. The UGC, New Delhi, has provided NEP-2020 policy and national credit framework guidelines for including various courses in engineering curricula; these categories are as mentioned in the above table.

The department has a Department Internal Quality Assurance Cell (DIQAC) and Program Assessment Committee (PAC) comprising experienced faculty members. These committees make all crucial decisions in the initial phase related to curriculum design, considering inputs from all stakeholders and requirements of the engineering domain. The curriculum is structured into various vertical domains for the program/course. Specialized groups of faculty members with relevant expertise are assigned to prepare the structure of courses within each domain. The expert faculty members prepare course outcomes and relevant content for each course. The department has identified all of these course categories. The discussions on curriculum by in-house course experts are a regular department practice. The faculty from the basic science department has been consulted to form the content of basic science courses. The open electives offered by the department are designed with the applications of other engineering programs in

mind. The department has also provided input for the design of open electives/ minor courses for which students from the specific domain are opting. During curriculum revision, the department aligns each course with the Program Outcomes (POs) and Program-Specific Outcomes (PSOs) it is intended to address. This ensures that each program outcome is covered by multiple courses to develop the program's students in every possible aspect. Department faculty members create detailed curricula for each course, including course outcomes and content outlines. After deciding on the rough content of a course, the course outcomes are framed by the course coordinator, and accordingly, the content of the course is finalized. Each course is designed by considering the credits available.

Program Assessment Committee and Departmental Internal Quality Assurance Cell

The draft curriculum undergoes a meticulous quality assurance process. First, it is presented to the Program Assessment Committee (PAC) and the Departmental Internal Quality Assurance Cell (DIQAC) to ensure its quality and alignment with educational objectives.

Board of Studies (BoS)

The department has a Board of Studies (BoS), a statutory body comprising representatives such as Vice-Chancellor nominees, industry experts, academic experts, alumni representatives, Head of Department, department Faculties and subject experts for courses in emerging areas. The draft curriculum undergoes deliberation in the BoS meeting, where members review and discuss the curriculum copy approved by PAC and DIQAC. The curriculum has been modified based on the suggestions received in the BoS meeting.

Curriculum Approval and Implementation

The draft curriculum is presented before the Academic Council (AC) for review and approval. The suggestions received from the Academic Council are incorporated into the final curriculum. After the approval of the curriculum, it is published and implemented.

Regular Review and Updating

The department has established a mechanism for periodic review and update of the curriculum to keep it in line with emerging technologies, industry trends, and educational best practices.

The following flowchart represents the detailed process of curriculum development,

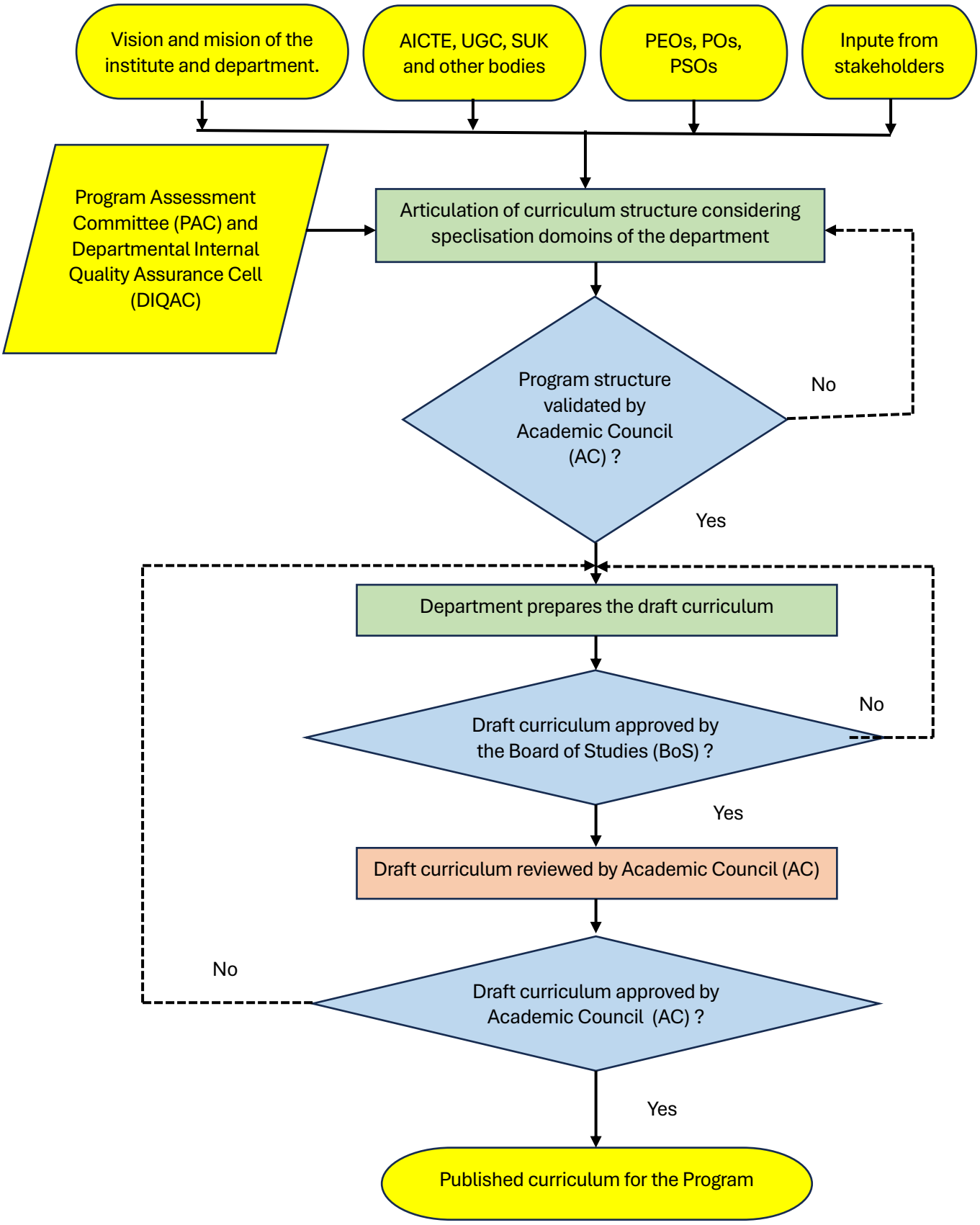


Figure 04: Process of curriculum development and its review

5. GRADUATE ATTRIBUTES WASHINGTON ACCORD

The Washington Accord is a significant international agreement focusing on the mutual recognition of engineering degree programs accredited by its signatories. Established in 1989, the accord aims to ensure that engineering graduates from accredited programs are recognized as having met the academic requirements for entry into engineering practice in any of the signatory countries. The Washington Accord was initiated by the Engineering Council in the United Kingdom and was signed in 1989 by six founding members: Australia, Canada, Ireland, New Zealand, the United Kingdom, and the United States. Over the years, the Accord has expanded to include many other countries, reflecting its growing importance in the global engineering community. The Accord has played a crucial role in promoting high standards in engineering education and facilitating the mobility of professional engineers across international borders. By establishing standard criteria for accrediting engineering programs, the Washington Accord ensures that graduates possess the knowledge and skills to practice engineering globally.

The Washington Accord aims to facilitate the mutual recognition of engineering degree programs accredited by its signatories. This international agreement ensures that graduates from accredited programs are recognized as having met the academic requirements for entry into engineering practice in any signatory country.

The primary goals of the Washington Accord include:

Promoting Mobility: By recognizing the equivalency of accredited engineering programs, the accord makes it easier for engineers to gain professional registration and employment opportunities in other countries.

Ensuring Quality: Establishing common criteria, policies, and procedures for accrediting engineering programs to maintain high educational standards.

Encouraging Best Practices: Facilitating the exchange of information and mutual monitoring among signatories to promote best practices in engineering education.

As of January 2024, the signatory countries of the Washington Accord are:

- Australia
- Bangladesh
- Canada
- China
- Costa Rica
- Hong Kong
- India
- Indonesia
- Ireland
- Japan
- Korea
- Malaysia
- Mexico
- New Zealand
- Pakistan
- Philippines

- Peru
- Russia
- Singapore
- South Africa
- Sri Lanka
- Taiwan
- Turkey
- United Kingdom
- United States.

5.1 Graduate Attributes (WA)

As mentioned in the introductory paragraph, the Washington Accord is an international agreement that ensures the mutual recognition of engineering degree programs accredited by its signatories. A vital component of this accord is the establishment of graduate attributes, a set of assessable outcomes that engineering graduates are expected to achieve by the end of their programs. These attributes are benchmarks for the quality and consistency of engineering education across different countries, ensuring that graduates possess the necessary knowledge, skills, and competencies to practice engineering professionally.

The graduate attributes outlined by the Washington Accord include a range of competencies that cover technical knowledge, problem-solving abilities, and professional skills. These attributes ensure that graduates can apply engineering principles to solve complex problems, work effectively in multidisciplinary teams, communicate proficiently, and uphold ethical standards in their professional practice. Additionally, the attributes emphasize the importance of lifelong learning, sustainability, and the ability to adapt to evolving technological and societal needs.

By adhering to these graduate attributes, engineering programs accredited under the Washington Accord provide assurance that their graduates are well-prepared to meet the demands of the global engineering profession. This enhances the employability and mobility of engineers and contributes to advancing engineering education and practice worldwide.

About ABET (Accreditation Board for Engineering and Technology):

ABET (Accreditation Board for Engineering and Technology) is a globally recognized nonprofit, non-governmental organization that accredits college and university programs in the fields of applied and natural science, computing, engineering, and engineering technology. Established in 1932 as the Engineers' Council for Professional Development (ECPD), ABET has become a leading authority in quality assurance for technical education.

Mission and Vision

ABET's mission is to ensure that educational programs meet the quality standards necessary to prepare graduates for the global workforce. By setting rigorous criteria and conducting thorough evaluations, ABET aims to foster continuous improvement in technical education and promote excellence in the professions it serves.

Accreditation Process

The accreditation process involves a comprehensive review of academic programs to determine if they meet the established standards of quality. This process is voluntary and involves self-assessment by the institution, followed by an external review conducted by a team of experts from academia and industry. The criteria for accreditation are developed collaboratively by ABET's member societies, which represent various technical disciplines.

Benefits of ABET Accreditation

Quality Assurance: ABET accreditation provides assurance that a program meets the quality standards of the profession for which it prepares graduates. This ensures students receive a relevant and up-to-date education that meets industry needs.

Global Recognition: ABET-accredited programs are recognized internationally, facilitating the mobility of graduates and enhancing their career opportunities worldwide.

Continuous Improvement: The accreditation process encourages institutions to continuously assess and improve their programs, fostering a culture of excellence and innovation in education.

Stakeholder Confidence: Accreditation instils confidence among students, employers, and society that graduates are well-prepared to enter the professional world and contribute effectively to their fields.

Scope and Reach

ABET accredits over 4,000 programs at more than 800 institutions in 41 countries. Its accreditation is recognized as a mark of excellence and a testament to the high standards of education provided by the accredited programs.

The ABET defines a set of Student Outcomes expected of graduates from accredited engineering programs. These outcomes are similar to the graduate attributes outlined by the Washington Accord and ensure that graduates are well-prepared for professional practice.

Here are the key ABET Student Outcomes:

1. **Knowledge Application:** An ability to apply knowledge of mathematics, science, and engineering.
2. **Experimentation and Analysis:** An ability to design and conduct experiments, as well as to analyze and interpret data.
3. **Design:** An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. **Teamwork:** An ability to function on multidisciplinary teams.
5. **Problem Solving**: An ability to identify, formulate, and solve engineering problems.
6. **Professional and Ethical Responsibility:** An understanding of professional and ethical responsibility.
7. **Communication:** An ability to communicate effectively.
8. **Global and Societal Context:** The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. **Lifelong Learning:** A recognition of the need for, and an ability to engage in lifelong learning.
10. **Contemporary Issues**: A knowledge of contemporary issues.
11. **Modern Tool Usage:** An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

In line with this, the Washington Accord defines a profile of engineering graduates in terms of knowledge and attitude domains as follows,

1. **WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
2. **WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
3. **WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
4. **WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
5. **WK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
6. **WK6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
7. **WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer for public safety and sustainable development.
8. **WK8:** Engagement with selected knowledge in the current research literature on the discipline, awareness of the power of critical thinking, and creative approaches to evaluate emerging issues.
9. **WK9:** Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability, etc., with mutual understanding and respect and inclusive attitudes.

6. PROGRAM OUTCOMES National Board of Accreditation,

As mentioned earlier, the National Board of Accreditation (NBA) was established in 1994 by the All India Council for Technical Education (AICTE) under Section 10(u) of the AICTE Act. Its primary purpose is to assess the qualitative competence of programs offered by educational institutions from diploma to postgraduate levels in various disciplines, including engineering, technology, management, pharmacy, and architecture. Initially, the NBA functioned under the AICTE, but it became an independent, autonomous body on January 7, 2010. This transition aimed to enhance the quality and relevance of technical education in India by ensuring that programs meet industry standards and requirements. The NBA's autonomy was further solidified in April 2013 when its Memorandum of Association and Rules were amended to make it completely independent of AICTE, both administratively and financially.

The NBA evaluates programs based on several criteria, including institutional missions and objectives, organization and governance, infrastructure facilities, quality of teaching and learning, curriculum design and review, and support services such as libraries and laboratories. Over the years, the NBA has introduced new processes, parameters, and criteria for accreditation that align with international best practices and focus on assessing program outcomes.

In 2014, the NBA achieved a significant milestone by becoming a full member of the Washington Accord, an international agreement among bodies responsible for accrediting engineering degree programs. This membership recognizes the substantial equivalency of NBA-accredited programs to those accredited by other signatories, facilitating global mobility for graduates. The NBA continues to play a crucial role in enhancing the quality of technical education in India, ensuring that graduates are well-prepared to meet the demands of the industry and contribute effectively to the global workforce.

India's National Board of Accreditation (NBA) has a well-defined administrative structure that effectively manages its activities and services. Here's an overview:

Governing Bodies

General Council (GC):

- The principal governing body of the NBA.
- Provides policy direction and guidelines.
- Chaired by the Chairman of the NBA.

Executive Committee (EC):

- Responsible for managing the day-to-day activities of the NBA.
- Implements the policies and guidelines set by the General Council.
- Also chaired by the Chairman of the NBA.

Academic Advisory Committee (AAC):

- Provides academic and technical advice.
- Ensures that the accreditation processes align with educational standards and industry requirements.
- Chaired by the Chairman of the NBA.

Key Positions

Chairman (At Present 2024):

Prof. Anil D. Sahasrabudhe also chairs the General Council and Executive Committee.

Member Secretary (At Present 2024):

The executive officer of the NBA. Currently, Dr. Anil Kumar Nassa. Responsible for all correspondence and administrative functions.

6.1 Program Outcomes (POs)

Program Outcomes (POs), as defined by the National Board of Accreditation (NBA), India, are specific statements that describe what students are expected to know and be able to do by the time they graduate from a program. These outcomes align with outcome-based education (OBE) goals and focus on the knowledge, skills, and attitudes students should acquire.

Key Aspects of Program Outcomes (POs) by NBA:

Knowledge: Understanding of fundamental and advanced concepts in the field of study.

Skills: Practical abilities and technical skills relevant to the discipline.

Attitudes: Professional and ethical behaviour, teamwork, and communication skills.

Steps in Assessing Program Outcomes (POs) :

1. **Defining Program Outcomes:** Clearly articulate what students are expected to know and be able to do by the end of the program. Ensure these outcomes are measurable, relevant, specific, and achievable. In the case of the engineering UG programs, the program outcomes are predefined by the NBA in India. So, the program doesn't have a choice for defining POs. Rather than that, we need to take POs as they are for assessment.
2. **Mapping Outcomes to Curriculum:** Align program outcomes with specific courses and learning activities within the curriculum. Ensure that each course contributes to achieving one or more program outcomes.
3. **Data Collection and Analysis:** Use various assessment tools and methods such as exams, projects, presentations, and surveys to gather data on student performance. Collect both direct evidence (e.g., test scores, project evaluations) and indirect evidence (e.g., student surveys, alumni feedback).
4. **Evaluation of Data:** Analyze the collected data to determine how students achieve the program outcomes. Identify strengths and areas for improvement based on the analysis.
5. **Continuous Improvement:** Use the evaluation results to make informed decisions about curriculum changes, teaching methods, and resource allocation. Implement changes aimed at improving student learning and achieving program outcomes more effectively.
6. **Documentation and Reporting:** Maintain detailed records of the assessment process, including data collection methods, analysis results, and actions taken for improvement. Prepare comprehensive reports for accreditation bodies, demonstrating how program outcomes are assessed and how the results are used for continuous improvement.

Program Outcomes (POs) are essential criteria used by the National Board of Accreditation (NBA) to assess the quality and effectiveness of engineering programs. These outcomes are detailed in the draft copy of the Self-Assessment Report (SAR) to be submitted by institutions seeking accreditation.

Here are the typical POs as outlined in the SAR for undergraduate engineering programs:

1. **Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to solve complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
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 information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.
6. **The Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate knowledge of and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

    Meanwhile, these 12 POs are further categorised into 3 parts: POs are primarily associated with cognitive, affective, and psychomotor domains for better evaluation and ease in determining their attainment. This bifurcation is only illustrative; it may be changed based on the nature of the programs.

    Cognitive domain
    - Engineering Knowledge
    - Problem Analysis
    - Design/Development of Solutions
    - Conduct Investigations of Complex Problems

    Affective domain
    - The Engineer and Society
    - Environment and Sustainability

- Ethics
- Life-long Learning

Psychomotor domain

- Modern Tool Usage
- Individual and Team Work
- Communication
- Project Management and Finance

In the new proposed draft of SAR (WA), these 12 POs are reduced to 11 by merging PO 6 and PO 7 as Engineer and World. This draft appeared on the NBA website in May 2024 to accept stakeholder comments and suggestions. These proposed POs are as follows (Just for reference, as they have not yet been finalized):

1. **PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4, respectively, to develop to the solution of complex engineering problems.
2. **PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems, reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge, including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling, recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to the economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. **PO8: Individual and Collaborative Teamwork:** Function effectively as an individual and as a member or leader in diverse/multidisciplinary teams.
9. **PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
10. **PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for
    i. independent and life-long learning
    ii. adaptability to new and emerging technologies and
    iii. critical thinking in the broadest context of technological change. (WK8)

7. PROGRAM SPECIFIC OUTCOMES (PSOs)

Program Specific Outcomes (PSOs) are detailed statements that describe what graduates of a specific program should be able to do upon completion. These outcomes are tailored to the unique aspects of the program and are designed to reflect the specialized knowledge and skills that students are expected to acquire. Unlike general Program Outcomes (POs), PSOs are unique to each program and focus on the specialized competencies relevant to that field. PSOs are typically developed by the department offering the program, often with input from faculty, industry experts, and other stakeholders. They emphasize the practical application of knowledge and skills in real-world scenarios specific to the program's discipline. PSOs are a critical component of the accreditation process as they provide a clear framework for evaluating the effectiveness of a program in delivering specialized education. They help ensure that graduates are well-prepared to meet the specific demands of their chosen profession.

NBA, India expects every department to draft 2 to 3 PSO statements highlighting the uniqueness of that program in developing engineering graduates. Every department at ADCET, Ashta drafted PSOs for each program offered by our institute and listed below. These are the promise the program offers to attract the students towards their programs.

Generally, 2 PSOs are articulated for each program listed below in our institute. It is expected that for every curriculum change, the PSOs must be revisited, and if necessary, new PSOs must be drafted and used till the following curriculum change.

Program Specific Outcomes (PSOs)

- **UG- Mechanical Engineering**

PSO1: An ability to find out, articulate the local industrial problems and solve with the use of mechanical engineering tools for realistic outcomes.

PSO2: Apply the knowledge of mechanical engineering domains to design and analyze the products or processes.

- **UG- Computer Science and Engineering**

PSO1: An ability to adapt to latest trends in software engineering practices and strategies in real-time software development lifecycle using open-source programming environment or commercial environment.

PSO2: An ability to get acquainted with contemporary trends in industrial / research areas and thereby provide solutions to real life problems, by specifically using knowledge and skills in the areas of Data Analytics, Machine Learning, Internet of Things, Cloud Computing and Security.

- **UG- Electrical Engineering**

PSO1: Ability to apply electrical engineering knowledge, skills for testing, control & maintenance of electrical systems such as Machines, Power Systems, Drives & Automation.

PSO2: Ability to identify problems in the diversified areas of Electrical Engineering and determine the hardware or software solutions to support the Societal, Environmental & Industrial needs.

- **UG- Civil Engineering**

PSO1: An ability to get acquainted with the contemporary trends in civil engineering and thereby demonstrate proficiency in the fields of structural health monitoring, remote Sensing, GIS and GPS, Construction technology, and management.

PSO2: Understand and provide solutions to issues faced during professional practice, such as the procurement and interaction with stakeholders during the construction phase of the work.

- **UG- Aeronautical Engineering**

PSO1: Apply the knowledge of aeronautical engineering in the Design and Development, Operating, Maintaining and overhauling of the products, enhancing the mobility in society.

PSO2: Develop aeronautical and aviation frameworks and subsystems to overcome the challenges faced by the aviation industry through innovative solutions leading to employability and entrepreneurial development.

8. TEACHING-LEARNING PROCESSES

The teaching-learning process is a dynamic and interactive relationship between educators and students aimed at achieving educational goals. This process involves the teacher identifying and understanding the learning needs of students, setting clear learning objectives, and employing various strategies to impart knowledge effectively. It is not a one-way street but a collaborative effort where teachers and students engage in continuous dialogue, feedback, and adaptation to enhance learning outcomes. This process ensures that students acquire knowledge and develop critical thinking, problem-solving skills, and the ability to apply what they have learned in real-world situations.

The teaching-learning process is a comprehensive and interactive system that involves several key components working together to facilitate effective education. Here are the main components:

Learner:

- The central focus of the teaching-learning process.
- Learners bring their prior knowledge, experiences, and learning styles to the educational environment.

Teacher:

- Facilitates learning by providing guidance, instruction, and support.
- Uses various teaching strategies to meet the diverse needs of learners.

Content:

- The subject matter or information that is being taught.
- It should be relevant, accurate, and aligned with learning objectives.

Instructional Strategies:

- Methods and techniques used by the teacher to deliver content and engage learners.
- Includes lectures, discussions, hands-on activities, and technology integration.

Learning Environment:

- The physical or virtual space where learning takes place.
- It should be conducive to learning, safe, and supportive.

Assessment:

- Tools and methods used to evaluate learner understanding and progress.
- Includes formative assessments (ongoing checks for understanding) and summative assessments (final evaluations).

Feedback:

- Information provided to learners about their performance.
- Helps learners understand their strengths and areas for improvement.

Reflection:

- Both teachers and learners reflect on the teaching-learning process.

- It helps identify what worked well and what can be improved for future learning experiences.

Pedagogy refers to the method and practice of teaching, especially as an academic subject or theoretical concept. It encompasses educators' strategies, techniques, and approaches to facilitate learning and ensure students acquire knowledge, skills, and attitudes effectively.

Key Aspects of Pedagogy:

1. **Teaching Methods:** The various ways instruction is delivered, such as lectures, discussions, hands-on activities, and technology integration.
2. **Learning Theories**: The principles and theories that guide how students learn, including cognitive, behavioural, and constructivist theories.
3. **Educational Goals**: The objectives that educators aim to achieve are developing critical thinking and problem-solving skills and fostering lifelong learning.
4. **Student-Centered Learning:** Approaches that focus on the needs, interests, and abilities of students, encouraging active participation and engagement.
5. **Assessment and Feedback:** Techniques used to evaluate student learning and provide constructive feedback to support improvement.

8.1 Expectations from the teacher in the Teaching Learning and Assessment (TLA) process.

In teaching-learning, teachers are expected to create an engaging and supportive environment that fosters student growth and learning. They should employ diverse instructional strategies to cater to different learning styles and needs, ensuring all students can grasp the material. Teachers are also responsible for setting clear learning objectives, providing timely and constructive feedback, and encouraging critical thinking and problem-solving skills. Additionally, they should model professional and ethical behaviour, inspire a love for learning, and continuously reflect on and improve their teaching practices to enhance student outcomes.

As a faculty member of a reputed institute like Annasaheb Dange College of Engineering and Technology, Ashta, Management expects a few things related to teaching, learning and assessment process. The details about it are explained in the following section.

1. **Alignment with New Education Policy (NEP) 2020:** The department ensures that its teaching and learning practices are aligned with the objectives and principles of the New Education Policy 2020. This includes adopting a multidisciplinary approach, promoting critical thinking, and providing flexibility in the curriculum.
2. **Adherence to Academic Calendar:** The detailed teaching-learning process is a time-bound process. So, the process should be completed in a well-defined and well-planned manner. Maintaining a well-structured academic calendar ensures curriculum completion is on time. It allows adequate time for instruction, assessment, and revision. Dean Academics prepares the institute's academic calendar based on the guidelines given by apex bodies, which are approved by the Director and Executive Director. An academic calendar prepares well in advance for the whole semester, comprising all the important dates, such as commencement and conclusion of teaching, slots for conduction of In-semester Evaluation (ISE), Mid-Semester Examination (MSE), End Semester Examinations (ESE), result declarations and list of holidays.
3. **Preparation of teaching plan:** At the beginning of the semester, the faculty prepares a detailed teaching plan in the format prescribed by the institute. The teaching/practical plan is approved by

the Head of the department and is a part of individual faculty member's course files. The teaching/practical plan is followed by individual faculty members for the delivery of content. For effective implementation, the Academic Coordinator, Head of the Department and Dean Academics conduct periodic checks of the progress of each course and ensure timely completion of the course with the help of weekly and monthly progress reports. ISE, MSE, and ESE are conducted as planned to check the depth of students' learning.

4. **Preparation of outcome-based course material and course files:** Every course teacher prepares detailed course material and course files. Which are periodically checked by the authorities. Outcome-based course material refers to educational content and resources designed to achieve predefined learning outcomes. In an outcome-based education (OBE) framework, the focus is on what students are expected to know, understand, and be able to do by the end of a course or program.
5. **Use of ICT-enabled tools for effective teaching and learning:** The institute has an exclusive content creation laboratory for creating videos related to the courses. The faculty engages with students through online platforms like Zoom, Google Meet, and Microsoft Teams. Further, faculty members prepared the module videos and shared them with the students, which helped them learn during off time. The faculty utilizes Google Classroom and Google Sites to share notes, assignments, quizzes, etc. The institute encourages students to register for MOOC courses on NPTEL, Coursera, SAP, Udemy, Edx, etc. The library has e-resources like journals, DELNET, eBooks, NPTEL video lectures, and YouTube videos. Here are some commonly used ICT (Information and Communication Technology) tools in teaching and learning which will be helpful for new faculty members,
    - Use of Smart Boards
    - YouTube Channels
    - Google Sites
    - Google Classroom
    - LMS: MOODLE
    - Internet Connectivity in Every Classroom for online content delivery and references
    - e- Resources
    - Content Creation Lab
    - Virtual Classroom Platforms- Zoom, Google meet, Microsoft teams
    - Google forms
    - Adobe Spark
    - Microsoft Excel
    - Use Google space.
6. **Quality of classroom teaching:** The quality of classroom teaching is a critical factor in determining the effectiveness of education and the overall learning experience for students. Several key elements contribute to the quality of classroom teaching as follows:
    - **Teacher Competence:** Teachers have a deep understanding of the course matter they are teaching and effective skills to communicate complex concepts in a way that students can understand.
    - **Engagement and Interaction:** Quality teaching involves creating an engaging and interactive learning environment. Teachers motivate the students to participate actively, encourage them by asking questions, and promote class discussions, which enhance the overall learning experience.

- **Clear Communication:** Teachers communicate effectively to articulate ideas clearly, use appropriate language, and employ various teaching methods to cater to different learning styles.
- **Adaptability:** To meet the diverse needs of students, teachers are flexible in their approach, modifying strategies based on student feedback and understanding.
- **Use of Technology:** Incorporating appropriate technology into the classroom enhances the learning experience. The classrooms are equipped with interactive boards and projectors. Teachers and students use these tools effectively to improve teaching and learning.
- **Assessment and Feedback:** Regular assessment of student understanding is essential for quality teaching. Teachers employ various assessment methods, provide constructive feedback, and adjust their teaching strategies based on assessment results to ensure student's progress.
- **Student-Centred Approach:** In a class, a student-centred approach is incorporated, where the teacher recognizes and accommodates the diverse needs, interests, and learning styles of individual students.

7. **Quality of outcome-based assessment:** Faculty ensure a quality assessment by setting question papers addressing predefined outcomes, using Bloom's taxonomy level, and timely and unbiased evaluation of answer books.
8. **Quality of laboratory for conducting experiments:** The departments at ADCET, Ashta, have a well-equipped laboratory that provides students with the necessary tools and resources to engage in hands-on experimentation to enhance the depth of understanding, critical thinking skills, and practical competence they gain through their experimental work. Every laboratory should provide self-explanatory lab manuals (OBE) to students at the commencement of the semester. It should also be displayed in terms of QR codes so that students can fetch the lab manual of related experiments and their technical aspects. The availability of modern and properly maintained equipment ensures the reliability and accuracy of results. Clear instructions and guidance from knowledgeable instructors contribute to a positive learning environment, enabling students to grasp scientific concepts effectively. The practical batch is divided into groups. Each group contains 4-5 students. These student groups are allowed to take the trials of the performing experiments, where they understand the actual workings of the machines and evaluate performance parameters.
9. **Continuous Assessment:** We at ADCET, Ashta, follow the continuous assessment of the theory and practical courses. In theory, the course In Semester Evaluation (ISE) assessment shall continuously be conducted through various activities (minimum three activities per course) throughout the semester. These activities will be evaluated using rubrics developed by the faculties and aligned to specific activities. The weightage and assessment tools will be decided by the course in charge. The only condition is that all activities, their nature, assessment rubrics and schedules should be intimated to the students well in advance and at the start of the semester so that students can prepare well for these assessments. In the case of a practical course, an ISE assessment shall be conducted using a continuous assessment sheet (CAS), which mentions evaluation in terms of cognitive, affective, and psychomotor domains.

8.2 Additional expectations from faculty in Teaching- Learning Processes

The faculties at ADCET, Ashta, are always encouraged to use the following instructional methods and pedagogical instructions. These methods were highly appreciated during a previous peer team visit by NAAC (June 2023). So, we appeal to all new faculty members to kindly continue with it.

Use of various instructional methods and pedagogical instructions

Student-centric methods: Teachers actively engage students in the classroom, transforming them from passive to active learners through periodic questioning. Each course is carefully designed, highlighting course objectives and outcomes and aligning with Bloom's cognitive levels following program outcomes and specific goals. The department adopts a student-centric approach such as experiential, participative and problem-solving methodology to enhance the effective teaching and learning process, which is discussed in the following sections,

1. **Experiential learning:** Experiential learning is an educational approach where students learn by engaging in direct experiences and reflecting on those experiences. This method emphasizes active participation and hands-on activities, allowing learners to apply theoretical knowledge in practical, real-world contexts. The concept is rooted in the idea that learning is most effective when it involves active involvement and personal reflection.

   Critical Components of Experiential Learning:

   Concrete Experience: Engaging in a hands-on activity.
   Reflective Observation: Reflecting on the experience.
   Abstract Conceptualization: Drawing conclusions and learning from the experience.
   Active Experimentation: Applying what has been learned to new situations.

   List of Activities:

In-Plant Training	Internship	Major/Minor/Micro Projects
Field Visits	Industrial Visits	Hands-on Training
Industry Specific Training	Laboratory Experiments	Field Trips
Community Service	Role-Playing	Simulations
Project-Based Learning	Outdoor Education	Study at other institutes
Workshops	Hands-On Training	

2. **Participative Learning:** Participative learning, also known as participatory or active learning, is an educational approach that emphasizes student engagement and involvement in the learning process. This method encourages learners to actively participate in their education through collaboration, discussion, and hands-on activities rather than passively receiving information from the teacher.

   Critical Characteristics of Participative Learning:

   Active Engagement: Students are actively involved in the learning process.
   Collaboration: Learning often occurs in groups or pairs, promoting teamwork and communication.
   Practical Application: Emphasis on applying knowledge through real-world tasks and problem-solving.
   Feedback and Reflection: Continuous feedback and opportunities for reflection to enhance learning.

   List of Activities:

Seminar Presentation	Value Added Courses	NPTEL Courses
Guest Lectures	Poster Presentations	Think Pair Share
Lab Trials	Group Discussions	Peer Teaching

Role-Playing	Case Studies	Games
Brainstorming Sessions	Debates	

3. **Problem-Solving:** Learning through problem-solving is an educational approach where students gain knowledge and skills by working through complex, real-world problems. This method encourages critical thinking, creativity, and the application of theoretical concepts to practical situations. It shifts the focus from passive learning to active engagement, where students take responsibility for their learning process.

Critical Characteristics of Learning Through Problem Solving:

Student-Centred: Students are at the centre of the learning process, actively engaging with the material.

Real-World Relevance: Problems are often based on real-life scenarios, making learning more meaningful.

Collaborative: Students often work in groups, promoting teamwork and communication.

Reflective: Students reflect on their problem-solving process and outcomes to deepen their understanding.

List of Activities:

Industry Projects	Draft the Research Paper	Publications
Innovative Assignment	Prototype Development	Case Studies
Design Projects	Inquiry-Based Learning	Design Challenges
Hackathons	Mathematical Problem Solving	Escape Rooms/Puzzles
Community service	Hypothetical Scenarios	Real-Life Problem Solving

9. ASSESSMENT EVENTS AND TOOLS

In education, assessment events refer to specific activities or instances designed to evaluate student learning and performance. These events are strategically planned and scheduled to measure how well students meet a course or program's learning objectives and outcomes. Examples of assessment events include exams, quizzes, project presentations, practical exams, and peer reviews. On the other hand, assessment tools are the instruments and methods used to gather data on student performance during these assessment events. These tools help educators measure, evaluate, and document students' academic readiness, learning progress, skill acquisition, and educational needs. Standard assessment tools include rubrics, surveys, questionnaires, portfolios, observation checklists, and self-assessment forms. Assessment events and tools play a crucial role in teaching-learning by providing valuable insights into student learning, guiding instructional practices, and ensuring that educational goals are met effectively.

Summative and formative assessments are two distinct approaches used to evaluate student learning, each serving different purposes and occurring at various stages of the educational process.

Formative Assessment

- **Purpose:** To monitor student learning and provide ongoing feedback that instructors can use to improve their teaching and students' knowledge.
- **Timing:** Conducted throughout the instructional period.
- **Nature:** Generally low stakes, meaning they have little or no point value.
- **Examples:** Quizzes, class discussions, homework assignments, and in-class activities like concept maps or one-minute papers.
- **Goal:** To identify areas where students are struggling and to address these issues promptly, helping students to improve continuously.

Summative Assessment

- **Purpose:** To evaluate student learning at the end of an instructional unit by comparing it against some standard or benchmark.
- **Timing:** Conducted at the end of a course or instructional period.
- **Nature:** Often high stakes, meaning they have a high point value and can significantly impact final grades.
- **Examples:** Final exams, end-of-term projects, standardized tests, and final presentations.
- **Goal:** To measure the extent to which students have achieved the learning objectives and to provide a summary of their performance.

In essence, formative assessments are like checkpoints along the learning journey, providing opportunities for adjustment and improvement, while summative assessments are like final evaluations that determine the overall success of the learning process.

We at ADCET, Ashta, use various assessment events and assessment tools to evaluate students' cognitive, affective and psychomotor domains. The list of assessment events and assessment tools is mentioned in the following table,

Table 06 List of Assessment Events and Assessment Tools

Sr.	Assessment Event	Assessment tool	Assessment method	Assessment Type
1.	In Semester Evaluation (ISE)	1. Quiz 2. Multi-Choice Exam. 3. Project 4. Poster presentation 5. Video Making 6. Group Discussion 7. PPT Presentation on the topic 8. Model Making 9. Case Study 10. Analysis of component 11. Programming test 12. Problem Solve Activity 13. Assignment 14. Portfolio development 15. Chart making 16. Open Book test 17. Report writing 18. Competition, etc*	Mark Evaluation/ Rubrics	Formative
2.	Mid-Semester Exam. (MSE)	Descriptive Exam.	Marks Evaluation	Summative
3.	End Semester Exam. (ESE)	Descriptive Exam.	Marks Evaluation	Summative
4.	Continuous Assessment Sheet (CAS)	KSA Assessment	Mark evaluation supported by rubrics	Formative
4.	Guest Lecture	Rubrics	Rubrics	Formative
5.	Workshop/Seminar	Rubrics	Rubrics	Formative
6.	Industrial Visit	Rubrics	Rubrics	Formative
7.	Practical Oral Examination	Oral Examination	Marks Evaluation	Summative
		Rubrics	Rubrics	Formative
8.	End of Course	Course End Survey	Rubrics	Formative
9.	End of Program	Course End Survey	Rubrics	Formative

* The above list is only indicative. The course coordinator can choose an assessment tool other than this list.

10. BLOOM'S TAXONOMY

Bloom's Taxonomy is a hierarchical model developed by educational psychologist Benjamin Bloom and his colleagues in 1956. It categorizes learning objectives into levels of complexity and specificity, ranging from basic knowledge and comprehension to advanced evaluation and creation. The original taxonomy comprised six cognitive domains: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. This framework provided a common language for educators to discuss and develop curricula and assessments. In 2001, Bloom's Taxonomy was revised by a group of cognitive psychologists led by Lorin Anderson, a former student of Bloom. The revised taxonomy updated the terminology and restructured the hierarchy to include Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating. This modern version emphasizes measurable activities and aligns more closely with contemporary educational practices. Bloom's Taxonomy has become a foundational educational tool widely used to design instructional strategies, develop assessments, and enhance student learning outcomes.

The original and revised versions of Bloom's Taxonomy differ in several ways, reflecting educational theory and practice changes over time. Here are the main differences:

1. Terminology:

- Original (1956): The original taxonomy used nouns to describe the cognitive levels: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation.
- Revised (2001): The revised taxonomy uses verbs to describe the cognitive processes: Remember, Understand, Apply, Analyze, Evaluate, and Create.

2. Structure:

- Original (1956): The highest level was Evaluation, followed by Synthesis.
- Revised (2001): The highest level is Creating, which replaced Synthesis, and Evaluation is placed just below it.

3. Focus:

- Original (1956): Emphasized a hierarchical model where each level builds on the previous one.
- Revised (2001): Focuses more on cognitive processes' dynamic and interactive nature, recognizing that learning can be non-linear.

4. Knowledge Dimensions:

- Original (1956): Primarily focused on cognitive skills.
- Revised (2001): Introduces a two-dimensional framework that includes the Knowledge Dimension (factual, conceptual, procedural, and metacognitive knowledge) and the Cognitive Process Dimension.

5. Practical Application:

- Original (1956): Used mainly for curriculum development and assessment design.
- Revised (2001): Provides a more comprehensive guide for educators to design instructional strategies, develop assessments, and enhance student learning outcomes.

As mentioned earlier, the revised Bloom's Taxonomy, introduced in 2001 by a group of cognitive psychologists led by Lorin Anderson (a former student of Benjamin Bloom), updates the original 1956 framework to reflect contemporary educational practices better. The revised taxonomy shifts from using nouns to verbs to describe the cognitive processes, emphasising the dynamic nature of learning. The six levels of cognitive processes are now Remember, Understand, Apply, Analyze, Evaluate, and Create.

Cognitive Process Dimension:

1. **Remember:** Recognizing and recalling facts and basic concepts.
2. **Understand:** Explaining ideas or concepts.
3. **Apply:** Using information in new situations.
4. **Analyze:** Drawing connections among ideas.
5. **Evaluate:** Justifying a decision or course of action.
6. **Create:** Producing new or original work.

Knowledge Dimension:

1. **Factual Knowledge:** Basic elements students must know to be acquainted with a discipline.
2. **Conceptual Knowledge:** Interrelationships among the basic elements within a larger structure.
3. **Procedural Knowledge:** How to do something, methods of inquiry, and criteria for using skills.
4. **Metacognitive Knowledge**: Awareness and understanding of one's own thought processes.

The revised Bloom's Taxonomy provides a more comprehensive and flexible framework for educators to design curricula, develop assessments, and enhance student learning outcomes.

10.1 How can teachers effectively apply the revised Bloom's Taxonomy in lesson planning?

Teachers can effectively apply the revised Bloom's Taxonomy in their lesson planning by following these steps:

1. **Identify Learning Objectives:**
    - Clearly define what students should know and be able to do by the end of the lesson.
    - Frame these objectives using the six levels of the revised taxonomy (Remember, Understand, Apply, Analyze, Evaluate, Create).
2. **Design Activities Aligned with Objectives:**
    - Remember: Include activities like listing, recalling, and recognising facts.
    - Understand: Use summarizing, explaining, and interpreting tasks.
    - Apply: Incorporate problem-solving exercises and practical applications.
    - Analyze Plan activities that involve comparing, contrasting, and organising information.
    - Evaluate Design tasks that require critiquing, judging, and making decisions.
    - Create: Encourage students to design, construct, and produce original work.
3. **Use a Variety of Assessment Methods:**
    - Implement formative assessments (e.g., quiz discussions) to monitor ongoing progress.
    - Use summative assessments (e.g., projects, exams) to evaluate the overall achievement of learning objectives.
4. **Incorporate Technology and Interactive Tools:**
    - Utilize digital tools like Kahoot!, Google Classroom, and interactive whiteboards to engage students at different cognitive levels.

- Use multimedia resources to enhance understanding and application of concepts.

5. **Provide Continuous Feedback:**
   - Offer constructive feedback to help students understand their strengths and areas for improvement.
   - Encourage self-assessment and peer feedback to foster a collaborative learning environment.
6. **Reflect and Adjust:**
   - Regularly reflect on the effectiveness of your lesson plans and make necessary adjustments.
   - Use student feedback and assessment data to inform future planning and instruction.

By systematically integrating the revised Bloom's Taxonomy into lesson planning, teachers can create more structured, engaging, and effective learning experiences that cater to various cognitive levels and learning styles.

10.2 Use of revised Bloom's taxonomy in question framing.

Using the revised Bloom's Taxonomy to frame questions can help ensure that you address different cognitive levels and promote higher-order thinking skills. Here's how you can apply it:

1. Remember:

   Objective: Recall facts and basic concepts.

   Question Stems:

   i. "What do you remember about...?"
   ii. "How would you define...?"
   iii. "Who was the author of...?"
2. Understand:

   Objective: Explain ideas or concepts.

   Question Stems:

   i. "How would you summarize...?"
   ii. "What is the main idea of...?"
   iii. "Can you explain why...?"
3. Apply:

   Objective: Use information in new situations.

   Question Stems:

   i. "How would you use...?"
   ii. "What examples can you find to...?"
   iii. "How would you solve...?"
4. Analyze:

   Objective: Draw connections among ideas.

   Question Stems:

i. “What are the parts or features of…?”
ii. “How would you compare…?”
iii. “What evidence can you find to…?”

5. Evaluate:

Objective: Justify a decision or course of action.

Question Stems:

i. “What is your opinion of…?”
ii. “How would you evaluate…?”
iii. “What criteria would you use to assess…?”

6. Create:

Objective: Produce new or original work.

Question Stems:

i. “How would you design a…?”
ii. “What would happen if…?”
iii. “Can you propose an alternative…?”

Example:
One more sample/ illustrative example for the UG Engineering program with a course in thermodynamics is how the questions are framed at different levels of revised blooms is mentioned as follows,

University UG Level Engineering:

1. **Remember:** Students recall the principles of thermodynamics.
2. **Understand:** They explain how these principles apply to real-world engineering problems.
3. **Apply:** Students design a simple heat engine using the principles of thermodynamics.
4. **Analyze:** They analyze the efficiency of different heat engines.
5. **Evaluate:** Students evaluate the environmental impact of various types of engines.
6. **Create:** They develop a prototype of an innovative, eco-friendly engine.

10.3 Action Verbs for creating learning outcomes (Bloom’s Revised Taxonomy)

Level 1. Remember/Knowledge

Choose	Describe	Define	Identify	Label
List	Locate	Match	Memorize	Name
Omit	Recite	Select	State	Count
Draw	Outline	Point	Quote	Read
Recall	Recognize	Repeat	Reproduce	

Level 2. Understand

Classify	Defend	Demonstrate	Distinguish	Explain
Express	Extend	Give Examples	Indicate	Illustrate
Interrelate	Interpret	Infer	Judge	Match

Paraphrase	Represent	Restate	Rewrite	Select
Show	Summarise	Tell	Translate	Associate
Compute	Convert	Discuss	Estimate	Extrapolate
Generalise	Predict			

Level 3. Apply

Apply	Choose	Dramatize	Explain	Generalize
Judge	Organize	Paint	Prepare	Produce
Select	Show	Sketch	Solve	Use
Add	Calculate	Change	Classify	Complete
Compute	Discover	Divide	Examine	Graph
Interpolate	Manipulate	Modify	Operate	Subtract
Use				

Level 4. Analyze

Analyze	Categorize	Classify	Compare	Differentiate
Distinguish	Identify	Infer	Point out	Select
Subdivide	Survey	Arrange	Breakdown	Combine
Design	Detect	Diagram	Develop	Discriminate
Illustrate	Outline	Relate	Point out	Separate
Utilize				

Level 5. Evaluate

Appraise	Judge	Criticize	Defend	Compare
Assess	Conclude	Contrast	Critique	Determine
Grade	Justify	Measure	Rank	Rate
Support	Test			

Level 6. Create

Choose	Combine	Compose	Construct	Create
Design	Develop	Do	Formulate	Hypothesize
Invent	Make	Originate	Organize	Plan
Produce	Role Play	Tell	Compile	Drive
Devise	Explain	Generate	Group	Integrate
Prescribe	Propose	Rearrange	Reorganize	Rewrite
Transform	Revise			

There are substantial verb charts available on the internet for reference. One of such a chart is mentioned below,

Remember	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Create**
Cite	Add	Acquire	Analyze	Appraise	Abstract
Define	Approximate	Adapt	Audit	Assess	Animate
Describe	Articulate	Allocate	Blueprint	Compare	Arrange

Remember	Understand	Apply	Analyze	Evaluate	Create
Draw	Associate	Alphabetize	Breadboard	Conclude	Assemble
Enumerate	Characterize	Apply	Break down	Contrast	Budget
Identify	Clarify	Ascertain	Characterize	Counsel	Categorize
Index	Classify	Assign	Classify	Criticize	Code
Indicate	Compare	Attain	Compare	Critique	Combine
Label	Compute	Avoid	Confirm	Defend	Compile
List	Contrast	Back up	Contrast	Determine	Compose
Match	Convert	Calculate	Correlate	Discriminate	Construct
Meet	Defend	Capture	Detect	Estimate	Cope
Name	Describe	Change	Diagnose	Evaluate	Correspond
Outline	Detail	Classify	Diagram	Explain	Create
Point	Differentiate	Complete	Differentiate	Grade	Cultivate
Quote	Discuss	Compute	Discriminate	Hire	Debug
Read	Distinguish	Construct	Dissect	Interpret	Depict
Recall	Elaborate	Customize	Distinguish	Judge	Design
Recite	Estimate	Demonstrate	Document	Justify	Develop
Recognize	Example	Depreciate	Ensure	Measure	Devise
Record	Explain	Derive	Examine	Predict	Dictate
Repeat	Express	Determine	Explain	Prescribe	Enhance
Reproduce	Extend	Diminish	Explore	Rank	Explain
Review	Extrapolate	Discover	Figure out	Rate	Facilitate
Select	Factor	Draw	File	Recommend	Format
State	Generalize	Employ	Group	Release	Formulate
Study	Give	Examine	Identify	Select	Generalize
Tabulate	Infer	Exercise	Illustrate	Summarize	Generate
Trace	Interact	Explore	Infer	Support	Handle
Write	Interpolate	Expose	Interrupt	Test	Import
	Interpret	Express	Inventory	Validate	Improve
	Observe	Factor	Investigate	Verify	Incorporate
	Paraphrase	Figure	Layout		Integrate
	Picture graphically	Graph	Manage		Interface
	Predict	Handle	Maximize		Join
	Review	Illustrate	Minimize		Lecture
	Rewrite	Interconvert	Optimize		Model
	Subtract	Investigate	Order		Modify
	Summarize	Manipulate	Outline		Network
	Translate	Modify	Point out		Organize
	Visualize	Operate	Prioritize		Outline
		Personalize	Proofread		Overhaul
		Plot	Query		Plan
		Practice	Relate		Portray

Remember	Understand	Apply	Analyze	Evaluate	Create
		Predict	Select		Prepare
		Prepare	Separate		Prescribe
		Price	Subdivide		Produce
		Process	Train		Program
		Produce	Transform		Rearrange
		Project			Reconstruct
		Provide			Relate
		Relate			Reorganize
		Round off			Revise
		Sequence			Rewrite
		Show			Specify
		Simulate			Summarize
		Sketch			
		Solve			
		Subscribe			
		Tabulate			
		Transcribe			
		Translate			

But these available lists are indicative, as in the above list, the verb "Draw" is indicated in level three (apply), but in what sense the course coordinator wants to use these verbs is to be understood. It purely depends upon the course teachers' understanding and implementation.

For Example, the action verb can be used in different contexts, as mentioned below.

The action verb "draw" can be associated with different levels of Bloom's Taxonomy depending on the context in which it is used:

Remember:

Example: "Draw a diagram of the human heart." Here, "draw" is used to recall and reproduce a specific image or diagram from memory.

Understand:

Example: "Draw a flowchart to explain the process of photosynthesis." In this case, "draw" involves visually understanding and representing a concept.

Apply:

Example: "Draw a map to show the route from your house to school." "draw" requires applying knowledge to create a practical representation.

Analyze:

Example: "Draw a diagram to compare and contrast the structures of plant and animal cells." Here, "draw" involves breaking down information into parts to illustrate relationships.

Create:

Example: "Draw an original design for a new product." In this context, "draw" is used to create something new and original, demonstrating higher-order thinking.

10.4 Bloom's Revised Taxonomy Pyramid

The revised Bloom's Taxonomy is a framework for categorizing educational goals, which is often depicted as a pyramid to illustrate the hierarchy of cognitive skills. At the pyramid's base is Remembering, which involves recalling facts and basic concepts. Moving up, Understanding requires explaining ideas or concepts. Applying consists of using information in new situations. Analyzing requires breaking information into parts to explore relationships. Evaluating involves justifying a decision or course of action. At the top, Creating consists of generating new ideas, products, or ways of viewing things. This hierarchical structure helps educators design curriculum and assessments that promote higher-order thinking skills.

Lower-order thinking skills (LOTS) are foundational cognitive abilities that form the basis for more complex thinking processes. The three steps of this pyramid, remembering, understanding, and applying, fall under lower-order thinking skills. Higher-order thinking skills (HOTS) involve more complex cognitive processes beyond basic memorization and understanding. These skills are essential for critical thinking, problem-solving, and applying knowledge in new and varied contexts. Analyzing, evaluating, and creating revised Bloom's taxonomy levels are under HOTS.

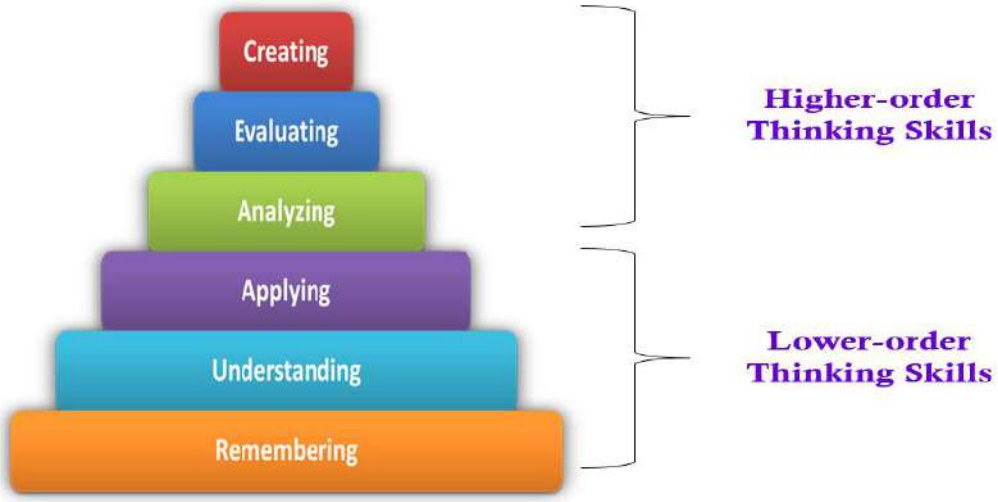


Fig. 04 Revised Bloom's Levels

Converting questions from lower-order thinking skills (LOTS) to higher-order thinking skills (HOTS) involves shifting from basic recall and understanding to more complex analysis, evaluation, and creation. Here are some examples to illustrate this transformation:

For example, consider a course/ topic related to the engineering design process. The sample questions are mentioned in each category of BL.

Topic: Engineering Design Process

Lower-Order Thinking Skills (LOTS)

1. **Remembering:** What are the steps in the engineering design process?

2. **Understanding:** Describe the purpose of the prototyping phase in the engineering design process.
3. **Applying:** How would you apply the engineering design process to solve a simple problem, like designing a paper aeroplane?

Higher-Order Thinking Skills (HOTS)

4. **Analyzing:** Analyze the strengths and weaknesses of different engineering design models. How do they compare in terms of efficiency and effectiveness?
5. **Evaluating:** Evaluate the success of a completed engineering project. What criteria would you use to determine its success or failure?
6. **Creating:** Create a new engineering design process model that incorporates sustainability principles. How would this model differ from traditional models?

By transforming questions this way, you encourage students to engage in deeper thinking and develop a more comprehensive understanding of the subject matter.

One more simple example is cited below for framing the questions in LOTS to HOTS in a photosynthesis process.

Topic: Photosynthesis Process

Lower-Order Thinking Skills (LOTS)

1. **Remembering**
   Question: List the primary components required for photosynthesis.
   Question: What are the end products of photosynthesis?
2. **Understanding**
   Question: Describe the role of chlorophyll in photosynthesis.
   Question: Summarize the steps involved in the light-dependent reactions of photosynthesis.
3. **Applying**
   Question: How would you use a spectrophotometer to measure the rate of photosynthesis?
   Question: Apply the concept of photosynthesis to explain why plants are essential for maintaining atmospheric oxygen levels.

Higher-Order Thinking Skills (HOTS)

4. **Analyzing**
   Question: Compare and contrast the processes of photosynthesis and chemosynthesis.
   Question: Analyze the effect of different environmental conditions on the rate of photosynthesis.
5. **Evaluating**
   Question: Evaluate the effectiveness of artificial light sources in promoting photosynthesis in indoor plants.
   Question: Critique a scientific study that investigates the impact of carbon dioxide concentration on photosynthesis.
6. **Creating**
   Question: Design a model to illustrate the process of photosynthesis in a plant cell.
   Question: Create a research proposal to study the effects of climate change on photosynthesis in different plant species.

These examples should help you frame questions that target various cognitive levels, promoting a deeper understanding and critical thinking among students.

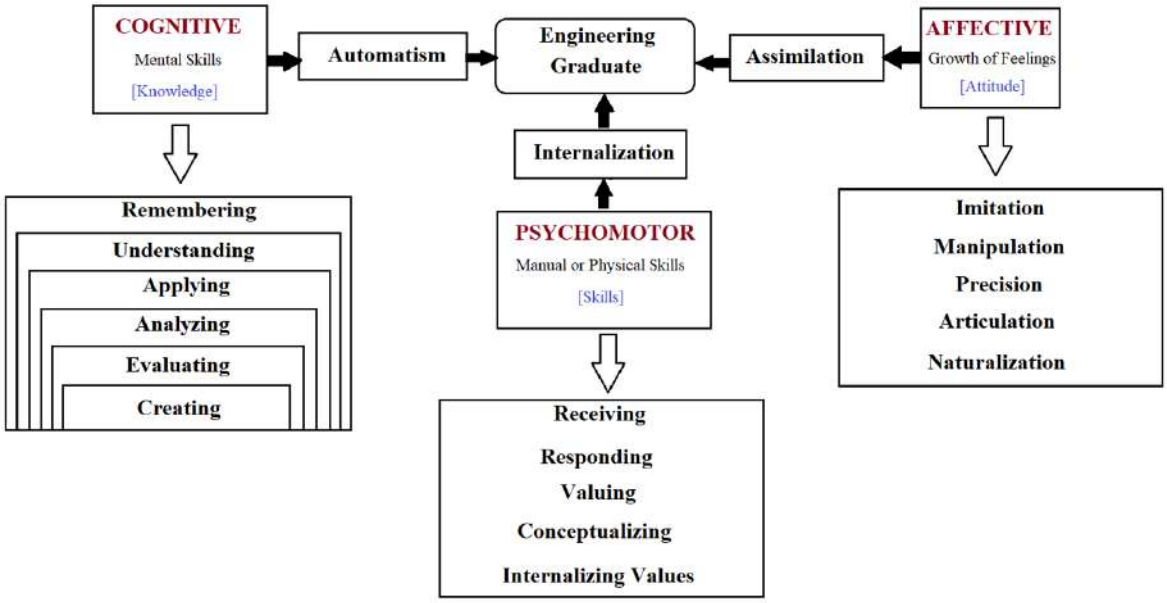


Fig. 05 The domains of learning and its constituents associated with engineering graduates.

The industry-ready engineering graduates are most likely to be recognized through their acquired knowledge, skills, and attitudes. Therefore, the three most appropriate learning cognitive, psychomotor, and affective domains are described with constituents in Fig. 5 . The 'cognitive domain' intends to nurture an undergraduate's intellectual ability and knowledge involving six hierarchical parameters: remembering, understanding, applying, analyzing, evaluating, and creating. An 'affective domain' addresses opinions, interests, values, motivations, attitudes, and emotions. It involves five nonhierarchical parameters: imitation, manipulation, precision, articulation, and naturalization. A psychomotor domain is allied to physical skills such as expressive movement, speed, handiness, and body gestures and assessed with non-sequential parameters: receiving, responding, valuing, conceptualizing, and internalizing values. As mentioned earlier, NBA. India expects every engineering institute to follow a predefined list of competencies and skills the undergraduate may receive until graduation, described in the PO statement. These PO statements must ally with at least one of the three learning domains. (i., e. cognitive, psychomotor, and affective domains) before starting the assessment.

11.COURSE OUTCOMES (COS)

In the context of the National Board of Accreditation (NBA), India, Course Outcomes (COs) refer to the specific, measurable, and achievable learning objectives students are expected to attain upon completing a particular course. These outcomes ensure that students acquire the necessary knowledge, skills, and competencies relevant to their field of study. The NBA emphasizes an Outcome-Based Education (OBE) model, which focuses on what students can do after they have completed their courses. COs are integral to this model as they provide a clear framework for assessing student performance and the effectiveness of the teaching-learning process. CO attainment of COs is measured through various direct and indirect assessment methods, such as exams, projects, and surveys, which help evaluate whether the educational goals are being met. This systematic approach ensures continuous improvement in the quality of education and aligns the curriculum with industry and societal needs.

Key characteristics of course outcomes :

Course outcomes should be clear and specific, leaving no room for ambiguity. They often use action verbs that are observable and measurable, making it easier to assess whether students have achieved the intended objectives.

- **Aligned with Learning Goals:** Course outcomes are aligned with broader learning goals, program objectives, or institutional mission statements. They ensure that individual courses contribute to the overall educational objectives of a program or institution.
- **Reflective of Bloom's Taxonomy:** Course outcomes often span different levels of Bloom's Taxonomy, encompassing a range of cognitive processes from basic recall of information to higher-order thinking skills such as analysis, synthesis, and evaluation.
- **Realistic and Attainable:** While course outcomes should be challenging, they need to be realistic and attainable within the scope of the course. They should consider the time, resources, and instructional methods available.
- **Student-Centered:** Course outcomes focus on what students will be able to do, emphasizing a student-centred approach to education. This perspective shifts the focus from teaching to learning, encouraging educators to design instructional strategies that facilitate student achievement of the outcomes.
- **Contextually Relevant:** Course outcomes are contextually relevant to the subject matter and the specific goals of the course. They reflect the unique content and objectives of the course, tailored to the needs of the students and the discipline.
- **Assessment Guides:** Course outcomes guide the development of assessments. They provide a basis for creating assignments, exams, and other evaluation methods that align with the intended learning objectives.
- **Dynamic and Iterative:** Course outcomes are not set in stone. They can be revised and refined based on feedback, changing educational needs, or advancements in the field. The process of defining and refining course outcomes is often iterative.

Benefits of using Course Outcomes (COs)

Using Course Outcomes (COs) offers several benefits for both educators and students:

For Educators:

- **Clear Framework:** COs provide a structured framework for designing course content, assessments, and learning activities, ensuring alignment with educational goals.
- **Transparency:** They make the expectations and objectives of the course clear to students, colleagues, and other stakeholders.
- **Assessment:** COs facilitate the creation of transparent and equitable assessment methods, making measuring student performance and course effectiveness easier.
- **Continuous Improvement:** By regularly assessing COs, educators can identify areas for improvement in their teaching methods and course design.

For Students:

- **Guidance:** COs clearly communicate what students are expected to learn and achieve, helping them focus their efforts and manage their learning strategies.
- **Self-Regulation:** They enable students to monitor their own progress, reflect on their learning, and seek help when needed.
- **Ownership:** COs help students take ownership of their learning by understanding the specific skills and knowledge they need to acquire.
- **Alignment with Goals:** They assist students in determining if a course aligns with their personal and professional goals, making informed decisions about their education.

11.1 Articulating the Course Outcomes (COs)

Articulating Course Outcomes (COs) involves a systematic approach to ensure they are clear, specific, and measurable. Start by identifying the key concepts and skills students should acquire by the end of the course, aligning these with the broader Program Outcomes (POs). Use action verbs from Bloom's Taxonomy to articulate the expected level of performance, ensuring each CO is specific and measurable. It's essential to align COs with the course content, teaching methods, and assessment strategies to create a cohesive learning experience. Typically, a course should have around 5-7 COs to maintain focus and manageability. Regularly review and revise COs based on feedback and assessment results to ensure continuous improvement. This structured approach helps create effective and meaningful learning objectives that enhance the educational experience.

When articulating Course Outcomes (COs), it's essential to include three key components: Performance, Criteria, and Condition. These components help in creating clear, measurable, and achievable learning objectives.

Performance

Performance refers to the specific action or behaviour that students are expected to demonstrate due to the learning activity. It answers the question, "What will the students be able to do?" This component should use action verbs that describe observable and measurable behaviours, such as "analyze," "design," "evaluate," or "create". The performance component refers to the specific behaviour or action that students are expected to demonstrate to show they have achieved the course outcome. It involves using action verbs that are observable and measurable. The performance component outlines what students should be able to do due to their learning in the course.

Examples of performance verbs include:

- Analyze
- Design
- Evaluate
- Solve
- Create
- Explain

Criteria

Criteria specify the standards or levels of performance that will be considered acceptable. This component answers, "How well must the students perform the task?" Criteria can include aspects like accuracy, speed, quality, or quantity. For example, a criterion might state that students must complete a task with 90% accuracy or within a specific time frame. The criteria component outlines the standards or benchmarks against which student performance will be assessed. It clarifies the expectations and sets the level of proficiency required for a student to succeed in achieving the outcome. Criteria help evaluate the quality of student work and ensure consistency in assessment.

Examples of criteria may include:

- Accuracy
- Clarity
- Creativity
- Logical reasoning
- Application of concepts
- Depth of analysis

Condition

Condition describes the circumstances under which the performance should occur. It answers the question, "Under what conditions will the students perform the task?" Conditions can include the tools, resources, or environment available to the students. For instance, a condition might specify that students will perform a task using a particular software or within a lab setting. The condition component specifies the context or circumstances under which the performance is expected. It sets the stage for how and where the learning outcome should be demonstrated. Conditions may vary depending on the nature of the course, the learning environment, or the specific skills being assessed.

Examples of conditions may include:

- Using specific tools or software
- Working individually or collaboratively
- Applying knowledge in real-world scenarios
- Demonstrating skills in a laboratory setting

Example

For a course, a CO might be: By the end of this course, students will be able to

1. "Analyze large datasets using Python (Performance) with an accuracy of 95% (Criteria) under supervised lab conditions (Condition)."
2. "Design a mechanical component (Performance) that meets specified engineering standards and tolerances (Criteria) using CAD software in a lab environment (Condition)."

3. “Design a primary electrical circuit (Performance) that meets industry safety standards and operates within specified voltage and current limits (Criteria) using simulation software in a controlled lab environment (Condition).”

Do and Don’t in drafting CO statements.

Dos:

1. Be specific and clear
2. Use measurable verbs
3. Align with program outcomes
4. Focus on student performance
5. Be realistic and achievable

Don’ts:

1. Avoid vague language
2. Don’t use multiple verbs in one Statement
3. Avoid overly ambitious goals
4. Don’t focus on teaching activities
5. Avoid jargon and complex language

We at ADCET, Ashta, follow certain practices while drafting the COs. These practices are desirable and must be considered while drafting the COs.

- **CO must be articulated with an increasing order of revised bloom levels.**
- **Avoid unitwise COs.**
- **Although COs are mentioned in the curriculum, any faculty who feels COs need to change can change COs for his course with the approval of PAC and DIQAC.**
- **Avoid complex statements**
- **CO statements must be realistic and measurable.**

A Sample course outcomes for the course “Data Structures” for the second year UG program in the computer science and engineering department of ADCET, Ashta, is as follows,

Note: While articulating course outcomes, write course objectives separately, which will help write/ articulate course outcomes correctly.

Table No. 07 Sample course outcomes for a course 2CSPC202 Data Structure.

Course Outcome No	Course Outcome Statement	Performance Component	Criteria Component	Condition Component
2CSPC202_1	Describe fundamentals in data structures for solving problems using a programming language	Describe fundamentals in data structures	for solving problems	using a programming language
2CSPC202_2	Explain the fundamental concepts of structuring, managing and organizing the data for solving problems using linear data structures with ADTs	Explain the fundamental concepts of structuring, managing and organizing the data	for solving problems	using linear data structures with ADTs
2CSPC202_3	Apply appropriate linear data structure to solve the problem using a programming language	Apply appropriate linear data structure	to solve the problem	using a programming language
2CSPC202_4	Explain the fundamental concepts of structuring, managing and organizing the data to solve problems using non-linear data structures with ADTs.	Explain the fundamental concepts of structuring, managing and organizing the data	for solving problems	using non-linear data structures with ADTs.
2CSPC202_5	Apply appropriate non-linear data structure to solve the problem using a programming language	Apply appropriate non-linear data structure	to solve the problem	using a programming language
2CSPC202_6	Compare and analyze different data structure algorithms and searching sorting methods for solving problems using complexity methods	Compare and analyze different data structure algorithms and searching sorting methods	for solving problems	using complexity methods

11.2 CO-PO Matrix

At present, two approaches are famous for establishing CO-PO mapping. In the first approach, the contact hours are used to identify the correlation between COs and POs. In the second approach, the AICTE exam reforms are considered,

1. Depending upon the contact hours,
2. The guidelines by AICTE are mentioned in its document on exam reforms (Examination Reform Policy November 2018).

At the ADCET, Ashta, we use the second method to correlate the COs with POs. This document talks about the two-step clarity process for POs. POs give helpful guidance at the program level for the curriculum design, delivery and assessment of student learning. However, they represent reasonably high-level generic

goals that are not directly measurable. Real observability and measurability of the POs at the course level are very difficult. To connect high-level learning outcomes (POs) with course content, course outcomes, and assessment, it is necessary to bring further clarity and specificity to the program outcomes. This can be achieved through the following two-step process of identifying Competencies and Performance Indicators (PI).

1. **Identify Competencies to be attained:** For each PO, define competencies, which are different abilities implied by the program outcome statement that generally require different assessment measures. This helps us to create a shared understanding of the competencies we want students to achieve. They serve as an intermediate step to the creation of measurable indicators.

   Example: Program Outcome (Attribute 3) Design:

   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.

   Competencies

   1) Demonstrate an ability to define a complex, open-ended problem in engineering terms.
   2) Demonstrate an ability to generate diverse alternative design solutions.
   3) Demonstrate an ability to select the optimal design scheme for further development.
   4) Demonstrate an ability to advance an engineering design to the defined end state.

2. **Define Performance Indicators:** For each identified competency, define performance Indicators (PIs) that explicitly state student learning expectations. They can act as measuring tools in assessment to understand the extent of attainment of outcomes. They can also be designed to determine the appropriate achievement level or competency of each indicator so that instructors can target students and help them achieve an acceptable level of proficiency.

   Example: **For the Competency -2**

   Demonstrate an ability to generate a diverse set of alternative design solutions

   Performance Indicators:

   1) Apply formal idea-generation tools to develop multiple engineering design solutions
   2) Build models, prototypes, and algorithms to develop a diverse set of design solutions
   3) Identify the functional and non-functional criteria for evaluation of alternate design solutions.

It should be noted that the program outcome looks like it can be achieved only in the Capstone project. But if we consider the competencies and performance indicators, we start seeing the opportunities to address them (and hence PO) in various program courses. Once the above process is completed for the program, the assessment of COs for all the courses is designed by connecting assessment questions (used in various assessment tools) to the PIs. Following this process, where examination questions map with PIs, we get clarity and better resolution for assessing COs and POs through a justifiable CO-PO mapping.

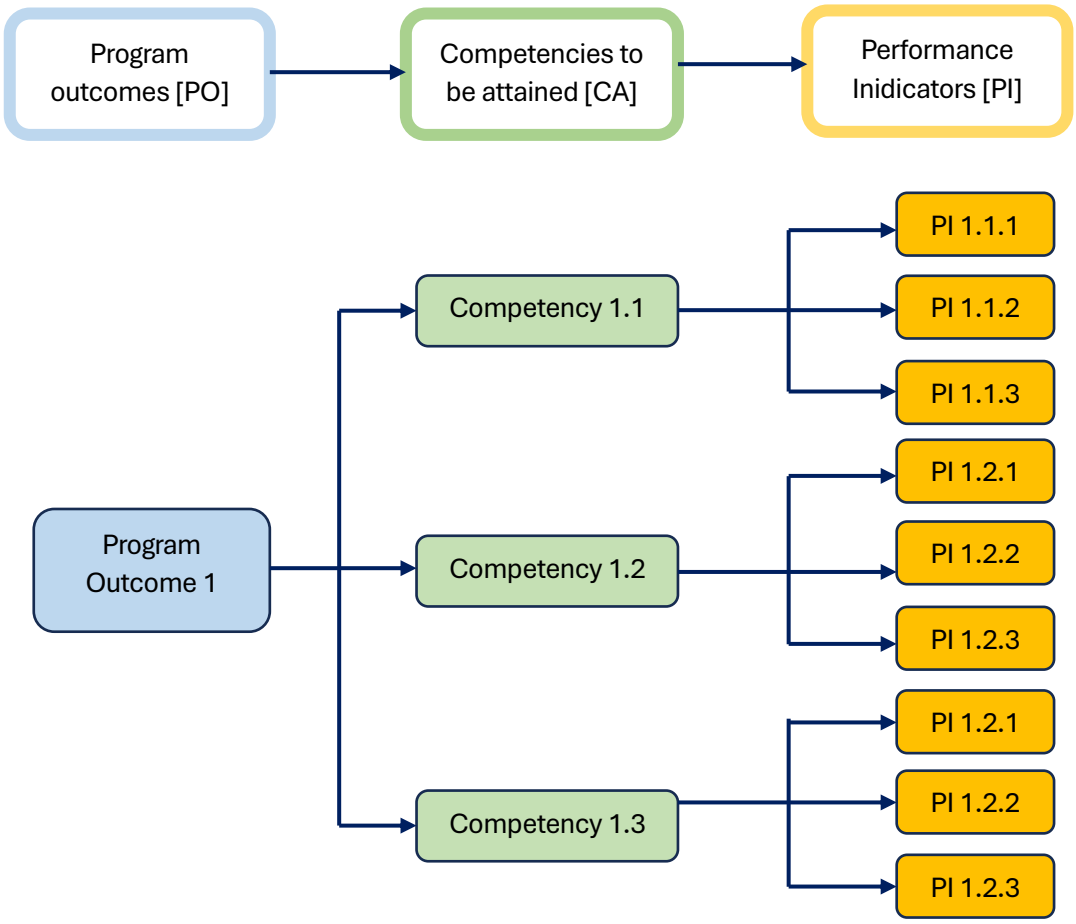


Fig. 06: Connecting POs to Competencies and PI

This examination policy document of AICTE mentions the competencies and performance indicators for UG Mechanical and UG Computer Science and Engineering as an example. Hence, a brainstorming session was organized at the program level to finalize specific programs' competencies and performance indicators. The first task to be undertaken by any new program/department is to draft the competencies and performance indicators for all twelve POs.

As a reference, the following table shows competencies and performance indicators for the UG Computer Science and Engineering program at ADCET, Ashta.

Table no.07 Competencies and performance indicator for POs at UG CSE program (Sample)

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.			
Competency		Indicators	
1.1	Demonstrate competence in mathematical modelling.	1.2.1	Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems.
		1.2.2	Apply the concepts of probability, statistics, and queuing theory to modelling computer-based systems, 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 and engineering to solve an engineering problem.
PO 2: Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.			
Competency		Indicators	
2.1.	Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Evaluate problem statements and identify objectives
		2.1.2	Identify processes/modules/algorithms of a computer-based system and parameters to solve a problem
		2.1.3	Identify 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	Identify 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 alternative solution processes to select the best process.
2.3.	Demonstrate an ability to formulate and interpret a model	2.3.1	Able to apply computer engineering principles to formulate system modules with required applicability and performance.
		2.3.2	Identify design constraints for required performance criteria.
2.4.	Demonstrate an ability to execute a solution process and analyze results	2.4.1	Applied 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.
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 public health and safety, and cultural, societal, and environmental considerations.			
Competency		Indicators	
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	Able to review state-of-the-art literature to synthesize system requirements.

		3.1.4	Able to choose appropriate quality attributes defined by ISO/IEC/IEEE standards.
		3.1.5	Explore and synthesize system requirements from more significant social and professional concerns.
		3.1.6	Able to develop software requirement specifications (SRS).
3.2.	Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Able to explore design alternatives.
		3.2.2	Able to produce various potential design solutions suited to meet functional requirements.
		3.2.3	Identify suitable non-functional requirements for the evaluation of alternate design solutions.
3.3.	Demonstrate an ability to select optimal design scheme for further development	3.3.1	Able to systematically evaluate the degree to which several design concepts meet the criteria.
		3.3.2	Consult with domain experts and stakeholders to select candidate engineering design solutions for further development
3.4.	Demonstrate an ability to advance an engineering design to a defined end-state	3.4.1	Able to refine architecture design into a detailed design within the existing Constraints.
		3.4.2	Able to implement and integrate the modules.
		3.4.3	Able to verify the functionalities and validate the design.
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.			
Competency		Indicators	
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	Able to choose appropriate procedure/algorithm, dataset and test cases.
		4.1.3	Able 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
		4.3.3	Represent data (in tabular and/or graphical forms) to facilitate analysis and explanation of the data and drawing of conclusions
		4.3.4	Synthesize 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.			
Competency		Indicators	
5.1.	Demonstrate an ability to identify/create modern	5.1.1	Identify modern engineering tools, techniques and resources for engineering activities.

	engineering tools, techniques and resources	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) modelling 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 concerning the accuracy, limitations, and 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.			
Competency		Indicators	
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 concerning protecting the public and public interest at the global, regional and local levels.
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.
PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.			
Competency		Indicators	
7.1.	Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and 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
PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
Competency		Indicators	
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 multidisciplinary settings.			
Competency		Indicators	
9.1.	Demonstrate an ability to form a team and define a role for each member	9.1.1	Recognize various 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 teamwork to accomplish a goal.
9.2.	Demonstrate effective individual and team operations-communication, problem-solving, conflict resolution and leadership skills	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
		9.2.4	Maintain composure in difficult situations
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
PO 10: 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.			
Competency		Indicators	
10.1.	Demonstrate an ability to comprehend technical literature and document project work	10.1.1	Read, understand and interpret technical and non-technical 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 non-technical 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 various 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 work, as a member and leader in a team, to manage projects and in multidisciplinary environments.			
Competency		Indicators	
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.
11.2.	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	11.3.1	Identify the tasks and resources required to complete an engineering activity.

	activity within time and budget constraints		
PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.			
Competency		Indicators	
12.1.	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for the 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 historical points of technological advances in engineering that required practitioners to seek education 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

Similarly, the competencies and performance indicators for the PSOs for each program are drafted, which will be helpful in mapping COs with PSOs.

Table no.08 Competencies and performance indicator for PSOs at UG CSE program (Sample)

PSO 1: An ability to adapt to latest trends in software engineering practices and strategies in real-time software development lifecycle using open-source programming environment or commercial environment.			
Competency		Indicators	
PSO 1.1.	Demonstrate an ability to identify and apply recent trends and strategies in software engineering practices.	PSO-1.1.1	Identify software engineering practices used in industry, such as agile methodology, design thinking, etc.
		PSO-1.1.2	Apply recent trends and strategies in software project development.
PSO 1.2.	Demonstrate an ability to adapt to recent technologies and environments	PSO-1.2.1.	Select/Identify and apply appropriate open-source technologies to solve real-world problems.
		PSO-1.2.2.	Apply appropriate commercial technologies/environments to solve real-world problems.
PSO 2: An ability to get acquainted with contemporary trends in industrial / research areas and thereby provide solutions to real life problems, by specifically using knowledge and skills in the areas of Data Analytics, Machine Learning, Internet of Things, Cloud Computing and Security.			
	Competency		Indicators
PSO 2.1	Demonstrate an ability to solve problems identified by industry.	PSO-2.1.1.	Design appropriate methodologies to solve industrial problems.
		PSO-2.1.2	Develop solutions for industrial problems using cutting-edge technologies.
PSO 2.2.	Demonstrate an ability to address diverse research issues at local,	PSO-2.2.1.	Identify research trends in computer science and engineering.

	regional, national and global levels and solve the same.	PSO-2.2.2.	Comprehend technical literature and analyze existing solutions to identify research gaps.
		PSO-2.2.3.	Address and justify different socio-economic problems in the domain of thrust areas.
		PSO-2.2.4.	Design and develop solutions for identified socio-economic problems.

11.3 Process flow for CO-PO Mapping

We at ADCET, Ashta, have a well-defined process flow for CO-PO Mapping, described in the following flowchart. This process is similar to the curriculum development process; we are using a practice that CO statements for the course will be defined in the curriculum documents so that the curriculum must be designed based on the CO statements.

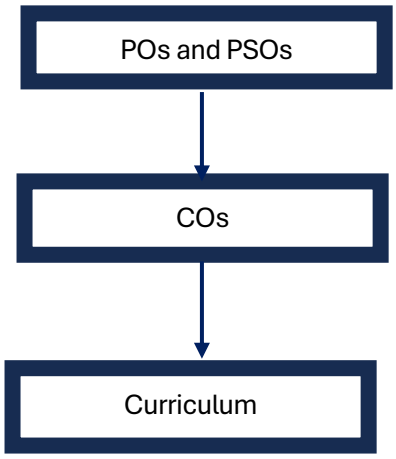
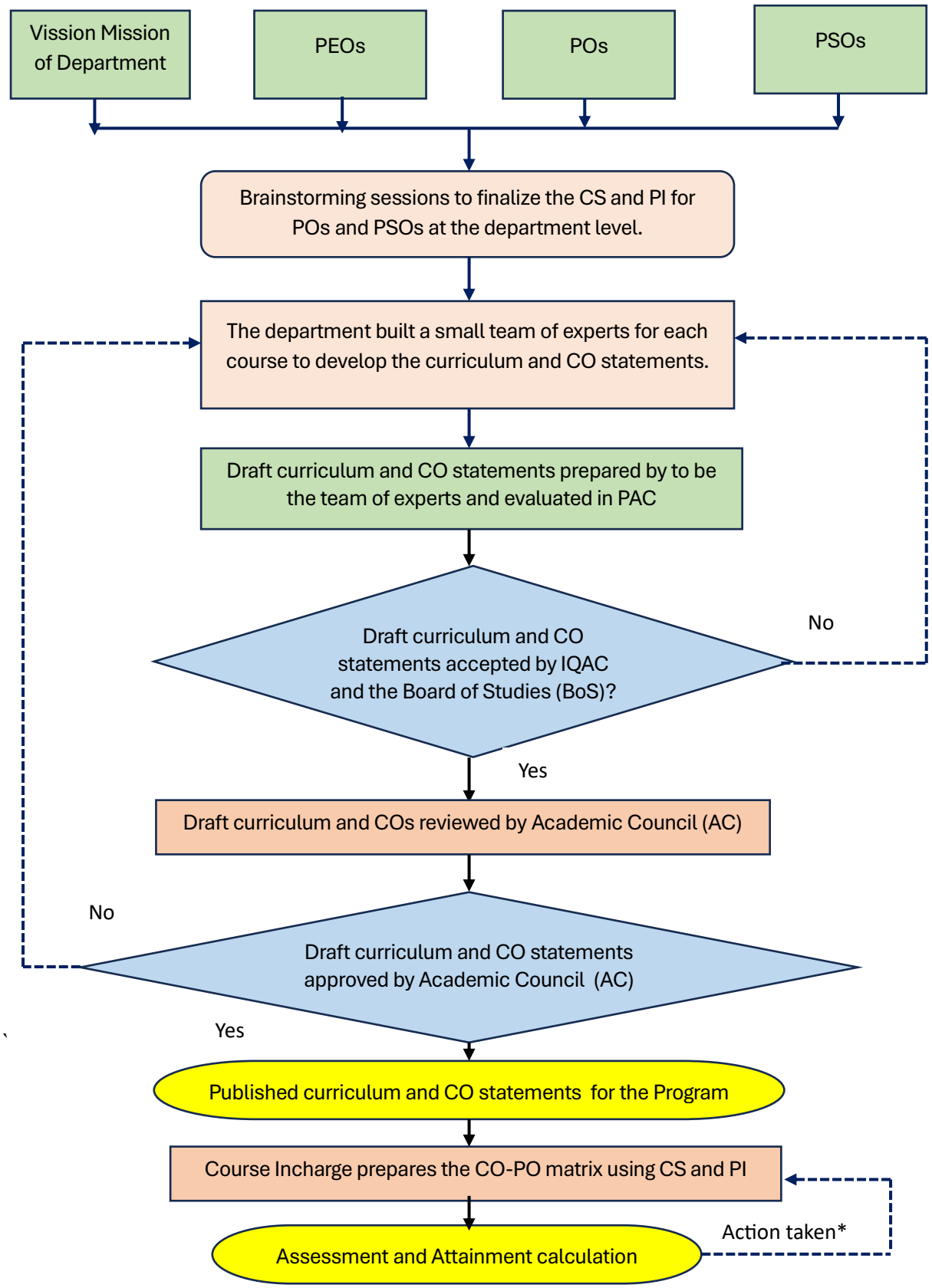


Fig. 07 Generalised flow for POs, COs and curriculum



* Explain the rationale of this action taken activity

Fig. 08 Process for establishment, assessment and attainment of COs

11.4 Sample CO-PO Mapping

To prepare for CO-PO Mapping, consider a course from UG (CSE) at the second-year level.

Course Name: Data Structure

Course Code: 2CSPC202

Teaching scheme: L: T: P: 3:0:2

Evaluation Scheme:

- For Theory-
  ISE: 40, **MSE:** 30 and **ESE:** 30
- For Laboratory-
  ISE: 50 **ESE:** 50

As per a standard defined process as discussed in previous sections, the COs for this course are drafted and mentioned below,

Table No. 09 Sample course outcome for a course

COs	Course Outcome Statement
2CSPC202_1	Describe fundamentals in data structures for solving problems using a programming language.
2CSPC202_2	Explain the fundamental concepts of structuring, managing and organizing the data for solving problems using linear data structures with ADTs
2CSPC202_3	Apply appropriate linear data structure to solve the problem using a programming language.
2CSPC202_4	Explain the fundamental concepts of structuring, managing and organizing the data to solve problems using non-linear data structures with ADTs.
2CSPC202_5	Apply appropriate non-linear data structure to solve the problem using a programming language.
2CSPC202_6	Compare and analyze different data structure algorithms and search sorting methods for solving problems using complexity methods.

Per our discussion, the Department of Computer Science and Engineering has identified the competencies and performance indicators for all twelve POs and PSOs. (Refer to table No. 6 From the previous section).

To map the COs with POs as a sample, consider course outcome numbers 2CSPC202_1 and PO 1 described by NBA, India.

So let us write both the statement again,

So, CO under consideration is,

Course outcome:

2CSPC202_1: Describe fundamentals in data structures for solving problems using a programming language.

Program outcome:

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.

Similarly, the department has already identified the competencies and performance indicators for PO1, Which are, as mentioned in the following table,

Table No. 10 Sample Competency and Performance Indicator for PO1

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation for the solution of complex engineering problems.			
Competency		Indicators	
1.1	Demonstrate competence in mathematical modelling.	1.2.1	Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems.
		1.2.2	Apply the concepts of probability, statistics, and queuing theory to modelling computer-based systems, 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 and engineering to solve an engineering problem.

So, in this case, four competencies are defined: 1.1, 1.2, 1.3. and1.4. While there are a total of five performance indicators,

Table No. 11 Sample Competency and Performance Indicator Mapping for PO1

Competency	Indicators
1.1	1.2.1
	1.2.2
1.2	1.2.1
1.3	1.3.1
1.4	1.4.1

So, in identifying the relationship between COs and POs, the course in charge needs a thorough exercise based on his judgement in determining the relation between CO and PO. To help this process, we now divided the complicated POs into small competencies, and competencies also have performance indicators that can help identify the relation. So, it's the course coordinator's pure judgment to specify how much of a percentage of specific CO statements are correlated with performance indicators.

To avoid the complication, we at ADCET, Ashta, restrict to only 11 percentage numbers,

Table No. 12 Mapping percentage number

0 %	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100 %

Where "0 %" indicates no correlation between the CO statement and the performance indicator of defined competencies.

There is no restriction in using any closest number to represent the correlation. However, proper justification needs to be mentioned if any authorities question it. Whenever you feel that the correlation doesn't exist, use it as 0 % (dash). So, in our case, a correlation between the identified CO 1 and the performance indicator for PO1 is as follows,

Table No. 13 Sample mapping judgement by the course coordinator (Sample) (CO1-PO1)

CO	Competency	Indicators	Sample mapping by a course coordinator	Average
2CSPC202_1	1.1	1.2.1	60 %	(60+30)/2 = 45 %
		1.2.2	30 %	
2CSPC202_1	1.2	1.2.1	50 %	50 %
2CSPC202_1	1.3	1.3.1	100 %	100 %
2CSPC202_1	1.4	1.4.1	70 %	70 %
			Concluding Average =	(45 + 50 + 100 + 70)/4 = 66.25 %

Similarly, for CO1 and PO 10

Table No. 14 Sample mapping judgement by the course coordinator (Sample) (CO1-PO10)

CO	Competency	Indicators	Sample mapping by a course coordinator	Average
2CSPC202_1	11.1	11.1.1	0 %	0 %
2CSPC202_1	11.2	11.2.1	0 %	0 %
2CSPC202_1	11.3	11.3.1	0 %	0 %
			Concluding Average =	(0 + 0 + 0)/3 = 0 %

Similarly, for CO1 and PO 12

Table No. 14 Sample mapping judgement by the course coordinator (Sample) (CO1-PO12)

CO	Competency	Indicators	Sample mapping by a course coordinator	Average
2CSPC202_1	12.1.	12.1.1	0 %	(80+0)/2 = 40 %
		12.1.2	80 %	
2CSPC202_1	12.2.	12.2.1	0 %	0 %
		12.2.2	0 %	
2CSPC202_1	12.3.	12.3.1	80 %	80%
			Concluding Average =	(40+ 0 + 80)/3 = 40 %

A similar exercise needs to be performed for each CO statement with all POs (i.e. 12); in total, there are six COs and twelve POs; we need to perform a total of 6 x 12 = 72 iterations and more than that iterations for PI to identify the complete CO-PO matrix.

However, the NBA expects the relationship between COs and POs to be represented in levels. So, at ADCET, Ashta, the following levels are decided: the same for all programs throughout the institute.

Table No. 15 Correlation levels for CO-PO mapping

Average %	Correlation Level	Correlation
> 70 %	3	**Strongly Mapped**
Between 50 % to 69 %	2	**Moderately Mapped**
Between 30 % to 49 %	1	**Weakly Mapped**
Between 0 % to 29 %	-	**Not Mapped**

Hence, in the above calculation,

Table No. 16 Sample use of correlation levels for CO-PO mapping

CO	PO	Conculed Average	Correlation Level
2CSPC202_1	PO1	66.25 %	2
2CSPC202_1	PO11	0 %	-
2CSPC202_1	PO12	40 %	1

Hence, as mentioned above, the outcome of the process is that at the end of the above method, we get a completed CO-PO acquisition matrix, which we can further use in the OBE with the PO assessment and attainment process. The final CO-PO Matrix for the course "Data Structure is as follows,

Table No. 17 Sample CO-PO matrix for the course 2CSPC202 Data Structure

Course Outcome (COs)	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
2CSPC202_1	2	2	-	-	-	-	-	-	-	-	-	1	2	-
2CSPC202_2	2	2	-	-	-	-	-	-	2	3	-	-	2	-
2CSPC202_3	3	3	2	2	-	-	-	2	2	3	-	1	2	-
2CSPC202_4	2	2	-	-	-	-	-	-	2	3	-	-	2	-
2CSPC202_5	3	3	2	2	-	-	-	2	2	3	-	1	2	-
2CSPC202_6	3	3	2	2	-	-	-	2	2	3	-	1	2	-
Total	15	15	6	6	-	-	-	6	10	15	-	4	12	-
Average	2.5	2.5	2	2	-	-	-	2	2	3	-	1	2	-
2CSPC202	3	3	2	2	-	-	-	2	2	3	-	1	2	-

While calculating the average, only cells with numbers are considered. If the number is more than 0.5, consider the next digit in the final targets of the CO-PO matrix.

So, the outcome of the CO-PO matrix, which we need to submit in SAR, is the CO-PO acquisition matrix for all courses prescribed in the curriculum.

Table No. 17 Final CO-PO matrix for the course 2CSPC202 Data Structure

Course Outcome (COs)	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Average	2.5	2.5	2	2	-	-	-	2	2	3	-	1	2	-
2CSPC202	3	3	2	2	-	-	-	2	2	3	-	1	2	-

IMPORTANT INSTRUCTIONS

1) FOR THEORY COURSE

Care should also be taken to ensure a proper assessment plan is ready before CO-PO mapping. This means if the ISE assessment course teacher is planning to take ISE activities for this course, like

1. Poster presentation
2. Debate competition
3. Project

Then, the course teacher is expected to map particular higher-order POs based on assessment tools that can relate to the POs and fulfil the predefined performance indicators. Illustrative examples are mentioned in the following table.

Table No. 18 Assessment tool and PO mapping

Sr	Assessment tools	Expected PO alignment based on assessment tool as and when required (Illustrative example)
1	Poster presentation	• PO 5: Modern tool usage • PO 10: Communication
2	Video Making	• PO 5: Modern tool usage • PO 8: Ethics • PO 10: Communication • PO 12: Life-long learning
3	Group Discussion	• PO 6: The engineer and society • PO 7: Environment and sustainability • PO 8: Ethics • PO 9: Individual and teamwork • PO 10: Communication
4	PPT Presentation on the topic	• PO 8: Ethics • PO 10: Communication
5	Model Making	• PO 6: The engineer and society • PO 7: Environment and sustainability • PO 8: Ethics • PO 9: Individual and teamwork

Sr	Assessment tools	Expected PO alignment based on assessment tool as and when required (Illustrative example)
6	Case Study	• PO 6: The engineer and society • PO 7: Environment and sustainability • PO 8: Ethics
7	Programming test/Coding	• PO 5: Modern tool usage
8	Analysis of component	• PO 5: Modern tool usage
9	Portfolio development	• PO 5: Modern tool usage • PO 8: Ethics
10	Report writing	• PO 6: The engineer and society • PO 7: Environment and sustainability • PO 8: Ethics • PO 10: Communication
11	Competitions	• PO 8: Ethics
12	Project	All POs from 5 to 12 other than lower order POs

2) FOR PRACTICAL COURSE

If the prescribed syllabus course also has a practical component, it is mandatory to map the following POs in CO-PO mapping based on the continuous evaluation of students in practical sessions, both affective and psychomotor domains, in addition to assessment in the cognitive domain,

Table No. 19 Domains and PO mapping for practical courses

Sr.	Domains	POs are to be aligned with COs based on practical performance.
1.	Affective domain	• PO 8: Ethics
2.	Psychomotor domain	• PO 5: Modern tool usage • PO 10: Communication

12. EXAMINATION SYSTEM AT ADCET

The examination system in autonomous engineering institutes plays a pivotal role in maintaining and enhancing the quality of education, particularly in the context of accreditation by bodies like the National Board of Accreditation (NBA) and the National Assessment and Accreditation Council (NAAC). These accreditations are crucial for ensuring that educational programs meet high standards of quality and relevance.

Importance of Examination System

1) Quality Assurance:

The examination system is a critical component of the quality assurance process. It ensures that the learning outcomes, as defined by the Course Outcomes (COs) and Program Outcomes (POs), are effectively assessed and achieved. This alignment is critical for NBA accreditation, emphasising an Outcome-Based Education (OBE) model.

2) Continuous Improvement:

Regular and systematic assessments help identify gaps in the teaching-learning process. This feedback loop is essential for continuous improvement, a core principle of both NBA and NAAC accreditation processes. By analyzing examination results, institutes can make informal decisions about curriculum updates, teaching methods, and resource allocation.

3) Transparency and Accountability:

A robust examination system promotes transparency and accountability. It provides a clear and objective measure of student performance, essential for maintaining the institution's credibility. This transparency is a crucial requirement for NAAC accreditation, which evaluates the overall functioning and governance of the institution.

4) Student Development:

Examinations are about grading students and fostering critical thinking, problem-solving, and analytical skills. By designing assessments that challenge students to apply their knowledge in practical scenarios, institutes can better prepare them for real-world challenges. This aligns with the NBA's focus on producing industry-ready graduates capable of lifelong learning.

5) Benchmarking and Recognition:

Accreditation by NBA and NAAC provides national and international recognition to the institute. A well-structured examination system that aligns with the accreditation criteria helps achieve high scores in these evaluations, enhancing the institute's reputation and attracting better students and faculty.

6) Compliance with Standards:

Autonomous institutes must comply with the standards set by regulatory bodies. The examination system ensures that the institute adheres to these standards, which is crucial for maintaining accreditation status. Both NBA and NAAC have specific criteria for the assessment and evaluation processes that institutes must meet.

In summary, the examination system in autonomous engineering institutes is fundamental to achieving and maintaining high educational standards. It supports quality assurance, continuous improvement, transparency, student development, benchmarking, and compliance with accreditation standards set by NBA and NAAC. By focusing on these aspects, institutes can ensure they provide a high-quality education that meets the needs of students, industry, and society.

There are three components for theory and practical assessment courses at ADCET, Ashta.

- For theory courses:
    1. In-Semester Evalution (ISE)
    2. Mid Semester Examinations (MSE)
    3. End Semester Examinations (ESE)
- For practical courses:
    1. In-Semester Evalution (ISE)
    2. End Semester Examinations (ESE)

The details for these assessment components are mentioned in the following table,

- For theory courses:

Table No. 20 Examination events and their weights (Theory course)

Name of Assessment	Assessment Methodology	Weightage	Unit Covered
ISE * (More than 2 activities)	Activity Based Assessment [Rubrics/Marks-based assessment]	40	1 to 6
MSE	Written Exam.	30	1 to 3
ESE	Written Exam.	30	4 to 6

- For practical courses:

Table No. 21 Examination events and their weights (Practical course)

Name of Assessment	Assessment Methodology	Weightage	Description
ISE	Continuous Assessment	25/50	Rubric based Assessment
ESE	Practical /Oral	25/50	Performance-based

12.1 Quality of question paper

Maintaining the quality of question papers at an autonomous engineering institute is crucial for ensuring the integrity and effectiveness of the examination system. High-quality question papers are essential for accurately assessing students' understanding, skills, and competencies in line with the Course Outcomes (COs) and Program Outcomes (POs). They help evaluate rote memorisation and higher-order thinking skills such as analysis, synthesis, and application, which are vital for engineering education. Well-crafted question papers cover the entire syllabus uniformly, are free from ambiguity, and include a mix of theoretical and practical questions that challenge students to apply their knowledge in real-world scenarios. This rigorous assessment process supports continuous improvement in teaching and learning, aligns with accreditation standards set by bodies like the NBA and NAAC, and ultimately enhances the institute's overall educational quality and reputation.

We at ADCET, Ashta, always emphasise maintaining the highest quality in the examination system. Given that the highest quality of the question paper is maintained, two mechanisms are in place at ADCET, Ashta.

- Self-declaration proforma by the paper setter
- Scrutiny process of question papers by the expert committee before examinations.

1. **Self-declaration proforma by the paper setter:**

   In this process, every paper setter has to submit a self-declaration proforma in a sealed packet mentioning the coverage of units in the question paper, CO covered in the question paper, types of questions used in the question paper, the difficulty level of the question paper, etc. about the question paper they submitted to the office of CoE. A typical declaration proforma is given in Fig.

Sant Dnyaneshwar Shikshan Sanstha's
Annasaheb Dange College of Engineering and Technology, Ashta
(An Autonomous Institute affiliated to Shivaji University, Kolhapur)
Office of Controller of Examinations

Proforma of Question Paper Analysis to be submitted by Paper Setter
[As a part of Question Papers Quality Review System (QPQRS)]

Information about paper setting

Name of the Paper Setter:	
Name of the Examinations:	MSE / ESE / 100 % Examinations / CPI Improvement Examinations
Course Code:	
Course Name:	

Analysis about the Question Paper Submitted at the office of CoE

1. Description about the unit wise mark distribution (Including compulsory and optional questions)

Unit No.	Unit No. 01	Unit No. 02	Unit No. 03	Unit No. 04	Unit No. 05	Unit No. 06
Marks						
Percentage						

2. A description indicating marks distribution based on the type of questions (Including compulsory and optional questions)

Type of Question	Descriptive	Short Answers	Computational /Numerical / Programming Analysis	Comparative Analysis/ Reasoning	Design	Graphical/ Illustrative/ pictorial Responses
Marks						
Percentage						

3. A description mentioning marks distribution based on the COs (Including only compulsory questions)

Course Outcome	CO1	CO2	CO3	CO4	CO5	CO6
Marks						
Percentage						

4. Marks distribution based on the cognitive level (Bloom's) (Including only compulsory questions)

Course Outcome	K1	K2	K3	K4	K5	K6
Marks						
Percentage						

Sign., Name and Date of the Paper Setter

Fig. 10 Self-declaration proforma by the paper setter

2. Scrutiny process of question papers by the expert committee before examinations.

A four-member committee is constituted by the office of CoE under the vigilance of the Director, ADCET, Ashta. This committee scrutinized all the question papers received for a particular examination. The constitution of this committee consists of the Chairman (senior faculty member from the program), a Member (Senior faculty member from another program), a Member (Expert faculty from the domain), and faculty members teaching the same course at that time, including paper setter.

This committee goes through the question paper, repetition of questions, CO mapping, and blooms level attainment. This committee has four options with them,

1. Accept the question paper as it is
2. Accept the question paper with minor corrections
3. Accept the question paper with major corrections (Rescrutiny required)
4. Reject the question paper.

A sample of the proforma for the QP scrutiny committee is mentioned below.

Sant Dnyaneshwar Shikshan Sanstha's

ANNASAHEB DANGE COLLEGE OF ENGINEERING AND TECHNOLOGY, ASHTA

(An Autonomous Institute affiliated to Shivaji University, Kolhapur)

Office of Controller of Examinations

FORM No. E – 29 C

ADCET

Question Papers Quality Scrutiny System (QPQSS)

A) General Information		
Question Paper Code :	Branch :	Date of Meeting :
Course Code :	Class :	Time of Meeting :
Course Name :		
Name of Examination :		

B) Curriculum and Numerical Aspect of Question Paper	Yes / No
Does the paper cover all content and skills as prescribed by the syllabus?	
Is any questions contains from outside the prescribed syllabus?	
Does the weight age for various types of questions like descriptive, short answer type, numerical based and Comparative type questions, data response, and essay type questions is appropriate?	
Are the numerical examples and illustrations of diagrams suitable and appropriate?	
Fair relationship between mark allocation, level of difficulty and time allocation among the QP	
Is there a clear differentiation between content suitable for weak and bright student?	

C) Cognitive Aspect of Question Paper	Yes / No
Clear and appropriate use of CO, Bloom Level and Taxonomy?	
The QP fulfils the proper conceptual constructs of the course. Ex. Reasoning ability, ability to compare and contrast, express an argument clearly	
Are the questions challenging and allowing for creative responses from students	
Is the course terminology used correctly	

D) **Conclusion : (Tick Appropriate)**

Accepted — Rejected

Accepted With Minor Correction — Not Accepted (Major Correction)

E) Correction Suggested :

F) Whether the Suggested Corrections made & found Correct	Yes / No

Committee Member :

Chairman :

Expert Member :

Member :

Examination Cell **ADCET, ASHTA**

Fig. 10 A proforma for the QP scrutiny committee

13. ASSESSMENT AND ATTAINMENT OF COs

Assessing Course Outcomes (COs) is a fundamental aspect of Outcome-Based Education (OBE), ensuring that educational objectives are effectively met. CO assessment measures students' knowledge, skills, and competencies acquired through a course, aligning with the broader Program Outcomes (POs). This process helps identify strengths and areas for improvement in both teaching and learning. By systematically evaluating COs, educators can make data-driven decisions to enhance curriculum design, instructional methods, and assessment strategies. This continuous feedback loop improves the quality of education and ensures that graduates are well-prepared to meet industry standards and societal needs. Ultimately, CO assessment fosters a culture of accountability and continuous improvement, which is essential for maintaining high educational standards and accreditation from bodies like the NBA and NAAC. The assessment process of COs is well defined by following the flowchart.

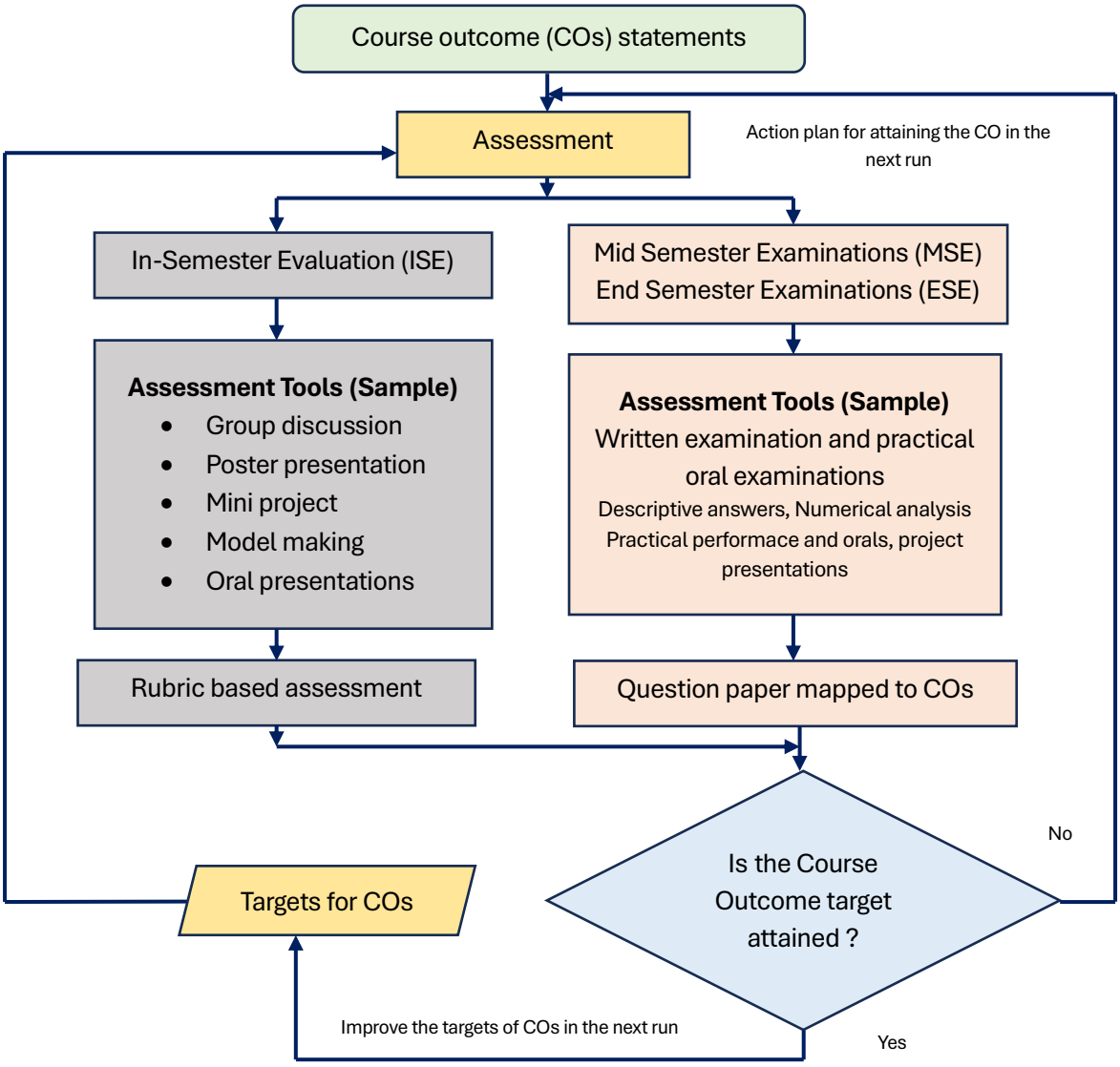


Fig. 11 Flowchart for CO assessment and attainment process

13.1 Levels of targets and attainments

Before proceeding with the CO assessment, let's talk about target setting. The NBA expects the target value and attainment to be defined in numbers 1, 2, and 3. These numbers indicate the levels of target and attainments.

So ADCET, Ashta, also follow the same process as mentioned as follows,

Let's decide the levels for targets and attainment

- CO attainment must be calculated with a condition such as,

Percentage of Students Getting More than X % of Marks

Where X is any value starting from 40 % to 100 % with a range of 10 %. The respective department must decide this value at any program based on an analysis of the student's capability based on previous examination results.
A brainstorming session must be conducted at the department level to decide on a solution.

Table No 22 Target and Attainment levels for CO attainment

Level No	Descriptions
3	Y1 % of Students getting more than X % of Marks
2	Y2 % of Students getting more than X % of Marks
1	Y3 % of Students getting more than X % of Marks

The Y1, Y2, and Y3 values must be decided at the department level, similarly to the X value.

One of the sample levels is mentioned in the following table,

Table No 23 Sample targets and attainment levels for CO attainment

Level No	Descriptions
3	70 % of Students getting more than 50 % of Marks
2	60 % of Students getting more than 50 % of Marks
1	50 % of Students getting more than 50 % of Marks

13.2 Assessment of CO

Before assessing COs, a course teacher should have a solid plan for evaluating COs in line with the COs that the course teacher has drafted and mapped to POs as per the guidelines mentioned in the previous section.

For example, for a course data structure, we drafted six COs and mapped them with respective POs. Hence, every course teacher must prepare a sheet mentioning the CO assessment prerequisites.

Target Value:

The program can decide the target value for any course at the initial run based on the course's nature, previous results of the course, and the assessment tools proposed. This target value is increased by 1 in the

next course run in the next academic year if the particular CO is attained. If the specific CO is not attained, the course coordinator should decide on the necessary action plan, such as a change in assessment tools and extra coaching for the course, which must be implemented in the next course run.

At the initial stage, proper planning should be done for mapping

1. For theory, the course decides the activities and map it with COs
2. For combining MSE and ESE, all COs must be mapped
3. For the practical course, map all experiments with COs as mentioned in the upcoming tables.

Table No 24 CO Assessment prerequisite sheet

For the theory course (CO mapping with assessment event)

- **Name of faculty :**
- **Course code and course name**
- **Academic year and Semester**

Sr.	CO Number	Target	Assessment Planning		Assessment event		
			ISE Activity No.	Assessment tool for ISE	ISE	MSE	ESE
1	2CSPC202_1	1	1	PPT Presentation (10)	Yes	Yes	
2	2CSPC202_2	1	1	PPT Presentation (10)	Yes	Yes	
3	2CSPC202_3	1					Yes
4	2CSPC202_4	1					Yes
5	2CSPC202_5	1	2	Group discussion (20)	Yes		Yes
6	2CSPC202_6	1	3	Poster Presentation (10)	Yes		Yes

1) Important Note:- All COs must be addressed in the theory course's combined MSE and ESE assessment events.

Table No 25 CO Assessment prerequisite sheet
For the practical courses (CO mapping with experiments)

- **Name of faculty :**
- **Course code and course name**
- **Academic year and Semester**

Sr.	CO Number	Target	Experiment No. (ISE)								ESE/POE
			1	2	3	4	5	6	7	8	
1	2CSPC202_1	1	Yes								Yes
2	2CSPC202_2	1	Yes	Yes				Yes			Yes
3	2CSPC202_3	1				Yes				Yes	Yes
4	2CSPC202_4	1			Yes				Yes		Yes
5	2CSPC202_5	1					Yes			Yes	Yes
6	2CSPC202_6	1									Yes

2) Important Note: ESE must address all COs for practical courses.

13.2 Assessment of COs through rubrics for ISE component of theory course

Rubrics are essential for assessing Course Outcomes (COs) in an educational setting, providing a clear and structured framework for evaluating student performance. A rubric typically consists of a matrix that outlines specific criteria and performance levels, offering detailed descriptions for each level of achievement. This helps ensure that assessments are consistent, objective, and transparent. Using rubrics,

educators can clearly communicate expectations to students, guiding them on what is required to meet or exceed the course outcomes. Rubrics also facilitate detailed feedback, highlighting strengths and areas for improvement, which is crucial for student development.

Additionally, they support aligning assessments with the intended learning outcomes, ensuring that the evaluation process accurately reflects the skills and knowledge that students are expected to acquire. This alignment is essential in Outcome-Based Education (OBE), which focuses on achieving specific educational goals. Overall, rubrics enhance the quality and effectiveness of the assessment process, contributing to continuous improvement in teaching and learning.

For example,

As mentioned in the above section, for an assessment of the ISE component of a theory course, three activities are planned by a course teacher, which are as follows.

Table No 26 Plan for ISE activities for theory course.

Sr.	ISE Activity Number	Activity Name	Marks/Weightage	COs addressed
1.	ISE Activity No. 01	PPT Presentation	10	2CSPC202_1, 2CSPC202_2
2.	ISE Activity No. 02	Group discussion	20	2CSPC202_5
3.	ISE Activity No. 03	Poster Presentation	10	2CSPC202_6

For all the abovementioned activities, the faculty needs to prepare three separate rubrics to help him assess all aligned COs and assessment tool-related POs. For a sample, three different rubrics have been prepared and mentioned for your reference.

Note: This is an illustrative table presenting information for a sample course. You can add more activities like model making, mini-projects, etc. Accordingly, design the rubrics for the same.

Rubrics for Activity No. 01 (PPT Presentation addressing CO1 and CO2)

Criteria No.	Performance Criteria	Excellent (80-100 %)	Good (60-79 %)	Satisfactory (40-59 %)	Average (20-39 %)	Unsatisfactory (0 – 19 %)	Score out of five
		5	4	3	2	1	
1	CO1 and CO2 about students' problem-solving skills using programming languages in data structure.	The student writes clear, efficient, well-documented code, demonstrating a deep understanding of data structures and algorithms.	The student writes mostly clear and efficient code with minor issues in documentation or optimization.	The student writes functional code that solves the problem but may lack clarity, efficiency, or proper documentation.	The student writes code that partially solves the problem with significant clarity, efficiency, or documentation issues.	The student writes code that fails to solve the problem or is unclear, inefficient, and poorly documented.	
2	1) Ethics 2) Communication	The student delivers a highly engaging and well-organized presentation, demonstrating strong ethical considerations and professionalism.	The student presents clearly and effectively, with minor issues in organization or ethical considerations.	The student provides a functional presentation that covers the topic but lacks engagement or has noticeable ethical lapses.	The student presents significant issues in clarity, organization, or ethical considerations.	The student delivers an unclear, disorganised presentation and lacks ethical considerations.	

Rubrics for Activity No. 02 (Group discussion addressing CO5)

Criteria No.	Performance Criteria	Excellent (80-100 %)	Good (60-79 %)	Satisfactory (40-59 %)	Average (20-39 %)	Unsatisfactory (0 – 19 %)	Score out of five
		5	4	3	2	1	
1	CO5 about students' ability to apply appropriate non-linear structures.	The student demonstrates a deep understanding of non-linear data structures, actively contributes insightful points, and effectively engages with peers.	The student understands non-linear data structures, contributes relevant points, and engages well with peers.	The student displays a basic understanding of non-linear data structures, makes some relevant contributions, and participates adequately.	The student has a limited understanding of non-linear data structures, makes few relevant contributions, and shows minimal engagement.	The student does not understand non-linear data structures, makes irrelevant contributions, and does not engage with peers.	
2	1) The engineer and society 2) Environment and sustainability 3) Ethics 4) Individual and teamwork 5) Communication	The student demonstrates a vital concern for societal and ethical issues, collaborates effectively with the team, and communicates ideas clearly and respectfully.	The student understands societal and ethical issues well, works well with the team, and communicates effectively with minor improvements needed.	The student is aware of societal and ethical issues, participates in teamwork, and communicates sufficiently.	The student has limited awareness of societal and ethical issues, shows minimal teamwork, and communicates with noticeable gaps.	The student lacks awareness of societal and ethical issues, does not engage in teamwork, and communicates ineffectively.	

Rubrics for Activity No. 03 (Poster presentation addressing CO6)

Criteria No.	Performance Criteria	Excellent (80-100 %)	Good (60-79 %)	Satisfactory (40-59 %)	Average (20-39 %)	Unsatisfactory (0 – 19 %)	Score out of five
		5	4	3	2	1	
1	CO6 about students' ability to Compare and analyse different data structure algorithms	The student comprehensively understands various data structure algorithms, compares and analyzes them, and presents the information clearly and engagingly.	The student shows a solid understanding of data structure algorithms, makes relevant comparisons and analyses, and presents the information clearly with minor improvements needed.	The student displays a basic understanding of data structure algorithms, makes relevant comparisons and analyses, and adequately presents the information.	The student has a limited understanding of data structure algorithms, makes few relevant comparisons and analyses, and presents the information with noticeable gaps.	The student does not understand data structure algorithms, makes irrelevant or incorrect comparisons and analyses, and presents the information ineffectively.	
2	1) Communication	The student communicates ideas clearly and confidently, engaging the audience effectively and using appropriate technical language.	The student communicates ideas clearly but needs minor engagement or technical language improvements.	The student communicates ideas adequately but lacks engagement or uses technical language inconsistently.	The student communicates ideas with noticeable clarity, engagement, or technical language gaps.	The student struggles to communicate ideas clearly, lacks engagement, and misuses technical language.	

So finally, after all ISE activities, the summarized sheet is prepared as follows,

Table No 27 Summary of ISE assessment through activities

Roll No.	Name of student	ISE Assessment									
		Activity No. o1 (CO1,CO2)			Activity No. o2 (CO5)			Activity No. o3 (CO6)			Total Marks (40)
		Part A	Part B	Total (10)	Part A	Part B	Total (20)	Part A	Part B	Total (10)	
201		5	4	**9**	10	10	**20**	4	3	**7**	**36**
202		5	5	**10**	4	5	**09**	4	4	**8**	**31**
203		2	4	**6**	9	7	**16**	5	5	**10**	**32**
204		1	3	**4**	9	9	**18**	1	3	**4**	**26**
205		2	0	**2**	6	2	**08**	3	5	**8**	**24**
Total		**15**	**16**	**31**	**42**	**39**	**81**	**17**	**20**	**37**	**149**
Average Marks		**3**	**3.2**	**6.2**	**8.4**	**7.8**	**16.2**	**3.4**	**4**	**7.4**	**29.8**
The number of students having more than 50 % marks				**3 out of 5**			**3 out of 5**			**4 out of 5**	
Percentage				**60 %**			**60 %**			**80 %**	
Level				**2**			**2**			**3**	

13.3 Assessment of COs through the MSE and ESE components of the theory course

We at ADCET, Ashta, provide a question paper where all sub-questions are mapped to COs by the paper setter during the submission of the question paper to the office of CoE. After the assessment, the office of CoE provides the bitwise marks of individual students to the course teacher through DEC. So, it is effortless to identify the marks of individual students in each subquestion, which we already mapped to COs. Hence, ultimately, we can attain CO in a student-wise manner. A sample copy of the question paper for MSE and ESE is mentioned in the following figure.

URN:- DX-355

Sant Dnyaneshwar Shikshan Sanstha's

Annasaheb Dange College of Engineering and Technology, Ashta

(An Autonomous Institute affiliated to Shivaji University, Kolhapur)

(Accredited by NAAC, Banglore with A++, Second cycle of Accreditation)

First Year B. Tech. (Mechanical Engineering) (Semester – I)

MID SEMESTER EXAMINATION [MSE], OCTOBER, 2023

(For Academic Year 2023-24, Odd Semester)

ENGINEERING PHYSICS [1MEBS106]

Day and Date:- Wednesday, 16.10.2023 Time: - 10.00 AM to 12.00 PM Total Marks:- 50

Instructions: -

1) All **questions** are **compulsory.**
2) Make suitable assumptions **wherever** necessary, and mention them clearly in the **answer book.**
3) Figures to the **rights** indicate **full** marks and **Course Outcome [CO] and Bloom's Taxonomy (BL)**
(K1-Remembering, K2- Understanding, K3 – Applying, K4 – Analyzing, K5 – Evaluating, K6 - Creating)
4) Draw neat diagrams **whenever** necessary.

			Marks	CO	BL
Q. 1	**Solve the following questions**		**[16]**		
	a)	Explain different types of gear train with neat sketch.	**08**	[1]	K2
	b)	All the four arms of a porter governor are 178 mm long and are hinged at a distance of 38 mm from the axis of rotation. The mass of the each ball is 1.15 kg and the mass of the sleeve is 20 kg. The governor sleeve begins to rise at 280 rpm. When the links are at angle of 30º to the vertical. Assuming the friction force to be constant, determine the minimum and maximum speed of rotation when the inclination of the arms to the vertical is 45º.	**08**	[2]	K3
		OR			
	b)	The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 rpm clockwise looking from the stern. Determine the gyroscopic couple and its effect upon the ship:	**08**	[3]	K3

Fig. 12 Sample of question paper at MSE/ESE

So, the CO attainment calculation of MSE and ESE is done using bitwise marks. For example,

3) MSE Bitwise marks

Table No 28 Bitwise marks provided by the office of CoE (MSE)

Roll No.	Name of Student	Q.1		Q.2		Q.3	
		a) [8]	b) [8]	a) [8]	b) [8]	a) [9]	b) [9]
		CO1	CO1	CO1	CO2	CO2	CO2
201		4	5	5	8	3	0
202		4	7	6	8	3	2
203		6	8	7	8	9	9

CO wise attainment calculation for MSE is as follows,

Table No 29 CO-wise evaluation at MSE

Roll No.	Name of Student	Q.1 a, b and Q 2 a	Total Marks CO1	Q 2 b and Q 3 a, b	Total Marks CO2	Total Marks
		[24]		[26]		
201		4 + 5 + 5	14	8 + 3 + 0	11	25
202		4 + 7 + 6	17	8 + 3 + 2	13	30
203		6 + 7+ 8	21	8 + 9 + 9	26	47
Total Marks			52		50	102
Average Marks			17.33		16.66	
The number of students having more than 50 % marks			**3 out of 3**		**2 out of 3**	
Percentage			**100 %**		**67 %**	
Level			**3**		**2**	

4) ESE Bitwise marks

Table No 30 Bitwise marks provided by the office of CoE (ESE)

Roll No.	Name of Student	Q.1		Q.2		Q.3	
		a) [8]	b) [8]	a) [8]	b) [8]	a) [9]	b) [9]
		CO3	CO4	CO4	CO5	CO6	CO6
201		2	3	5	5	3	8
202		4	0	4	6	4	7
203		3	8	4	8	6	6

CO wise attainment calculation for ESE is as follows,

Table No 31 CO-wise evaluation at ESE

Roll No.	Name of Student	Q.1 a	Total Marks CO3	Q 1 b and Q 2 a	Total Marks CO4	Q 2 b	Total Marks CO5	Q 3 a, b	Total Marks CO6	Total Marks
		[08]		[16]		[08]		[18]		
201		2	2	3+5	8	5	5	3 + 8	11	26
202		4	4	0+4	4	6	6	4 +7	11	25
203		3	3	8+4	12	8	8	6 + 6	12	35
Total Marks			9		24		19		34	86
Average Marks			3		8		6.33		11.33	
The number of students having more than 50 % marks			**1 out of 3**		**2 out of 3**		**3 out of 3**		**3 out of 3**	
Percentage			**34 %**		**67 %**		**100 %**		**100 %**	
Level			**0**		**2**		**3**		**3**	

13.4 Assessment of COs through the ISE component of the practical course

Practical courses in engineering are essential for bridging the gap between theoretical knowledge and real-world application. They provide students with hands-on experience, allowing them to apply concepts learned in the classroom to solve actual engineering problems. This experiential learning fosters critical thinking, problem-solving, and innovation, which are crucial skills for any engineer. Practical courses also enhance technical proficiency by familiarizing students with industry-standard tools and technologies, making them more adaptable and job-ready. Additionally, these courses help develop soft skills such as teamwork, communication, and time management, as students often work on collaborative projects. Practical courses are vital for producing competent, confident, and industry-ready engineers.

Assessing Course Outcomes (COs) in practical courses ensures that engineering students gain the hands-on skills and competencies required. CO assessment provides a structured way to measure whether students can apply theoretical knowledge to real-world problems, which is essential for their professional development. It helps educators identify areas where students excel and where they need further improvement, facilitating targeted feedback and support. This process also ensures that the curriculum's practical components effectively contribute to the overall Program Outcomes (POs), aligning with accreditation standards set by bodies like NBA and NAAC. Ultimately, CO assessment in practical courses

enhances the quality of education, ensuring that graduates are well-prepared to meet industry demands and societal needs.

5) Continuous Assessment Sheet (CAS)

In assessing practical courses, a continuous assessment sheet is used to systematically record and evaluate students' performance throughout the course. Unlike traditional assessments at the end of a term, continuous assessment involves regular, ongoing evaluations that provide a comprehensive picture of a student's progress and learning. This sheet typically includes various criteria related to the practical skills and knowledge that students are expected to acquire, such as lab work, project completion, participation, and application of theoretical concepts. Educators can use a continuous assessment sheet to monitor students' development in real-time, offer timely feedback, and make necessary adjustments to teaching methods. This approach not only enhances the learning experience but also aligns with the principles of Outcome-Based Education (OBE), ensuring that students meet the desired Course Outcomes (COs) and Program Outcomes (POs).

Table No 32 Typical continuous assessment sheet (CAS)

Sr	Name of Experiment	CO	Marks			Dates		Sign
			Cognitive (15)	Affective (5)	Psychomotor (5)	Performed	Submitted	
1		CO1, CO2	10	4	5			
2		CO2	12					
3		CO4	7					
4		CO3	14					
5		CO5	14					
6		CO2	8					
7		CO4	9					
8		CO3, CO5	11					
Total			85	4	5			
Average Marks			10.62	4	5	Term Work (25)	19.62	

For the cognitive domain, 15 marks are allotted for experimental work during practical hours; these 15 marks are allotted by assessing his domain knowledge in the course.

1) Performance of experiment
2) Ability to understand the aim and objective of the experiment
3) Ability to draw conclusions
4) Ability to perform calculation part
5) Ability to draw variables, graphs, coding, programming

Faculty can maintain separate sheets/rubrics to record the subcriteria marks for the cognitive domain.

For the affective and psychomotor domains, marks are allotted based on students' skill and behaviour aspects collectively once in the semester, out of 5.

1) For the affective domain, consider the student's ethical behaviour during laboratory work and his performance in the course.
2) For psychomotor domain-
   a) Ability to use instruments and modern tools effectively
   b) Oral and written communication of the student

Faculty can maintain separate sheets/rubrics to record the subcriteria marks for affective and psychomotor domains.

So, the final sheet for the assessment of ISE for the practical course will be as follows,

Table No 33 Summary of CO assessment through CAS

Roll No.	Name of Student	CO1 [15 +10]			CO2 [45 +10]			CO3 [30 +10]			CO4 [30 + 10]			CO5 [30 + 10]			CO6 [0]
Experiment No.-		1			1+2+6			4+8			3+7			5+8			
201		10	9	19	10+12+8 = 30	9	39	14+11= 25	9	34	7+9 = 16	9	25	15+1 1 =26	9	35	
202		11	6	17	40	6	46	23	6	29	20	6	26	21	6	27	
203		9	3	12	23	3	26	21	3	24	25	3	28	15	3	18	
Total Marks				48			111			87			79			80	
Average Marks				16			37			29			26.33			26.6	
The number of students having more than 50 % marks				**2 out of 3**			**2 out of 3**			**3 out of 3**			**3 out of 3**			**2 out of 3**	
Percentage				**67 %**			**67 %**			**100 %**			**100 %**			**67 %**	
Level				**2**			**2**			**3**			**3**			**2**	

13.5 Assessment of COs through the ESE component of the practical course

As an ESE component for a practical course, a practical oral examination is conducted by a panel of two experts, out of which one is the external expert, i.e., a faculty member from another engineering institute. The student-wise marks for these ESEs are provided by the office of the controller of examinations. The oral questions and marks can not be separated based on the CO map, so all COs are assigned the same percentage marks in the final attainment sheet.

Table No 34 Students marks provided by the office of COE for ESE for practical courses.

Roll No	Name of Student	ESE Marks for practical courses [50]
201		43
202		40
203		30
	Total Marks	97
	Average Marks	32.33
	The number of students having more than 50 % marks	3 out of 3
	Percentage	**100 %**
	Level	**3**

13.6 Attainment of COs

While calculating the final attainment, We need to summarise the entire process mentioned in the earlier section. To summarise the following, let's use the following table for convenience.

Table No 35 Summary of assessment

Mapping of Assessment events with COs							
Course Outcomes	**Blooms Level**	**Assessed Through Theory courses**			**Assessed Through practical courses**		**Target**
		ISE	**MSE**	**ESE**	**ISE**	**ESE**	
2CSPC202_1	K2	Yes	Yes	-	Yes	Yes	1
2CSPC202_2	K2	Yes	Yes	-	Yes	Yes	1
2CSPC202_3	K3	-	-	Yes	Yes	Yes	1
2CSPC202_4	K3	-	-	Yes	Yes	Yes	1
2CSPC202_5	K4	Yes	-	Yes	Yes	Yes	1
2CSPC202_6	K4	Yes	-	Yes	-	Yes	1
Course Outcomes	**Blooms Level**	**Assessed Through Theory courses**			**Assessed Through practical courses**		**Average Percentage**
		ISE	**MSE**	**ESE**	**ISE**	**ESE**	
2CSPC202_1	K2	60.00	100.00	-	67.00	100.00	**81.75**
2CSPC202_2	K2	60.00	67.00	-	67.00	100.00	**73.50**
2CSPC202_3	K3	-	-	34.00	100.00	100.00	**78.00**
2CSPC202_4	K3	-	-	67.00	100.00	100.00	**89.00**
2CSPC202_5	K4	60.00	-	100.00	67.00	100.00	**81.75**
2CSPC202_6	K4	80.00	-	100.00	-	100.00	**82.33**

- **Course end survey:**

Course-end survey rubrics are tools used to evaluate and measure the effectiveness of a course from the student's perspective at the end of the term. These rubrics typically consist of criteria and performance levels that help systematically gather feedback on various aspects of the course, such as the quality of instruction, relevance of course materials, achievement of learning outcomes, and overall student experience.

By using these rubrics, educators can obtain detailed and structured feedback, which is essential for identifying strengths and areas for improvement. This feedback is crucial for continuous improvement in teaching practices and course design, ensuring that the course meets the educational goals and enhances the learning experience for future students.

So, every faculty member at ADCET, Ashta, needs to draft rubrics independently to measure the course outcomes at the end of the course, and feedback should be collected on what students feel about COs they have attained. The course-end survey is not about how the teacher delivered the course. Instead, it is about how many outcomes students attain at the course's end.

A summary of course end survey rubrics is as follows,

Table No 36 Summary of assessment through course-end survey rubrics

Roll No	Name of Student	CO1	CO2	CO3	CO4	CO5	CO6
201		4	4	4	5	3	3
202		5	3	4	4	3	2
203		3	3	4	5	4	1
Total Marks		12	10	12	14	10	6
Average Marks		4	3.33	4	4.66	3.33	2
The number of students having more than 50 % marks		3	3	3	3	3	1
Percentage		**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**34 %**
Level		**3**	**3**	**3**	**3**	**3**	**0**

13.8 Weitages for assessment events

NBA, India also expects that assessment events used in the assessment must be used with their weightage while arriving at the final value. However, this will not always be possible, as each event can be used to assess all the COs that have been drafted. So at ADCET, Ashta, we come up with a methodology that,

- All COs must be covered by both MSE and ESE.
- If any CO is not mapped to any event, then the mapping is represented by "-".
- Whenever there is – in the mapping table, don't consider it in the calculation; if any number is there, it must be regarded as it in the calculations.

So the weighages to be considered are as follows,

Table No 37 Weightages for assessment event

Case No.	ISE	MSE	ESE	ISE (P)	ESE (P)	Formula
1	Yes	Yes	Yes	Yes	Yes	0.2 (ISE) + 0.3 ([MSE+ESE]/2) + 0.25(ISE,P) + 0.25 (ESE,P)
2	-	Yes	Yes	Yes	Yes	0.5 ([MSE+ESE]/2) + 0.25(ISE,P) + 0.25 (ESE,P)
3	Yes	Yes	-	Yes	Yes	0.2 (ISE) + 0.3 [MSE] + 0.25(ISE,P) + 0.25 (ESE,P)
4	Yes	-	Yes	Yes	-	0.2 (ISE) + 0.3 (ESE) + 0.5 (ISE,P)

13.9 Final Attainment for the CO

As all assessments have been done in the above example, it's time to calculate the final attainment. For calculating the final attainment, we have a reference table,

Table No 38 Reference table for attainment

Mapping of Assessment events with COs							
Course Outcomes	Blooms Level	Assessed Through Theory courses			Assessed Through practical courses		Target
		ISE	MSE	ESE	ISE	ESE	
2CSPC202_1	K2	Yes	Yes	-	Yes	Yes	1
2CSPC202_2	K2	Yes	Yes	-	Yes	Yes	1
2CSPC202_3	K3	-	-	Yes	Yes	Yes	1
2CSPC202_4	K3	-	-	Yes	Yes	Yes	1
2CSPC202_5	K4	Yes	-	Yes	Yes	Yes	1
2CSPC202_6	K4	Yes	-	Yes	-	Yes	1

Course Outcomes	Blooms Level	Assessed Through Theory courses			Assessed Through practical courses		Average Percentage
		ISE	MSE	ESE	ISE	ESE	
2CSPC202_1	K2	60.00	100.00	-	67.00	100.00	81.75
2CSPC202_2	K2	60.00	67.00	-	67.00	100.00	73.50
2CSPC202_3	K3	-	-	34.00	100.00	100.00	78.00
2CSPC202_4	K3	-	-	67.00	100.00	100.00	89.00
2CSPC202_5	K4	60.00	-	100.00	67.00	100.00	81.75
2CSPC202_6	K4	80.00	-	100.00	-	100.00	82.33

The direct attainment value in term level of attainment is now replaced in the above table,

Table No 39 Final attainment calculation for a course 2CSPC202 Data Structure (Sample)

Course Outcomes	Assessed Through Theory courses			Assessed Through practical courses		Direct attainment	Indirect attainment	Final Attainment	Target	Result
	ISE	MSE	ESE	ISE	ESE					
2CSPC202_1	2	3	-	2	3	2.55	3	2.60	1	Attained
2CSPC202_2	2	2	-	2	3	2.25	3	2.33	1	Attained
2CSPC202_3	-	-	0	3	3	1.5	3	1.65	1	Attained
2CSPC202_4	-	-	2	3	3	2.1	3	2.19	1	Attained
2CSPC202_5	2	-	3	2	3	2.55	3	2.60	1	Attained
2CSPC202_6	3	-	3		3	2.25	0	2.03	1	Attained

Attainment

(0.2[2] + 0.3 [3]) + (0.25[2] + 0.25[3]) = (0.4 + 0.9) + (0.5 + 0.75)

= (1.3) + (1.25)

= 2.55

The final Attainment: CO Attainment = 0.9 * Direct Attainment + 0.1 * Indirect Attainment

14. ATTAINMENT OF POS AND PSOS

The success of an engineering graduate depends upon their knowledge, skills, and attitude. Accreditation agencies worldwide described these attributes as desirable competencies referred to as Program Outcomes (POs) by the National Board of Accreditation (NBA) India. These POs are expected to be imparted during the student's graduation, and they must effectively implement them in their career/profession. The attainment of POs is a continuous process and should be performed through course outcomes (COs). The generalised process for attaining POs followed at the ADCET, Ashta, is mentioned in Figure.

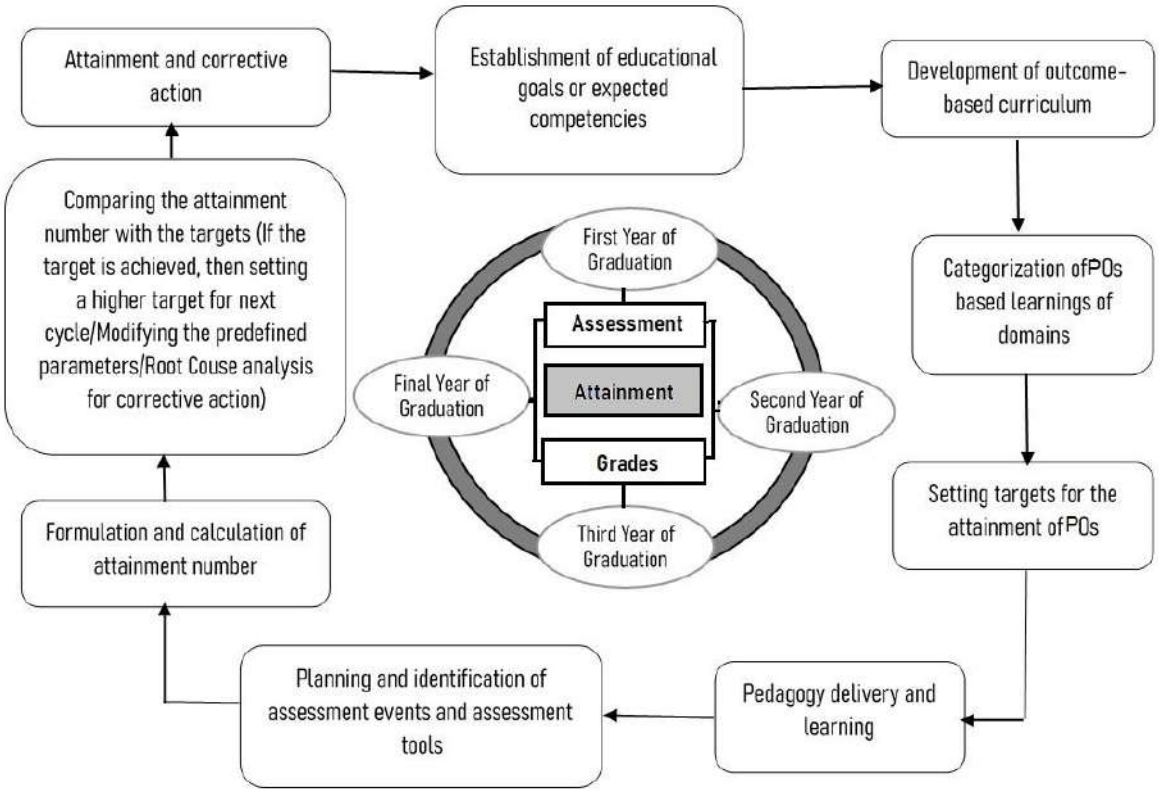


Fig. 13 The generalised higher education process for an engineering program with its sequential constituents.

The ADCET, Ashta, uses two different tools to assess student performance: direct assessment tools and indirect assessment tools. The direct method assesses students' knowledge, skills, and attitudes based on their performance in the in-semester evaluation, laboratory evaluation, project, and mini-project. The Indirect Method is implemented by conducting various rubrics and surveys from stakeholders, including opinions and thoughts about the graduate's knowledge, skills and attitude.

Different assessment tools are listed in the Table below.

Table No. 40 Assessment Tool/Assessment Event

Mode of Assessment	Assessment Tool/Event	Description	Frequency
Direct	In Semester Evaluation	Different modes of evaluation include any two activities, such as Presentations, Case studies, Model making, Video presentations, Poster presentations, Open book tests, seminars, micro-projects etc..	Evaluation is made by using rubrics. continuously throughout Semester
Direct	• End Semester Examination • Mid Semester Examination	Written Test	At mid and end-of-semester
Direct	Weekly Assessment (Laboratory)	The weekly evaluation uses a Continuous Assessment Sheet (CAS).	Continuous
Direct	The internal/external practical oral examination.	Internal and external evaluations are conducted during the laboratory course.	At the end of the semester
Direct	Project Assessment Rubrics	This assessment tool is explicitly used for Project Work. It evaluates the students' technical, communication, and presentation skills. Appropriate rubrics are used to assess the attainment of related POs. This assessment tool plays a vital role in meticulously evaluating students' attainment level of all the Program outcomes defined for the Mechanical Engineering Program towards the completion of the Program. Appropriate rubrics are used to assess the attainment of POs and PSOs.	Two reviews per semester
Indirect	Program Exit Survey	A survey taken from students at the end of the program regarding POs and PSOs	At the end of the semester last semester of the program
Indirect	Guest Lecture Assessment rubric	A survey taken from participants regarding POs and PSOs	At the end of activity
Indirect	Workshop of activity Assessment Rubric	A survey was taken from participants regarding POs and PSOs	At the end of activity
Indirect	Industrial Visit Evaluation Rubric	A survey taken from industry experts relevant to POs and PSOs	At the end of activity
Indirect	External oral Exam Survey	This survey gives opinions from external on the performance of students for laboratory practical work in terms of Program Outcomes (POs) and Program Specific Outcomes (PSOs)	At the end of activity
Indirect	Recruitment Evaluation Rubric	A survey taken from relevant industry Recruiters regarding POs and PSOs	At the end of activity

Course outcomes are related to program outcomes. Course coordinator prepares CO-PO correlation matrix. Each course defined in the curriculum has predefined statements of the course outcomes (COs), which are described to students before the start of the course. It is also made available in the public domain for information for other stakeholders. While drafting the curriculum, care is taken to ensure that every course drafts at least five to six course outcomes (COs). After intense brainstorming sessions, Course Outcomes are drafted. CO statements are finalised by considering Bloom's Taxonomy. The Department of Mechanical Engineering Program initially finalizes the curriculum structure, credits, CO statements, and curriculum. The department has prepared the program outcome competencies. These PO competencies map CO by comparing CO statements with competencies. Course teachers prepare using this method of CO PO correlation matrix.

14.1 Process for the attainment of POs and PSOs

Values obtained through each CO assessment event are considered to calculate PO attainment. The average CO attainment value is used to calculate PO attainment. The attainment levels by direct (student performance) and indirect (surveys) methods are calculated based on students' performance. Targets for each PO and PSO are predefined, and attainment levels are found per guidelines provided by regulating authorities. In PO and PSO attainment, the weightage to direct and indirect assessments is 90% and 10%, respectively. After the attainment computation of POs/PSOs, the department thoroughly analyses attainment levels. This analysis includes finding the weak areas towards attaining POs/PSOs. Furthermore, a detailed action plan is prepared for the improvement.

PO / PSO attainment is calculated by considering 90 % weight to direct assessment and 10 % Weight to indirect assessment through surveys, as shown in Figure.

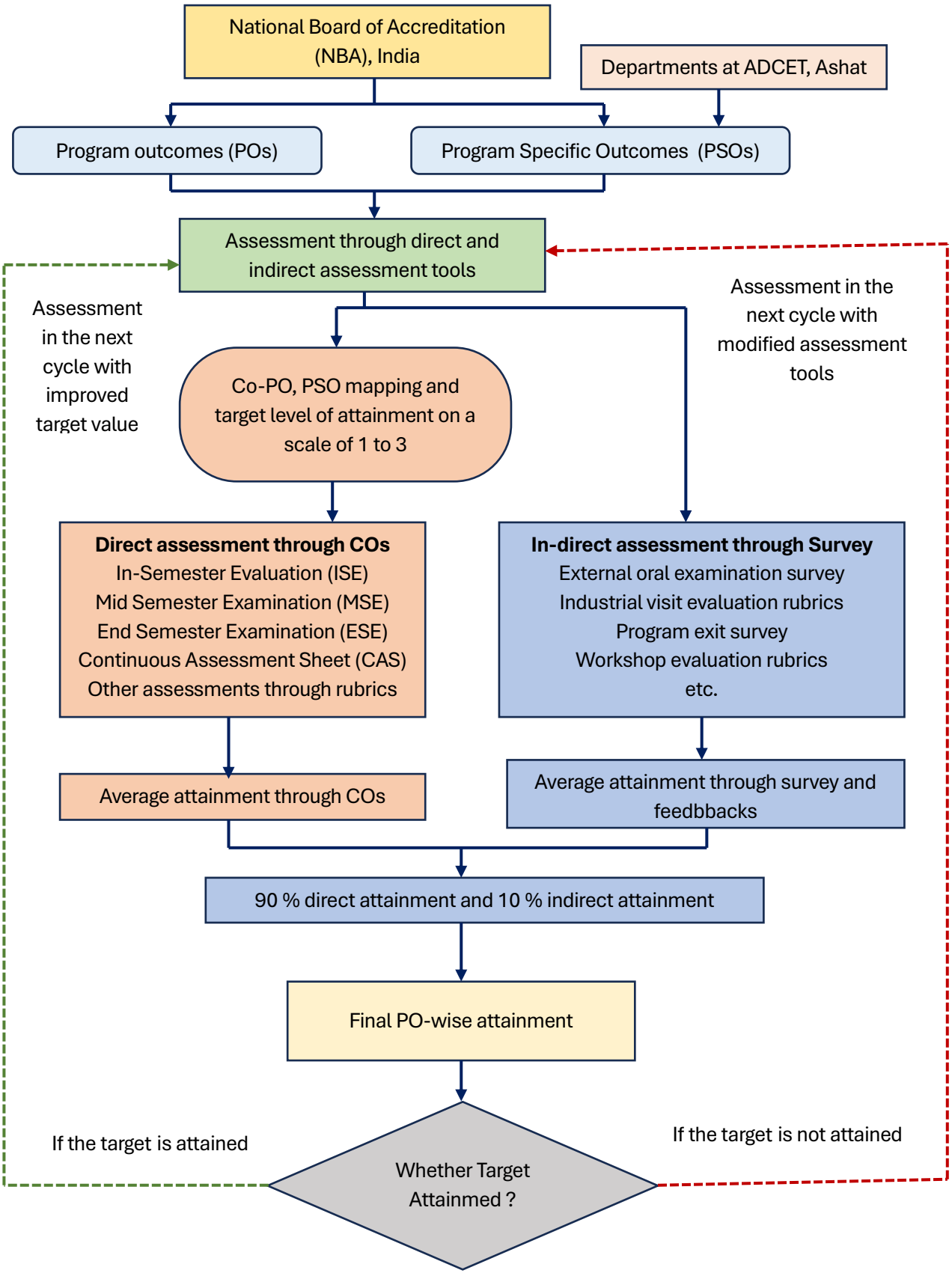


Fig. 14 Assessment and attainment process of POs and PSOs

As discussed in the previous chapter, the final attainment of COs for a course is calculated as indicated in the course articulation matrix.

Table No. 41 Final CO attainment

Course Outcomes	Final Attainment
2CSPC202_1	**2.60**
2CSPC202_2	**2.33**
2CSPC202_3	**1.65**
2CSPC202_4	**2.19**
2CSPC202_5	**2.60**
2CSPC202_6	**2.03**

As previously mentioned, the course teacher predates the final CO-PO mapping for the course 2CSPC202 Data Structure.

Table No. 42 CO-PO Mapping for a course

Course Outcome (COs)	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
2CSPC202_1	2	2	-	-	-	-	-	-	-	-	-	1	2	-
2CSPC202_2	2	2	-	-	-	-	-	-	2	3	-	-	2	-
2CSPC202_3	3	3	2	2	-	-	-	2	2	3	-	1	2	-
2CSPC202_4	2	2	-	-	-	-	-	-	2	3	-	-	2	-
2CSPC202_5	3	3	2	2	-	-	-	2	2	3	-	1	2	-
2CSPC202_6	3	3	2	2	-	-	-	2	2	3	-	1	2	-
Total	15	15	6	6	-	-	-	6	10	15	-	4	12	-
Average	2.5	2.5	2	2	-	-	-	2	2	3	-	1	2	-
2CSPC202	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**2**	**2**	**3**	**-**	**1**	**2**	**-**

So, the attainment of POs through COs is calculated as,

Attainment = (Attainment through COs) * (Target value / Maximum possible mapping)

= (2.60) * (2/3)

= 2.60 * 0.66

= 1.77

Similar calculations are performed for all COs and correlated locations of mapped POs. The mapping after calculation is mentioned in the following table.

Table No. 43 PO Attainment through a course

Course Outcome (COs)	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
2CSPC202_1	1.73	1.73	-	-	-	-	-	-	-	-	-	0.87	1.73	-
2CSPC202_2	1.55	1.55	-	-	-	-	-	-	1.55	2.33	-	-	1.55	-
2CSPC202_3	1.65	1.65	1.10	1.10	-	-	-	1.10	1.10	1.65	-	0.55	1.10	-
2CSPC202_4	1.46	1.46	-	-	-	-	-	-	1.46	2.19	-	-	1.46	-
2CSPC202_5	2.60	2.60	1.73	1.73	-	-	-	1.73	1.73	2.60	-	0.87	1.73	-
2CSPC202_6	2.03	2.03	1.35	1.35	-	-	-	1.35	1.35	2.03	-	0.68	1.35	-
Total	11.03	11.03	4.19	4.19	0.00	0.00	0.00	4.19	7.20	10.80	0.00	2.96	8.93	-
Average	**1.84**	**1.84**	**1.40**	**1.40**	**-**	**-**	**-**	**1.40**	**1.44**	**2.16**	**-**	**0.74**	**1.49**	**-**

So, the final comparison of targets and attainment for course 2CSPC202 Data Structure is as follows,

Table No. 44 PO target and attainment through a course

Course 2CSPC202	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Target	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**2**	**2**	**3**	**-**	**1**	**2**	**-**
Attainment	**1.84**	**1.84**	**1.40**	**1.40**	**-**	**-**	**-**	**1.40**	**1.44**	**2.16**	**-**	**0.74**	**1.49**	**-**

Similarly, all course attainments must be calculated and compiled in the table. We need to provide this table in the SAR.

Table No. 45 PO attainment through all courses

Courses	Program Outcomes (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
2CSPC201														
2CSPC202	**1.84**	**1.84**	**1.40**	**1.40**	**-**	**-**	**-**	**1.40**	**1.44**	**2.16**	**-**	**0.74**	**1.49**	-
2CSPC203														
2CSPC204														
.....														
.....														
Average Attainment	**2.38**	**1.78**	**1.38**	**1.40**	**1.86**	**1.24**	**1.19**	**1.50**	**1.60**	**1.62**	**1.63**	**1.23**	**1.47**	**1.42**

The average value of each column gives us the direct attainment of a particular PO.

14.2 In-Direct Assessment of POs and PSOs

As we have already discussed, indirect assessment concerns the stakeholders' opinions and surveys about how students attain the POs during and after graduation. At present, we at ADCET, Ashta, use certain specific survey rubrics to assess students indirectly. However, assessment can not be restricted to only these surveys. So, programs and departments can use surveys they have collected other than institute-specific ones. The rubrics drafted by the office of Dean, Quality Assurance and IQAC are listed below,

1. Program Exit Survey (This survey is program-specific, so the program/department needs to take the lead in drafting these rubrics. This survey should address all POs and PSOs)
2. External oral exam survey rubrics
3. Industrial Visit Evaluation Rubric
4. Recruitment Evaluation Rubric

The developed rubrics for sr. 2, 3 and 4 programs have to be used as they are.

Annasaheb Dange College of Engineering and Technology, Ashta

Department of ……

RUBRICS FOR A GROUP ASSESSMENT OF STUDENTS BY AN EXTERNAL EXAMINER

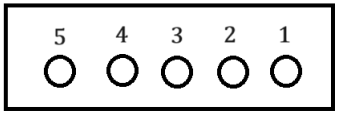
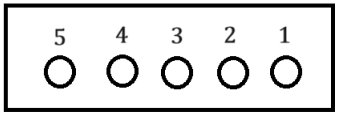
Assessment Event: Practical Oral Examinations

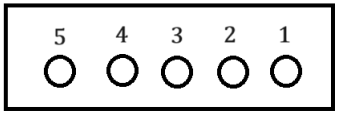
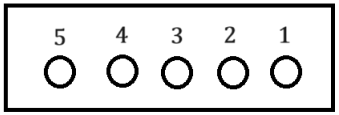
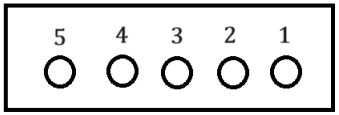
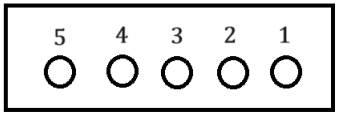
Use: To be used for indirect assessment of POs for the particular batch of graduate students.

Name of External Examiner:		Designation:	
Name of Institute:		Contact Details:	
Address of Institute:		Course code and Course:	

Class	Date of POE	Current Academic Year (CAY)	The year of Admission is the First Year for this batch (YOA) YOA = (CAY – Class*)	Year of Graduation for this batch (YOG) = YOA + 4

*Use: For FY B Tech-0, SY B Tech-1, TY B Tech-2 and Final Year B Tech-3

Performance Criteria	**Excellent**	**Good**	**Satisfactory**	**Average**	**Unsatisfactory**	**Grading Marks**
	5	**4**	**3**	**2**	**1**	
Engineering knowledge (PO 1)	Students demonstrated excellent knowledge and expertise, providing detailed and intelligent answers and completing tasks with skill and originality.	Students displayed a solid understanding of the subject, answering questions decisively and performing exercises effectively.	Students showed some understanding but gave incomplete or incorrect responses. They performed activities with instructions but needed better explanations.	Students showed average understanding, struggled to find correct responses, and lagged in performing experiments and validating results.	Students struggled to answer basic questions and complete tasks during practical and oral exams.	
Problem Analysis (PO 2)	Students demonstrated strong analytical skills, providing practical and comprehensive	Students effectively analysed problems and offered multiple	Students adequately analysed problems and provided reasonable	Students showed an average understanding of the content and	Students demonstrated insufficient understanding and	

Performance Criteria	Excellent	Good	Satisfactory	Average	Unsatisfactory	Grading Marks
	5	4	3	2	1	
	solutions to posed problems.	solutions to assigned problem statements.	answers to assigned problem statements.	struggled to find appropriate solutions.	were unable to analyse challenges appropriately.	
Design and Development of Solutions (PO 3)	The student demonstrated creativity and deep understanding by presenting thoughtful solutions that considered all engineering aspects and the environment.	The student demonstrated competence by offering practical solutions addressing key engineering and environmental considerations.	The student met proficiency by providing reasonable solutions covering essential engineering and environmental aspects.	The student showed average proficiency, providing incomplete solutions and struggling to cover essential engineering and environmental aspects.	The student's performance was inadequate. They lacked understanding and failed to consider vital engineering concerns in their solutions.	
Design and conduct experimentation (PO 4)	Students performed well in practical and oral exams, demonstrating accurate and organized experiment design, data collection, analysis, and interpretation.	Students demonstrated excellent experimental ability, clearly understanding scientific methodologies, controlling variables, and effectively analysing data.	Students showed some understanding of experimental execution but lacked clarity and thoroughness, struggling with variable control and result interpretation.	Students demonstrated an average understanding of experimental execution, struggling to follow scientific procedures during experimentation.	Students showed a lack of understanding in designing and conducting experiments, struggling to follow proper procedures.	
Ethics (PO 8)	Students demonstrated integrity, honesty, and respect for academic and professional standards, showing outstanding behaviour towards classmates and examiners.	Students followed moral and academic standards, respected others' rights, and behaved professionally during the exams.	Students showed some ethical awareness but occasionally raised concerns regarding honesty, integrity, and academic standards.	Students lacked awareness of honesty and respect for academic standards and exam regulations.	Students demonstrated dishonesty and disrespect for academic standards and exam regulations.	
Oral communication (PO10)	Students demonstrated excellent oral communication, confidently and clearly explaining complex topics engagingly.	Students spoke well, explaining their points effectively and confidently.	Students expressed themselves well but showed low confidence.	Students expressed themselves well but lacked confidence and clarity.	Students struggled with oral communication during the examination.	

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Department of ……

RUBRICS FOR A GROUP ASSESSMENT OF STUDENTS BY AN INDUSTRY EXPERT

Assessment Event: Industrial visit by the group of students

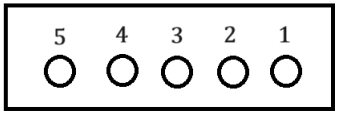
Use: To be used for indirect assessment of POs for the particular batch of graduate students.

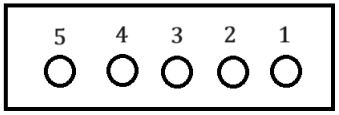
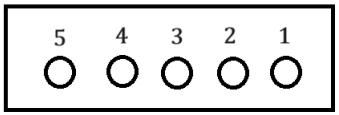
Name of Industry :		Name of Expert:	
Address:		Designation:	
Type of Industry:		Contact Details:	

Name of Incharge :		Name of course and course code :	
Department:		A total number of students attended :	

Class	Date of Visit	Current Academic Year (CAY)	The year of Admission is the First Year for this batch (YOA) YOA = (CAY – Class*)	Year of Graduation for this batch (YOG) = YOA + 4

*Use: For FY B Tech-0, SY B Tech-1, TY B Tech-2 and Final Year B Tech-3

Performance Criteria	**Excellent**	**Good**	**Satisfactory**	**Average**	**Unsatisfactory**	**Grading Marks**
	5	**4**	**3**	**2**	**1**	
Engineering knowledge (PO 1)	Throughout the industrial visit, the students were knowledgeable and enthusiastic about the subject. They asked thoughtful questions, understood complex processes, and applied theoretical knowledge to real-world problems. Their intelligent	The student actively participated during the industrial visit, asking relevant questions and showing a solid understanding of the concepts and practices discussed. They could make connections between what they observed and their prior knowledge.	The student demonstrated satisfactory understanding during the industrial visit. They showed some interest in the operations but lacked depth in their questions or observations.	The student demonstrated average understanding during the industrial visit. They showed some interest in the operations but lacked depth in their questions or observations.	The student appeared disengaged during the industrial visit, showing little interest in the processes or technologies being showcased.	

Performance Criteria	Excellent	Good	Satisfactory	Average	Unsatisfactory	Grading Marks
	5	4	3	2	1	
	contacts with industry professionals showed preparation and critical thought.					
Ethics (PO 8)	The student demonstrated exemplary ethical behaviour throughout the industrial visit, prioritising safety, integrity, and respect for others. They actively sought to understand and abide by company policies and procedures, demonstrating a solid commitment to ethical conduct in all aspects of their engagement.	The student demonstrated solid ethical behaviour throughout the industrial visit, adhering to safety protocols, respecting confidentiality, and displaying professionalism in their interactions with industry professionals and peers.	The student was aware of ethical issues throughout the industrial visit.	The student exhibited poor ethical behaviour during the industrial visit, demonstrating a lack of respect for safety protocols, company policies, or professional conduct norms.	The student exhibited poor ethical behaviour during the industrial visit, demonstrating a lack of respect for safety protocols, company policies, or professional conduct norms.	
Oral communication (PO10)	Throughout the industrial visit, the student exhibited outstanding communication skills. They confidently and eloquently expressed their ideas, actively listened to others, and engaged in thought-provoking discussions. Their straightforward, concise and convincing communication showcases their ability	The students communicated their thoughts and questions effectively during the industrial visit, demonstrating clear and concise expression. They engaged in meaningful dialogue with industry people, conveying their understanding and seeking clarification when needed.	The student satisfactorily communicated their thoughts and questions during the industrial visit, demonstrating clear and concise expression.	The student demonstrated basic communication skills during the industrial visit, but their interactions lacked clarity and precision. They may have had difficulty articulating ideas or asking insightful questions.	The student struggled to communicate effectively during the industrial visit, often appearing unsure or hesitant when asking questions or expressing thoughts.	

Performance Criteria	Excellent	Good	Satisfactory	Average	Unsatisfactory	Grading Marks
	5	4	3	2	1	
	to convey complex concepts with ease and professionalism.					

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RUBRICS FOR A GROUP ASSESSMENT OF STUDENTS BY A RECRUITER

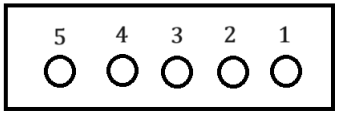
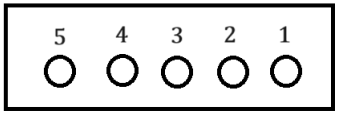
Assessment Event: Assessment of a group of students by the recruiter during campus placement activity

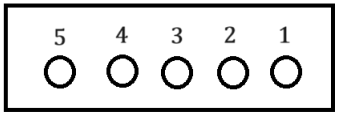
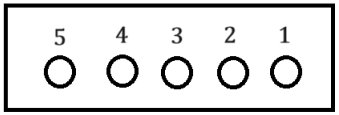
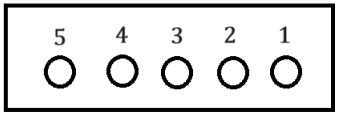
Use: To be used for indirect assessment of POs for the particular batch of graduate students.

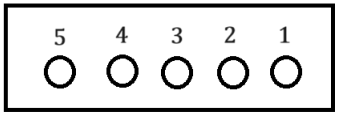
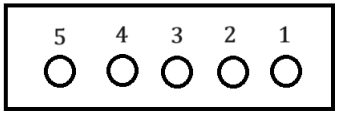
Name of Industry :		Name of Expert:	
Address:		Designation:	
Type of Industry:		Contact Details:	

Class	Date of record	Current Academic Year (CAY)	The year of Admission is the First Year for this batch (YOA) YOA = (CAY – Class*)	Year of Graduation for this batch (YOG) = YOA + 4

*Use: For FY B Tech-0, SY B Tech-1, TY B Tech-2 and Final Year B Tech-3

Performance Criteria	**Excellent**	**Good**	**Satisfactory**	**Average**	**Unsatisfactory**	**Grading Marks**
	5	**4**	**3**	**2**	**1**	
Engineering knowledge (PO 1)	Excellent: Students demonstrate exceptional understanding, creativity, and application of engineering concepts. They exceed expectations.	Students show solid understanding and application of concepts. Their work meets expectations.	Students meet the minimum requirements but may demonstrate a basic understanding and have gaps or errors.	Students demonstrate basic understanding but may have gaps or errors.	Students fall significantly short of expectations; their incomplete or incorrect work lacks depth or originality.	
Problem Analysis (PO2)	The student demonstrates exceptional problem-solving skills. They analyse complex problems thoroughly, propose innovative	The student effectively identifies and analyses problems. Their solutions are sound, although they may lack some depth or creativity.	The student meets the minimum requirements for problem-solving. They can identify issues and propose essential solutions.	The student shows a basic understanding of problem-solving concepts but may struggle with more complex scenarios.	The student's problem-solving skills fall significantly short of expectations. They may struggle to identify problems	

Performance Criteria	Excellent	Good	Satisfactory	Average	Unsatisfactory	Grading Marks
	5	4	3	2	1	
	solutions, and effectively communicate their thoughts.				or propose viable solutions.	
Modern tool usage (PO5)	Excellent: The student adeptly utilises various modern tools, demonstrating mastery. They seamlessly apply tools for analysis, design, and problem-solving.	The student effectively employs standard tools, showcasing competence. They can navigate software and hardware tools with confidence.	The student meets basic requirements and uses essential tools adequately. Their proficiency may lack depth or versatility.	The student shows a basic understanding of tools but may struggle with more complex features or specialised software.	The student's tool usage falls significantly short. They may lack familiarity with essential tools or misuse them.	
The engineer and society (PO6)	The students demonstrate a deep understanding of engineers' multifaceted role in society. They recognise the ethical, environmental, and social implications of engineering decisions.	The students have a solid grasp of engineers' responsibilities and can articulate the importance of engineering in addressing societal challenges.	The students meet the basic expectations by acknowledging the engineer's role but may lack depth in their understanding.	The students know the engineer's societal impact but may not consider broader implications.	The student's understanding of the engineer's role is significantly limited. They may overlook critical aspects or misconstrue their responsibilities.	
Environment and sustainability (PO7)	The students demonstrate a profound understanding of environmental issues, sustainable practices, and their interconnectedness. They recognise the importance of balancing economic, social, and ecological.	The students have a solid grasp of environmental concepts and sustainability principles. They can discuss relevant challenges and potential solutions.	The students meet the basic expectations by acknowledging environmental concerns but may lack depth in their understanding.	The students know about environmental impact and sustainability but may not explore broader implications.	The student's understanding of environmental issues and sustainability is significantly limited. They may overlook critical aspects or misunderstand their significance.	

Performance Criteria	Excellent	Good	Satisfactory	Average	Unsatisfactory	Grading Marks
	5	4	3	2	1	
Ethics (PO8)	The student consistently demonstrates solid ethical principles. They exhibit honesty, integrity, and a commitment to moral decision-making.	The student generally adheres to ethical standards. They recognise ethical dilemmas and make reasonable choices.	The student meets basic expectations regarding ethical behaviour but may occasionally falter.	The student shows a basic understanding of ethics but may struggle in complex situations.	The student's ethical behaviour falls significantly short. They may disregard ethical considerations or engage in questionable actions.	
Communications (PO10)	The student communicates eloquently, with clarity, confidence, and effective language use. Their oral presentations and written documents are compelling and well-structured.	The student communicates effectively, demonstrating solid language skills. They convey their ideas clearly, although minor room for improvement may exist.	The student meets basic communication expectations. Their language use is functional, but there may be occasional issues with clarity or organisation.	The student's communication is adequate but lacks polish. They may struggle with complex expressions or organisation.	The student's communication falls significantly short. They may have difficulty expressing themselves or conveying ideas coherently.	

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14.3 Mapping of Indirect assessment tools with POs and PSOs

Per our discussion, ADCET Ashta uses four indirect assessment tools to assess POs and PSOs. To calculate the attainment, we must map these assessment rubrics and surveys to POs and PSOs.

- Program Exit Survey
- External oral exam survey rubrics
- Industrial Visit Evaluation Rubric
- Recruitment Evaluation Rubric

So, their mapping with the POs and PSOs are as follows,

Table No. 46 PO assessment rubrics and PO mapping

Sr	Assessment rubrics	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	Program Exit Survey	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	External oral exam survey rubrics	Yes	Yes	Yes	Yes				Yes		Yes				
3	Industrial Visit Evaluation Rubric	Yes							Yes		Yes				
4	Recruitment Evaluation Rubric	Yes	Yes			Yes	Yes	Yes	Yes		Yes	Yes			

14.4 Assessment through indirect assessment tools

The feedback is collected for a particular batch of engineering graduates, gathering input on a five-point scale. The average of feedback collected for final attainment calculations.

Table No. 47 Average PO assessment through rubrics

Sr	Assessment rubrics	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	Program Exit Survey	4.6	4.6	4.3	4	4	3.4	3	3.5	4.7	4,0	4.5	3	3.6	4.5
2	External oral exam survey rubrics	4.8	4.6	4.3	4.2				3.8		3.8				
3	Industrial Visit Evaluation Rubric	3.7							2.8		4.1				
4	Recruitment Evaluation Rubric	2.6	3.5			3.5	4.1	2.9	3.2		4.6	3.8			
	Average	3.93	4.23	4.30	4.10	3.75	3.75	2.95	3.33	4.70	4.17	4.15	3.00	3.60	4.50

This average score must be converted into a three-point scale per the NBA requirements. So, the converted average assessment value is shown below.

Table No. 48 Final PO attainment through indirect assessment

Sr	Assessment rubrics	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Average	3.93	4.23	4.30	4.10	3.75	3.75	2.95	3.33	4.70	4.17	4.15	3.00	3.60	4.50
	Attainment through indirect assessment	**2.36**	**2.54**	**2.58**	**2.46**	**2.25**	**2.25**	**1.77**	**2.00**	**2.82**	**2.50**	**2.49**	**1.80**	**2.16**	**2.70**

14.5 Final attainment for POs and PSOs

Two parts of attainment are completed,

So, the final attainment of POs is calculated as,

Attainment = 0.9 (Direct Attainment) + 0.1 (In-direct attainment)

So, the final attainment is,

Table No. 49 Final PO attainment

Assessment rubrics	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Direct Attainment	2.38	1.78	1.38	1.40	1.86	1.24	1.19	1.50	1.60	1.62	1.63	1.23	1.47	1.42
Indirect Attainment	2.36	2.54	2.58	2.46	2.25	2.25	1.77	2.00	2.82	2.50	2.49	1.80	2.16	2.70
90 % of direct attainment (a)	2.14	1.60	1.24	1.26	1.67	1.12	1.07	1.35	1.44	1.46	1.47	1.11	1.32	1.28
10 % of indirect attainment (b)	0.24	0.25	0.26	0.25	0.23	0.23	0.18	0.20	0.28	0.25	0.25	0.18	0.22	0.27
Final Attainment (a+b)	**2.38**	**1.86**	**1.50**	**1.51**	**1.90**	**1.34**	**1.25**	**1.55**	**1.72**	**1.71**	**1.72**	**1.29**	**1.54**	**1.55**

14.6 Continuous Improvement

The attainment must be compared with the target, and based on the comparison, two parameters need to be identified by the program,

1. Observations about attainment comparing target and its value in the previous run.
2. Action to be taken for better value in the next run.

15. FACULTY CONTRIBUTION IN SAR (NBA)

The Self-Assessment Report (SAR) is a crucial document in the NBA (National Board of Accreditation) accreditation process. It serves as a comprehensive self-evaluation tool for institutions seeking accreditation.

For an autonomous institute in Tier I, the following parameters are included in the SAR. (January, 2016)

Table No. 50 Criteria of SAR (Jan. 2016, Tier I) and its weightage

Criteria No.	Criteria	Mark /Weightage
Program Specific Criteria		
1	Vision, Mission and Program Educational Objectives	50
2	Program Curriculum and Teaching –Learning Processes	100
3	Course Outcomes and Program Outcomes	175
4	Students' Performance	100
5	Faculty Information and Contributions	200
6	Facilities and Technical Support	80
7	Continuous Improvement	75
Institute Level Criteria		
8	First Year Academics	50
9	Student Support Systems	50
10	Governance, Institutional Support and Financial Resources	120
	Total	**1000**

Faculty contribution to various criteria of NBA:

Faculty members are expected to contribute to various NBA criteria. The following table lists the expected contributions by the faculty.

Table No. 51 Criteria of SAR (Jan. 2016, Tier I) and its weightage

Criteria No.	Criteria	Expected Contribution By Faculties
1	Vision, Mission and Program Educational Objectives	• Faculty contribution in defining Vision, Mission and PEOs • Disseminating in vision, mission and PEOs • Establishing a correlation between mission and PEOs
2	Program Curriculum and Teaching – Learning Processes	• Development of OBE curriculum • Quality of the teaching-learning process • Adherence to the academic calendar • Pedagogical initiatives • Quality of conduction of practical courses • Identification of weak and bright students • Separate strategies and efforts for a weak and bright student • Outcome-based assessment

Criteria No.	Criteria	Expected Contribution By Faculties
		• Quality of question paper • Proper records keeping for assessment and attainment • Quality of student project • Initiative for industry interactions • Initiative for student internship
3	Course Outcomes and Program Outcomes	• Articulating the course outcomes • Preparation of CO-PO and CO-PSO mapping (Course articulation matrix) • Attainment of course outcome and its records • Records for an assessment process • Use of innovative assessment tools • Continuous assessment of students • Development of rubrics for assessment • Direct and Indirect assessment • Action plans
4	Students' Performance	• Student admission • Success rate • Academic performance improvement • Students' Professional chapters and clubs • Student Activities • Motivate students for inter-institute events • Technical magazine • Newsletter
5	Faculty Information and Contributions	• Faculty qualification • Faculty competencies • Innovation by the faculty in teaching and learning • Participation in FDP/Training/ STTPs • Research paper/ Publications • PhD Guide • Sponsored Research • Product development • Consultancy from industry
6	Facilities and Technical Support	• Maintenance and upgradation of laboratories • Laboratory maintenance • Safety Measures in the Lab • Upgradation of project lab
7	Continuous Improvement	• Observations • Action taken on CO and PO attainments • Placement • Higher studies • Entrepreneurship
8	First Year Academics	• Drafting the course outcomes • Preparation of CO-PO and CO-PSO mapping (Course articulation matrix)

Criteria No.	Criteria	Expected Contribution By Faculties
		• Attainment of course outcome and its records • Records for an assessment process • Use of innovative assessment tools • Continuous assessment of students • Development of rubrics for assessment • Direct and Indirect assessment • Action plans
9	Student Support Systems	• Mentoring system • Feedback on facilities and action taken • Motivation for self-learning • Career Guidance • Training and palcement • Entreprenuership cell • Co-curricular and extra-curricular activities • NSS • NCC
10	Governance, Institutional Support and Financial Resources	• Responsibilities in administrative posts • Budget • Infrastructure improvement

16. FACULTY CONTRIBUTION TO NAAC

The National Assessment and Accreditation Council (NAAC) has introduced significant reforms in 2024 to enhance the quality and inclusivity of the accreditation process for Higher Education Institutions (HEIs) in India. These reforms are being implemented in two stages: the Binary Accreditation system and the Maturity-Based Graded Levels (MBGL).

Binary Accreditation System Overview:

The Binary Accreditation system is designed to simplify the accreditation process by replacing the traditional grading system with a binary outcome: "Accredited" or "Not Accredited." This approach encourages more institutions to participate in accreditation, promoting a quality assurance culture across the educational landscape.

Key Features:

- **Simplified Evaluation:**

  Institutions will be assessed based on a set of essential criteria that determine their eligibility for accreditation. The focus will be on fundamental aspects such as infrastructure, faculty qualifications, student performance, and institutional governance.

- **Encouraging Participation:**

  By removing the complexity of multiple grades, the Binary system aims to make the accreditation process more accessible to a broader range of institutions. This inclusivity will drive widespread adoption and foster a quality-centric educational environment.

- **Transition Period:**

  While transitioning to the Binary system, institutions with pending applications under the current Revised Accreditation Framework (RAF) can choose to switch to the Binary system or continue the existing process. Institutions already accredited under RAF will retain their accreditation status until its validity expires and may opt for the new system once it is launched.

- **Implementation Timeline:**

  The Binary Accreditation system is set to be implemented within the next four months, followed by the introduction of the Maturity-Based Graded Levels by December 2024.

Benefits of the Binary System

1. **Clarity and Transparency:** The binary outcome provides a clear and straightforward understanding of an institution's accreditation status.

2. **Reduced Administrative Burden:** Simplified criteria and evaluation processes reduce the administrative load on institutions and NAAC evaluators.
3. **Enhanced Quality Assurance:** By encouraging more institutions to seek accreditation, the overall quality of higher education in India is expected to improve.

After implementing the Binary system, the NAAC will introduce the Maturity-Based Graded Levels, providing a more nuanced assessment of institutional quality. This two-stage reform aims to create a robust, dynamic accreditation framework supporting continuous improvement and higher education excellence.

The modified SSR, criteria and metric title for Binary Accreditations are listed in the following table.

Table No. 52 NAAC proposed criteria for Binary Accreditation

Criteria	Name	No.	Metric title	Contribution from faculties
1	Curriculum Design	1.1	Outcome-based curriculum	• Development of OBE curriculum • Quality of the teaching-learning process • Adherence to the academic calendar • Pedagogical initiatives • Quality of conduction of practical courses • Identification of weak and bright students • Separate strategies and efforts for a weak and bright student • Outcome-based assessment • Quality of question paper • Proper records keeping for assessment and attainment • Quality of student project • Initiative for industry interactions • Initiative for student internship
		1.2	Statke holder participation	
		1.3	Curriculum Flexibility	
		1.4	Practical and industry focus	
		1.5	Practical/skill orientation	
		1.6	Online and blended learning	
		1.7	Curriculum Revision	
		1.8	Indian Knowledge System	
2	Faculty resources	2.1	Recruitment	• Faculty qualification • Faculty competencies • Innovation by the faculty in teaching and learning • Participation in FDP/Training/ STTPs
		2.2	Pay and allowances	
		2.3	Faculty diversity	
		2.4	Faculty development	
		2.5	Faculty retention	
		2.6	Faculty-student ratio	
3	Infrastructure	3.1	Physical infrastructure	• Maintenance and upgradation of laboratories • Laboratory maintenance • Safety Measures in the Lab • Upgradation of project lab
		3.2	Learning resources	
		3.3	IT Infrastructure	
		3.4	Research Resources	
		3.5	Divyangjan friendly facilities	

Criteria	Name	No.	Metric title	Contribution from faculties
4	Financial Resources & Management	4.1	Capital Income	• Budget preparation and utilization
		4.2	Revenue Income	
		4.3	Capital Expenditure	
		4.4	Revenue Expenditure	
		4.5	Sustainability and Growth	
		4.6	Financial Controls & Risk Management	
5	Learning and Teaching	5.1	Pedagogical Approaches	• Drafting the course outcomes • Preparation of CO-PO and CO-PSO mapping (Course articulation matrix) • Attainment of course outcome and its records • Records for an assessment process • Use of innovative assessment tools • Continuous assessment of students • Development of rubrics for assessment • Direct and Indirect assessment Action plans
		5.2	Internships, Field Projects etc.	
		5.3	Assessment	
		5.4	Academic Grievances redressal	
		5.5	Catering to Diversity	
		5.6	Learning Management System	
		5.7	Industry-Academia Linkage	
6	Extended Curricular Engagements	6.1	Technical/Domain related Clubs activities and technical festivals	• Mentoring system • Feedback on facilities and action taken • Motivation for self-learning • Career Guidance • Training and palcement • Entreprenuership cell • Co-curricular and extra-curricular activities • NSS • NCC
		6.2	Hackathons and Ideation workshops	
		6.3	Cultural Clubs and activities and festivals	
		6.4	Mental health clubs and activities (Yoga)	
		6.5	Sports clubs/teams and activities	
		6.6	Community related activities including UBA	
7	Governance and Administration	7.1	Institutional Development Plan	• Responsibilities at administrative posts
		7.2	e-governance	

Criteria	Name	No.	Metric title	Contribution from faculties
		7.3	Student & Employee Welfare	• Infrastructure improvement
		7.4	Grievance handling Mechanism	
		7.5	Quality Assurance System	
		7.6	Effective Leadership	
8	Student Outcomes	8.1	Placements/Employment	• Mentoring system • Feedback on facilities and action taken • Motivation for self-learning • Career Guidance • Training and palcement
		8.2	Academic Progression	
		8.3	Self-employment/ entrepreneur	
		8.4	Awards/Prizes/ Recognitions in curricular and extended curricular areas	
		8.5	Enrollment ratio	
		8.6	Graduation rate	
		8.7	Student /alumni learning experience	
9	Research and Innovation Outcomes	9.1	External Research Grants	• Research paper • PhD Guide • Sponsored research • Product development • Consultancy from industry
		9.2	Research Publications	
		9.3	Research Quality	
		9.4	IPRs produced	
		9.5	Research Collaboration	
		9.6	Number of students Startups	
10	Sustainability (Green initiatives)	10.1	Community activities	• Community activities • Social responsibility
		10.2	Waste and Water Management	
		10.3	Progressing towards Net Zero	
		10.4	Green Audits and Initiatives	
		10.5	Collaborations with industry/NGOs	

17. EXPERT VISIT PREPARATION FOR NBA

The institute preparing for the NBA visit should have the following program and institute-level files ready for evidence verification.

1. **List of faculties for the program, first-year department and aligned programs in the following format.**

Information of Faculty

Please provide the list of faculty in the Department as per the below format separately (year-wise) for each year under consideration:

S. No.	Name	PAN No.	Qualification	Area of Specialization	Designation	Date of Joining	The date on which Designated as Professor/ Associate Professor	Currently Associated (Y/N)	Nature of Association (Regular/Contract/ Adjunct)	If contractual, mention Full-time or Part-time	Date of Leaving (In case Currently Associated is " No")
1.											
..											
N.											

2. **List of institute level (I Files) and program level (P-Files) Documents**

List of Documents / Records to be verified during the Visit-UG Engineering Program (Records of last three years to be made available, wherever applicable)

Institute Specific

The College that is seeking accreditation or re-accreditation of its program must have the following list of files in place:

I.1	Evidence of appointment letters of all first-year courses teaching faculty members, their qualifications and first-year faculty-student ratio.
I.2	Evidence of first-year student academic performance in the last 3 years.
1.3	Course files(1st year) with course delivery plan, question papers, sample answer scripts, assignments, reports of assignments, list of laboratory experiments, reports of laboratory experiments, etc.
1.4	Records of PO/PSO attainment values of all first-year courses and observations of actions taken based on the results of PO/PSO in the last 3 years.

I.5	Records of the mentoring system and state the efficacy of the mentoring system- Keep a few samples of mentor diaries /proctor diaries of respective branches.
I.6	Records of feedback on teaching learning and, feedback on various facilities & feedback analysis, and corrective measures taken in the last 3 years.
I.7	Records of career guidance cell, training & placement cell & entrepreneurship cell & no.of programs organized and their outcomes in the last 3 years.
I.8	Evidence of co-curricular and extra-curricular activities in the last 3 years.
I.9	Records of GC/GB/senate and other academic and administrative bodies, their responsibilities and strategic plan and implementations.
I.10	Records of various rules, policies, procedures, service books and academic regulations. Policies, procedures and service books are made available on the college website.
I.11	Governance, leadership and management. Records of the decentralization process in working for taking administrative decisions
I.12	Records of grievance redressal mechanisms, including the anti-ragging committee, sexual harassment committee, and corrective measures taken in the last 3 years.
I.13	Records of budget allocation and utilization at the college level, audited statement of accounts by CA in the last 3 years. Delegation of financial powers of various heads.
I.14	Records of library resources, digital library facilities, and self-learning facilities are available at the college.
I.15	Records of Internet & Wi-Fi facilities, provision for accessing Internet/Wi-Fi facilities for students and staff & Internet security mechanism available within the College.

Program Specific:

The program of an Institution that is seeking accreditation or re-accreditation must have the following list of files in place:

P.1	NBA accreditation reports of past visits & list of actions taken based on weaknesses and deficiencies of the latest NBA visit (if any).
P.2	Evidence of program-specific budget allocation and utilization in the last 3 years and sample bills
P.3	Records of the process used in defining vision, mission, PEO and PSO statements.
P.4	Publication and dissemination among stakeholders & awareness programs on vision, mission & PEO, PO, and PSO statements.
P.5	Justification of PEO matrix against department mission elements.
P.6	Records of program curriculum and process are used to identify the extent of compliance with the curriculum for attaining POs & PSOs.

P.7	Records of delivery details of the content beyond the syllabus & list of activities/ events organized for the past 3 years.
P.8	Records of instructional methods and pedagogical initiatives used in teaching and learning.
P.9	Records of the list of methodologies used to support weak students and encourage bright students and impact analysis.
P.10	Records of quality assessment in continuous internal evaluation question papers, assignments, quizzes, etc.
P.11	Evidence of quality students' projects & rubrics used to access the student projects and their outcomes in the last 3 years.
P.12	Records of initiatives related to industry interaction & partial delivery of lectures by experts from Industry/research Institutes and their impact analysis in the last 3 years.
P.13	Records of industry internships/summer training and its impact analysis in the last 3 years.
P.14	Records of course outcomes(COs) of all courses.
P.15	Records of CO-PO/PSO mapping of all courses and courses-PO/PSO mapping.
P.16	Course file with a course delivery plan, question papers, answer scripts, assignments, reports of assignments, project reports, reports of design projects, list of laboratory experiments, etc.
P.17	Records of the list of assessment tools used for PO and PSO & attainment values. Observation and actions taken based on the results of POs /PSO in the last 3 years.
P.18	Evidence of the number of seats filled under various quotas and quality of students (ranks/percentage of marks) admitted to the program in the last 3 years.
P.19	Evidence of program success rate (success rate without backlogs and success rate within the stipulated period) in the last 3 years.
P.20	Evidence of academic performance of 2nd and 3rd year students in the last 3 years.
P.21	Evidence of placement, higher studies and entrepreneurship details in the last 3 years.
P.22	Evidence of a list of professional societies and a number of events organized by the Department in the last 3 years.
P.23	Records of technical magazines, newsletters, etc. & student participation in the inter-institute events & list of awards received by the students in the last 3 years.
P.24	Details of faculty-student ratio.
P.25	Records of a list of regular/contract/visiting faculty members with their appointment letters, designation, qualification, promotion, salary details, etc.
P.26	Evidence of short-term courses/workshops arranged, course modules developed, faculty competencies and innovations done by the faculty in the teaching and learning process.
P.27	Evidence of faculty participation in the FDP/STTP/NPTEL/training activities in the last 3 years.

P.28	Evidence of faculty publications/books/chapters/citations/IPRs/awards/Ph.D awarded and a number of PhD scholars guided by faculty members in the last 3 years.
P.29	List of R&D projects and consultancy projects along with approval letters & proof of working models/ products developed by faculty in the last 3 years.
P.30	Records of student feedback on the teaching-learning process & faculty performance appraisal system and corrective measures taken in the last 3 years.
P.31	Records of program-specific laboratories and other computing facilities available within the department.
P.32	Records of project laboratories, research laboratories, industry-supported laboratories, and other additional facilities are available within the department.
P.33	Records of lab maintenance and safety measures available within the department laboratories.
P.34	Evidence of non-teaching staff members along with their appointment letters, degree, skill upgradation, etc.
P.35	Records of academic audit and corrective measures taken in the last 3 years.

3. Guidelines for Director and HoD presentation

Principal Presentation Template

S.N.	Information on	No. of Slides Indicative
1.	Promoters	01
2.	Group Activities; other Institution details; if applicable	01
3.	Institute achievements/Recognitions: • Institute level • Faculty level • Student level	03
4.	Faculty Centric Policies & Utilization	02
5.	Student Centric Policies & Utilization	02
6.	Quality Assurance Initiative & Impact	02
7.	Curriculum & Teaching – Learning Process – Implementation details	05
8.	Faculty Information & Contribution points (As per SAR; Institute level – Program wise)	06
9.	Student Performance Points (As per SAR; Institute level – Program wise)	06
10.	Facilities and Technical Support	02

11.	Governance, Institutional Support and Financial Resources	05
12.	Vision, Mission and Program Educational Objectives(Process – formulation & Attainment)	05
	Total:	40

Note: The Institute may add/delete a few slides. Maximum Permissible slides are 45.

Head of the Department Presentation Template

S.N.		Information on	No. of Slides Indicative
1.	Part I	Introduction	01
2.		Department achievements/Recognitions: • Department level • Faculty level • Student level	03
3.		Criteria 1- Vision, Mission and Program Educational Objectives	02
4.		Criteria 2- Program Curriculum and Teaching – Learning Processes	03
5.		Criteria 3 - Program Outcomes and Course Outcomes	08
6.		Criteria 4 - Students' Performance	07
7.		Criteria 5 - Faculty Information and Contributions	08
8.		Criteria 6 - Facilities and Technical Support – Teaching Labs and Special Laboratories	02
9.		Criteria 7 - Continuous Improvement	06
	Part II	OBE Philosophy of the Department: Description of OBE Philosophy followed by the Department in the attainment of COs & Pos and Assessment methodology	20-25

Note: The department may add/delete a few slides. Maximum Permissible slides are 60-65

17.1 Tentative Schedule of NBA Visiting Team

Visit Schedule – UG Engineering

Day 1: Morning Session 9:00am to 1:00pm

Arrival 8:45am at the College

Time	Participants	Theme	Observations
PART - I			
9:00am-9:20am	Entire Team	Introductions	At the Institute
9:20am-10:00am	Entire Team and Management /Institution representatives	Principal's Presentation about the Institute	Not more than 45 minutes
10:20am – 12:30pm	Chairman	Visit Central facilities, 1st Year Labs, meet 1st Year faculty	
PART - II			
10:15am – 11:00am	Experts in respective departments	Presentation by HoD	
11:00am – 12:00pm	Experts in respective departments	Meeting with Program faculty	
12:00pm – 12:30pm	Experts in respective departments	Individual meetings with a few (3-4) faculty as decided by the experts	
12:30pm – 1:00pm	The entire team meets alone	To share thoughts	
1:00pm – 2:00pm	Working Lunch at the College		

Day 1: Afternoon: 2.15pm to 5.30pm

Time	Participants	Work Theme	Observation
2:15pm -4:30pm	Chairman	Discussion and Study of Admin Different committees and their working	

Time	Participants	Work Theme	Observation
2:15pm -4:30pm	Experts	Laboratories to see equipment adequacy, Conduct of lab sessions	Friday is normally a working day. So, labs would be functioning
4:30pm -5:30pm Day 1 the college ends	A meeting at the College to review the day's work		

Day 2: Morning Session 9:30am – 1:00pm

Time	Participants	Work Theme	Observations
PART - I			
9:30am – 10:00am *To be adjusted for the timetable*	All Team	Lectures. Every member on his own	Either one or two halves. Allows one to see the conduct of teaching.
10:00am – 12:00pm	Chairman	Study Budget, Accounts etc.	
PART - II			
10:00am – 1:00pm	Experts	Study all evidence for the attainment of POs	
12:00pm – 1:00pm	Chairman	Visit the placement office	
1:00pm – 2:00pm	Working Lunch at the College		

Day 2: Afternoon Session 2:00pm – 4:15pm

Time	Participants	Work Theme	Observations
2:00pm – 3:30pm	Experts	Visit and study projects towards the attainment of POs	
2:30pm – 3:00pm	Chairman	Alumni, Parents, employers	
3:30pm – 4:00pm	All Team	Faculty Meeting	

Time	Participants	Work Theme	Observations
4:00pm – 4:30pm	All Team	Students	
4:30pm onwards	All Team	Report writing	
4:30pm Depart for a place of stay			

Day 3

10:00am – 10:45am Exit meeting: Chairman and Evaluators present their exit comments
11:00am Visit Concludes

18. NEW SAR FOR TIER I (JULY 2024)

New Self-Assessment Report (Tier I Engineering Programs)

The National Board of Accreditation (NBA) announces a new Self-Assessment Report (SAR) format (July 2024 document) for the Tier I Engineering Programs as per the GAPC Version 4.0, applicable with effect from 1st August 2024.

The implementation of New SAR for Accreditation of Tier I Engineering Programs will be as follows:

1. The new SAR (July 2024 document) for the Tier I Engineering programs will be applicable from 1st August 2024.

2. Institutions that have already submitted SAR in the existing January 2016 document can either continue in the same format or apply afresh in the new format. This option will be available till 31st December 2024.

3. Institutions wishing to submit fresh applications can do so either in the existing SAR document (January 2016 document) or the new SAR document (July 2024 document) till 31st December 2024.

4. the new SAR document (July 2024) will only be available for the Tier I Engineering programs from 1st January 2025.

Criteria No.	Name of the Criteria	Marks/ Weightage
Program Level Criteria		
1	Outcome-Based Curriculum	120
2	Outcome-Based Teaching Learning	120
3	Outcome-Based Assessment	120
4	Students' Performance	120
5	Faculty Information	100
6	Faculty Contributions	120
7	Facilities and Technical Support	100
8	Continuous Improvement	80
Institution Level Criteria		
9	Student Support and Governance	120
Total Marks/Weights		**1000**

19. SCHEDULE OF VISIT FOR NAAC

A tentative schedule of the NAAC visiting team is mentioned as follows,

Day	Schedule	Time	Responsibility	
DAY 0				
0 Day	Peer Team Discussion (Pre-visit meeting at the place of stay)	05:00 – 07:00 pm	ED Sir and IQAC team	
DAY 1				
1 Day	Presentation by the Director, Sir	9:00 – 09:45 am	Director Sir	Board Room
1 Day	Activities / Meeting Meeting and Interaction with Heads of Department (Planning and documentation for curriculum delivery, cross-cutting issues integrated into the Curriculum, etc...)	09:45 – 10:30 am	HoD's, Deans	Board Room
1 Day	Activities / Meeting Visit to selected Departments (not more than 50% of the Departments to be elected by the Peer Team/HEI) (Assessment of learning levels of students, student-centric methods for enhancing learning experiences, innovation and creativity in teaching-learning, Reforms-Transparency andGrievance-redressal mechanism in Continuous Internal Evaluation (CIE), adherence to Academic Calendar for conductof CIE, Statements & Attainment of POs, PSOs & COs etc....)	10:30 – 01:00pm	Concerned HoD	departme nt office
1 Day	**Lunch**	01:00 – 02:00 pm		Board Room

Day	Schedule	Time	Responsibility	
1 Day	Meeting and Interaction with Heads of the Departments/Faculty Members on Teaching-Learning and Evaluation	2:00-2:30 pm	Dean Academics, HoD, Academic Coordinators all dept	Board Room
1 Day	Meeting and Interaction with Controller of Examination	2:30-3:00 pm	CoE Team	CoE Office
1 Day	Visit to Research and Development Cell, Center of Excellence, Collaborations, Extension activities, NSS	3:00-3:30 pm	Concerned Deans, Coordinator	Respective location
1 Day	Visit to Computer Centre Incubations Centre Media Laboratory	3:30-3:45 pm	Concerned Coordinator	Respective location
1 Day	Visit to Physical Facilities: Library, Language Lab Boys Hostel Guest house Sports, Gymnasium, Yoga Centers Hospital Subhadra Ladies Hostel Canteen New Ladies Hostel	3:45-4:30 pm	Concerned Coordinator	Respective location
1 Day	Interaction with Placement Cell, Career Counseling Centre, Anti Raging Cell, ICC Interaction with Students, Alumni, Parents	4:30-5:15 pm	Concerned Authority and	Respective location
1 Day	Meeting with the governing body, management, and state government. Representatives, College representatives. Meeting with the Director-IQAC IQAC members in the IQAC office. Interact with the Registrar, Finance Officer, and other non-teaching staff.	5:15-6:00 pm	IQAC Coordinator	Board room

Day	Schedule	Time	Responsibility	
Day 1	Cultural Programmes by Students	6:00-6:45 pm	Kala Academy Team	Auditorium
DAY 2				
Day 2	Review of physical facilities such as safety and security, Counseling, Ramp/Rails, skill development centres, etc., and review of alternative energy initiatives, rainwater harvesting, waste management system	09:00-09:45 am	Core Team	Respective Location
Day 2	Review of best practices and Institutional Distinctiveness		Core Team	Board Room
Day 2	Report writing, Checking Documentary evidence	09.45 – 1:00 pm	IQAC, Director, All Criteria Coordinators	Board Room
Day 2	Lunch			
Day 2	Exit Meeting	05:00-05:30pm	Core Team	Board Room