



M. Kumarasamy
College of Engineering

NAAC Accredited Autonomous Institution

Approved by AICTE & Affiliated to Anna University

ISO 9001:2015 Certified Institution

Thalavapalayam, Karur - 639 113, TAMILNADU.



Outcome Based Education **Policy Manual**

Internal Quality Assurance Cell (IQAC)

M.Kumarasamy College of Engineering, Karur - 639113



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1. Preamble / Introduction

Outcome-Based Education (OBE) is a student-centric approach that emphasizes the measurable outcomes of the teaching–learning process rather than the process itself. The focus is on what learners are expected to achieve at the end of their academic program in terms of knowledge, skills, and professional attitudes.

This policy manual establishes the institutional framework for implementing OBE across all programs offered at the college. It serves as a guiding document for faculty, students, administrators, and all stakeholders to ensure that:

- Every course and program is outcome-driven.
- Graduate attributes are systematically developed and measured.
- Continuous improvement becomes an integral part of academic practice.

By adopting OBE, the institution demonstrates its commitment to quality, accountability, and global competitiveness in higher education.



1.1 Rationale for OBE Implementation

The rationale for implementing OBE stems from the need to shift from traditional input-based education (focus on syllabus coverage, teaching hours, and examinations) to an output-driven model (focus on competencies, skills, and employability).

Key reasons include:

- Student-Centered Learning: Ensures that students achieve predefined competencies that are measurable, transparent, and verifiable.
- Global Employability: Equips graduates with skills that are recognized by industry and academia worldwide.
- Continuous Quality Enhancement: Creates a structured mechanism for gap analysis, corrective action, and curriculum enrichment.
- Accreditation Preparedness: Aligns institutional practices with international quality assurance frameworks.
- Societal Contribution: Prepares graduates who can address challenges of sustainability, ethics, innovation, and social responsibility.



1.2 Alignment with Vision & Mission

OBE directly supports the realization of the institution's Vision and Mission by ensuring that:

- Vision: The long-term aspirations of the institution (such as global competence, innovation, societal development) are translated into Program Educational Objectives (PEOs).
- Mission: The strategies to achieve the vision (through teaching, research, industry collaboration, and social responsibility) are operationalized through Program Outcomes (POs), Program Specific Outcomes (PSOs), and Course Outcomes (COs).
- Traceability: Every course taught in the institution is mapped to higher-level outcomes, ensuring transparency and accountability.
- Feedback Integration: Stakeholder expectations (industry, alumni, employers, professional society, parents, and students) are integrated into curriculum design and program objectives.

Thus, OBE serves as the bridge between institutional aspirations and student achievements.

1.3 Global and National Accreditation Relevance

Implementation of OBE ensures compliance with global and national accreditation frameworks, thereby enhancing the credibility and recognition of the institution and its graduates.

National Board of Accreditation (NBA), India

- NBA mandates OBE as the foundation for accreditation of engineering, management, and other professional programs.
- Focuses on PEOs, POs, PSOs, and COs, and their attainment.
- Evaluates continuous improvement practices and stakeholder involvement.

National Assessment and Accreditation Council (NAAC), India

- NAAC emphasizes student learning outcomes, teaching effectiveness, and continuous internal quality assurance.
- OBE aligns with NAAC criteria such as curriculum design, teaching-learning evaluation, and student performance.

Washington Accord

- An international agreement among bodies responsible for accrediting engineering degree programs.
- Recognizes that graduates from accredited OBE programs demonstrate substantial equivalence in competencies.
- Ensures global mobility and employability of graduates.

ABET (Accreditation Board for Engineering and Technology, USA)

- A pioneer in OBE-based accreditation, emphasizing student outcomes and continuous improvement.
- Provides benchmarks that are globally recognized in engineering and technology education.

2. Philosophy of OBE

Outcome-Based Education (OBE) is not documentation — it is a living culture that integrates vision, mission, teaching, learning, and assessment into a continuous cycle of improvement.



2.1 Core Belief

- Education should begin with a clear vision of the desired outcomes: the knowledge, skills, and attitudes that graduates are expected to demonstrate.
- Every course, activity, and assessment must be mapped to outcomes that ensure global competencies, industry relevance, and societal impact.



2.2 The OBE Cycle

Vision → PEOs → POs → PSOs → Courses → COs → Assessment → Target Setting → Continuous Improvement

- Vision & Mission: Institutional aspirations and strategies.
- PEOs (Program Educational Objectives): Broad achievements 4–5 years after graduation.
- POs (Program Outcomes): Graduate attributes defined by NBA/Washington Accord.
- PSOs (Program Specific Outcomes): Discipline-specific skills at the time of graduation.
- COs (Course Outcomes): Measurable outcomes achieved by completing a course.
- Assessment: Direct (tests, labs, projects) & Indirect (surveys, feedback).
- Target Setting: Benchmarks fixed from historical data & national standards.
- Continuous Improvement: Action plans for gaps and curriculum enrichment.



3. Derivation of PEOs from Vision and Mission

Outcome-Based Education (OBE) begins with a clear Vision and Mission at the institutional and program level.

- Vision: Long-term aspiration — what the institution/program wants its graduates to ultimately achieve (global competency, innovation, societal impact).
- Mission: The broad approach taken to achieve the vision — the strategies, culture, and systems adopted (teaching, research, industry collaboration, social responsibility).

From these, Program Educational Objectives (PEOs) are derived.

- PEOs describe what graduates are expected to achieve 4–5 years after graduation.
- They are broad, future-oriented, and bridge institutional aspirations with student career paths.
- They are the foundation of OBE, as PEOs set the direction for PSOs, COs, and assessment.



3.1 Inputs for PEO Development

PEOs are not written in isolation. Institutions must consult multiple stakeholders to ensure relevance and alignment.

Institutional Vision & Mission – Top-down alignment with long-term goals.

Graduate Attributes – NBA / Washington Accord / ABET expectations.

Stakeholder Expectations:

- **Industry** – Employability, innovation, skills.
- **Alumni** – Career progression, global exposure.
- **Students** – Aspirations, higher studies, entrepreneurship.
- **Parents & Society** – Ethics, social contribution.
- **Professional Societies** – Standards, certifications, technical advancements, and lifelong learning orientation.

Regulatory Bodies – AICTE Model Curriculum, accreditation guidelines.

Benchmarking – PEOs from IITs, NITs, and global top universities.



3.2 Characteristics of Good PEOs

- Broad and future-focused (not course-level skills)
- Achievable (based on program curriculum and resources)
- Aligned (to Vision, Mission, POs)
- Stakeholder-driven (reflects industry & societal needs)
- Measurable (can be evaluated through alumni/employer surveys, placement, higher studies)
- Limited in number: 3–5 PEOs recommended

3.3 Guidelines for Writing PEOs

Step 1: Review Vision & Mission

- Extract key themes (e.g., “global competency,” “research culture,” “sustainable development”).
- Translate themes into graduate aspirations.

Step 2: Identify Stakeholder Needs

- Gather feedback from employers, alumni, industry advisory boards, accreditation benchmarks.
- Categorize needs into: Career, Higher Studies, Entrepreneurship, Ethics, Societal Impact.

Step 3: Draft Broad Graduate Goals

- Write 4–5 broad goals graduates should achieve 4–5 years post-graduation.
- Ensure coverage of:
 - Professional career (jobs/entrepreneurship)
 - Higher studies/research
 - Ethics and societal contribution
 - Leadership/innovation

Step 4: Validate Alignment

- Each PEO must:
 - Directly support Vision & Mission
 - Be traceable to POs (graduate attributes)
 - Address stakeholder expectations

Step 5: Finalize & Approve

- Discuss draft PEOs in the Department Advisory Board (DAB), Board of Studies (BoS).
- Approve in the Academic Council.

3.4 Examples of PEOs

Example 1: Computer Science & Engineering

- Vision: To produce globally competent computer engineers with innovation and social responsibility.
- Mission: Provide quality education in computing, foster research, and build industry collaboration.
- PEOs:
 - PEO1: Graduates will establish successful careers in software industries, research organizations, or as entrepreneurs.
 - PEO2: Graduates will pursue higher education in advanced computing and interdisciplinary domains.
 - PEO3: Graduates will demonstrate ethical practices, teamwork, and societal responsibility in professional life.
 - PEO4: Graduates will adapt to emerging technologies and contribute to innovation.

Example 2: Mechanical Engineering

- Vision: To nurture mechanical engineers capable of addressing global engineering challenges through innovation and sustainability.
- Mission: Deliver strong fundamentals, hands-on skills, research opportunities, and industry exposure.
- PEOs:
 - PEO1: Graduates will establish careers in mechanical industries, manufacturing, design, and R&D.
 - PEO2: Graduates will pursue advanced studies, research, or professional certifications.
 - PEO3: Graduates will practice engineering with a focus on ethics, safety, and sustainability.
 - PEO4: Graduates will demonstrate leadership and teamwork in multidisciplinary projects.



Example 3: Civil Engineering

- Vision: To be a center of excellence in civil engineering education and sustainable infrastructure development.
- Mission: Provide quality instruction, modern laboratories, and exposure to real-world construction practices.
- PEOs:
 - PEO1: Graduates will work in civil engineering firms, construction industries, or government sectors.
 - PEO2: Graduates will pursue higher studies, research, and professional licensure (e.g., Chartered Engineer).
 - PEO3: Graduates will adopt sustainable and ethical practices in civil engineering solutions.
 - PEO4: Graduates will contribute to societal development through infrastructure projects.

Example 4: Electrical & Electronics Engineering

- Vision: To produce competent electrical engineers contributing to industry and sustainable energy solutions.
- Mission: Provide strong fundamentals, modern design skills, and hands-on exposure in power and electronics.
- PEOs:
 - PEO1: Graduates will work in electrical power, automation, and electronics industries.
 - PEO2: Graduates will pursue higher studies or research in emerging technologies (renewable energy, smart grids).
 - PEO3: Graduates will demonstrate professional ethics and contribute to sustainable energy solutions.
 - PEO4: Graduates will adapt to global challenges and provide innovative engineering solutions.

3.5 Evaluation of PEOs

PEOs are long-term. Their attainment must be evaluated once every 3–4 years.

Assessment methods:

- Alumni survey (career growth, higher studies, entrepreneurship)
- Employer survey (job performance, skills relevance, ethics)
- Placement data analysis
- Higher education enrollment statistics
- Industry recognition / awards

Example Rubric for PEO Evaluation:

Indicator	Data Source	Scale (1–5)	Target
Career progression	Alumni survey	Avg \geq 3.5	70% satisfied
Higher studies	Alumni records	\geq 15% of graduates	
Ethical/societal contribution	Employer survey	Avg \geq 3.5	70% satisfied
Entrepreneurship	Alumni database	\geq 5% startups	



3.6 Continuous Improvement

- If targets are not met → identify gaps (curriculum, training, industry exposure).
- Revise PEOs only if Vision/Mission or external needs change.
- Keep documentation of revisions and justification.

4. Formulation of Program Specific Outcomes (PSOs)

In Outcome-Based Education (OBE), PEOs provide long-term career achievements of graduates (4–5 years after graduation).

Program Specific Outcomes (PSOs) are narrower, discipline-specific competencies that students should attain by the time of graduation.

- PEOs → “Where graduates will be in the future.”
- PSOs → “What technical/discipline-specific competencies they must acquire now to reach that future.”

Thus, PSOs operationalize PEOs at the program level by translating broad career goals into specific technical skills.



4.1 Key Principles in Deriving PSOs from PEOs

1. Alignment

- Each PSO must directly support one or more PEOs.
- Mapping should be visible in the PEO–PSO matrix.

2. Discipline-Specific Focus

- While POs (Program Outcomes) are generic (as per NBA/Washington Accord), PSOs differentiate each branch (e.g., CSE vs. Civil).
- PSOs must highlight what is unique in that program.

3. Scope & Count

- Typically 2–4 PSOs per program.
- Should cover application of core knowledge, tools, and problem-solving in the discipline.

4. Stakeholder Input

- Industry (emerging technologies, sector needs)
- Alumni (career relevance)
- Faculty expertise and research thrusts

5. Assessment-Ready

- PSOs should be measurable through course outcomes (COs), lab/projects, internships, placements, certifications, etc.

4.2 Guidelines

Step 1: Analyze PEOs

- Break down broad goals into discipline-specific requirements.
- Example (CSE PEO): Graduates will establish successful careers in software industries, research, or entrepreneurship.
 - What technical competencies enable this? → Programming skills, system design, data analytics, entrepreneurship mindset.

Step 2: Identify Core Competencies of the Program

- Refer to curriculum, emerging technologies, NBA model curriculum.
- Extract 2–3 technical focus areas (e.g., “Data-driven computing,” “Infrastructure design,” “Sustainable energy systems”).

Step 3: Formulate PSOs

- Express as measurable abilities graduates should have by graduation.
- Begin with action verbs: apply, analyze, design, develop, demonstrate, solve, integrate.

Step 4: Validate

- Ensure PSOs:
 - Cover the discipline’s unique identity.
 - Map clearly to PEOs.
 - Are not too broad (like PEOs) nor too narrow (like COs).

Step 5: Approval & Documentation

- Department Advisory Board (DAB) → Board of Studies (BoS) → Academic Council approval.
- Record mapping of PEO ↔ PSO.

4.3 Examples of PEO-to-PSO Derivation

Example 1: Computer Science & Engineering

PEOs

- PEO1: Graduates will establish successful careers in software industries, research organizations, or entrepreneurship.
- PEO2: Graduates will pursue higher education in advanced computing and interdisciplinary domains.
- PEO3: Graduates will demonstrate professional ethics, teamwork, and societal responsibility.
- PEO4: Graduates will adapt to emerging technologies and contribute to innovation.

Derived PSOs

- PSO1: Apply fundamental concepts of computing and mathematics to design, develop, and test software systems.
- PSO2: Analyze, design, and implement solutions for data-driven and AI-enabled applications.
- PSO3: Demonstrate entrepreneurship, innovation, and research skills through projects and product development.

Example 2: Mechanical Engineering

PEOs

- PEO1: Graduates will establish careers in industries, design, manufacturing, and R&D.
- PEO2: Graduates will pursue higher studies, research, or certifications.
- PEO3: Graduates will practice engineering with ethics, safety, and sustainability.
- PEO4: Graduates will demonstrate leadership and teamwork in multidisciplinary projects.



PSOs

- PSO1: Apply knowledge of mechanics, thermal sciences, and materials for engineering problem solving.
- PSO2: Use CAD/CAM/CAE and modern tools to design and analyze engineering systems.
- PSO3: Apply sustainable and ethical practices in mechanical design and manufacturing.

Example 3: Civil Engineering

PEOs

- PEO1: Graduates will work in civil engineering firms, construction industries, or government sectors.
- PEO2: Graduates will pursue higher studies, research, and professional licensure.
- PEO3: Graduates will adopt sustainable and ethical practices.
- PEO4: Graduates will contribute to societal development through infrastructure.

PSOs

- PSO1: Apply knowledge of surveying, structural analysis, and geotechnical engineering in construction projects.
- PSO2: Design sustainable infrastructure using modern tools, codes, and practices.
- PSO3: Demonstrate knowledge of project management and cost estimation in real-world projects.

Example 4: Electrical & Electronics Engineering

PEOs

- PEO1: Graduates will work in power, automation, and electronics industries.
- PEO2: Graduates will pursue higher studies or research in emerging technologies.
- PEO3: Graduates will demonstrate ethics and contribute to sustainable energy.
- PEO4: Graduates will adapt to global challenges with innovative solutions.



PSOs

- PSO1: Apply knowledge of electrical circuits, power systems, and control to design and analyze engineering solutions.
- PSO2: Use modern simulation tools for automation, renewable energy, and smart grid applications.
- PSO3: Demonstrate ability to develop innovative electronic systems for industrial and societal needs.



4.4 Evaluation of PSOs

Unlike PEOs (evaluated every 3–4 years), PSOs are evaluated every year since they are closer to courses.

Assessment Methods:

- Exit surveys of final-year students.
- Course Outcome (CO) → PSO mapping.
- Project evaluations, internships, industry certifications.
- Placement and higher studies statistics.



4.5 Continuous Improvement

- If a PSO target is not achieved → revise curriculum, add labs, industry training, or electives.
- PSOs are updated when PEOs change, or when industry trends shift (e.g., AI, EVs, green buildings).



5. Course Identification Based on PSOs

In Outcome-Based Education (OBE), Program Specific Outcomes (PSOs) define the discipline-specific competencies that students must achieve by graduation.

Course identification ensures that:

- Every PSO is explicitly addressed by one or more courses in the curriculum.
- Courses collectively equip students with the knowledge, skills, and attitudes needed to achieve PSOs.
- There is traceability from PSOs to Program Outcomes (POs) and eventually to Course Outcomes (COs).

This step is critical for curriculum alignment, assessment planning, and accreditation compliance.



5.1 Inputs for Course Identification

1. Program Specific Outcomes (PSOs) – The starting point.
2. Curriculum Structure – Existing courses in each semester.
3. Syllabus Content – Learning objectives, topics, labs, and projects.
4. Industry & Academic Benchmarking – Emerging technologies, global standards, professional requirements.
5. Faculty Expertise & Research Focus – To identify courses where deep competency can be developed.

5.2 Guidelines

Step 1: Analyze PSOs

- Review each PSO carefully and break it into technical knowledge areas or skills.
- Example:
 - PSO1: “Programming & Algorithms” → skills: coding, data structures, algorithm design, optimization.
 - PSO2: “Machine Learning & IoT” → skills: data analysis, model building, embedded systems.

Step 2: Map Knowledge/Skills to Courses

- Identify existing courses that explicitly cover the skills and knowledge areas.
- Assign primary courses (core subjects) and supporting courses (electives, labs, workshops).

Step 3: Validate Coverage

- Ensure each PSO is addressed in at least 2–3 courses.
- Avoid gaps where a PSO is not supported by any course.
- Avoid redundancy where multiple courses teach the same competency unnecessarily.

Step 4: Document the Mapping

- Create a PSO–Course Matrix.
- Include course codes, names, and the level of contribution (High, Medium, Low).
- Use this matrix later for CO mapping, assessment planning, and accreditation reports.

Step 5: Periodic Review

- Review course-PSO mapping annually to incorporate:
 - Curriculum updates, New technologies, Industry feedback & Student performance

5.3 PSO-to-Course Identification

Example: Computer Science & Engineering

PSOs

- **PSO1:** Apply programming, algorithm design, and data structures to develop software solutions.
- **PSO2:** Apply knowledge of Machine Learning, IoT, and Big Data for intelligent system design.
- **PSO3:** Demonstrate cybersecurity principles and secure software practices.

PSO → Course Mapping

PSO	Courses (Core/Support)	Contribution Level
PSO 1	Data Structures, Algorithms, Operating Systems, Software Engineering	High
PSO 2	Artificial Intelligence, IoT Systems, Big Data Analytics, Embedded Systems	High
PSO 3	Computer Networks, Cryptography & Network Security, Cloud Computing	High

6. Formulation of Course Outcomes (COs)

In Outcome-Based Education (OBE), Course Outcomes (COs) define what a student should be able to demonstrate, perform, or achieve upon successful completion of a course.

- COs translate PSOs and POs into course-level, measurable learning outcomes.
- COs ensure teaching, learning, and assessment are aligned and outcomes are achieved.
- Each CO should be specific, measurable, achievable, relevant, and time-bound (SMART).

Key Concept:

PSOs → COs → Assessment → Attainment.

6.1 Key Principles

1. Number of COs

- 2-credit course → 4 COs
- 3-credit course → 5 COs
- 4-credit course → 6 COs
- Adjust based on the complexity of the course and lab/project components.

2. Alignment with Bloom's Taxonomy

- COs should span different cognitive levels:
 - Remember/Understand: Define, Describe, Explain
 - Apply: Implement, Solve, Execute
 - Analyze: Compare, Evaluate, Differentiate
 - Create/Evaluate: Design, Formulate, Assess

3. Structure of CO Statement

Each CO should ideally include:

- Action Verb (Bloom's level)
- Technical Content / Skill
- Condition (tools, software, environment)
- Criteria / Benchmark (performance standard)

Example Structure:

1. CO#: Action Verb + Technical Content + Condition + Criteria
 - CO1: "Implement linear and non-linear data structures to solve computational problems."
 - Action Verb: Implement → Apply



- Technical Content: Linear and Non-linear data structures
- Condition: Solve computational problems
- Criteria: Correct, efficient, and tested implementation

6.2 Guidelines for CO Formulation

Step 1: Analyze Course Content

- Review syllabus, topics, labs, and projects.
- Identify key skills and knowledge that support PSOs.

Step 2: Identify Learning Levels

- Map topics to Bloom's Taxonomy levels.
- Ensure mix of cognitive skills: lower levels for foundational knowledge, higher levels for analysis, design, and evaluation.

Step 3: Draft COs

- Begin each CO with a measurable action verb.
- Include technical content (subject/topic/lab/project).
- Specify conditions/tools if applicable.
- Include criteria for performance (e.g., accuracy, efficiency, teamwork).

Step 4: Validate Alignment

- Ensure each CO:
 - Maps to at least one PSO.
 - Contributes to one or more POs.
 - Is measurable (accessible through tests, labs, assignments, projects).

Step 5: Approval & Documentation

- Department-level review → BoS approval → Academic Council approval.
- Maintain CO–PSO–PO mapping in course files for accreditation and continuous improvement.

6.3 Examples

Example 1: Computer Science & Engineering – Data Structures (PSO1)

CO	Statement	Bloom Level	Assessment
CO1	Implement linear and non-linear data structures to solve computational problems.	Apply	Lab assignments, coding tests
CO2	Analyze algorithms in terms of time and space complexity.	Analyze	Quiz, assignments
CO3	Design and evaluate efficient algorithms for real-world case studies.	Create/Evaluate	Project, case study
CO4	Demonstrate teamwork through coding projects in open-source platforms.	Apply/Collaborate	Group project, peer review

Example 2: Mechanical Engineering – Thermodynamics (PSO1)

CO	Statement	Bloom Level	Assessment
CO1	Explain laws of thermodynamics and their applications in engineering systems.	Understand	Quiz, test
CO2	Solve problems on energy analysis in closed and open systems.	Apply	Assignment, tutorial
CO3	Analyze thermodynamic cycles for performance evaluation.	Analyze	End-semester exam
CO4	Design an energy-efficient system considering thermodynamic constraints.	Create	Mini-project / simulation

Example 3: Civil Engineering – Structural Analysis (PSO1, PSO2)

CO	Statement	Bloom Level	Assessment
CO1	Apply principles of mechanics to determine internal forces in structures.	Apply	Problem-solving exercises
CO2	Analyze structural components under various loads using software tools.	Analyze	Lab assignments
CO3	Design simple structural elements adhering to safety codes.	Create	Design project
CO4	Evaluate the efficiency of structures for sustainability and cost.	Evaluate	Case study, project report

Example 4: Electrical & Electronics Engineering – Control Systems (PSO1, PSO2)

CO	Statement	Bloom Level	Assessment
CO1	Explain basic control system concepts and block diagrams.	Understand	Test, quiz
CO2	Apply modeling techniques for electrical and mechanical systems.	Apply	Assignments, lab
CO3	Analyze system response using time and frequency domain methods.	Analyze	Simulation, exam
CO4	Design PID controllers and evaluate performance under different scenarios.	Create/Evaluate	Project, lab experiment



6.4 Best Practices

1. 4–6 COs per course – Align with credit hours.
2. Use measurable verbs – Avoid vague terms like “understand” alone.
3. Map each CO to PSO(s) and POs – Ensure traceability.
4. Include practical/lab/application COs – Encourage hands-on learning.
5. Periodic Review – Adjust COs annually based on:
 - Student performance
 - Industry relevance
 - Emerging technologies



6.5 CO Assessment & Target Setting

- **Assessment Methods:**

Direct (tests, assignments, projects, labs), Indirect (feedback, surveys).

- **CO Attainment Levels:**

- Level 1 (Basic): $\geq 50\%$ students score $\geq 60\%$ marks
- Level 2 (Proficient): $\geq 65\%$ students score $\geq 60\%$ marks
- Level 3 (Advanced): $\geq 80\%$ students score $\geq 60\%$ marks

- **Target Setting:**

- Typically Level 2 is the minimum benchmark for all COs.
- Use rubrics for labs/projects to evaluate higher-order skills (analysis, design, innovation).

7. Development of Technical Content Aligned with COs

In Outcome-Based Education (OBE), Course Outcomes (COs) define what students should achieve by the end of a course.

- Technical content is developed to ensure students can achieve these COs.
- The process is iterative: faculty draft content → BoS reviews → suggestions incorporated → syllabus approved.
- Properly designed content ensures COs are measurable, achievable, and aligned with PSOs and POs.

Key Concept:

CO → Draft Technical Content → BoS Review & Approval → Learning Activities → Assessment → Attainment



7.1 Sources for Technical Content

Faculty should derive technical content from:

1. Course Outcomes (COs)

- CO statements guide what knowledge, skills, and abilities the students must develop.

2. PSO Mapping

- Content should enable students to achieve the corresponding PSO(s).

3. Program Outcomes (POs) / Graduate Attributes

- Ensure content develops problem-solving, innovation, design, teamwork, and ethical practices.

4. Industry Feedback

- Include emerging tools, technologies, and skills relevant for employability.

5. Curriculum & Benchmarking References

- Use textbooks, journals, MOOCs, and global curriculum standards (ABET, AICTE) as references.

7.2 Guidelines for Drafting Syllabus Content

Step 1: Analyze the CO Statement

- Break down the CO into components:
 - Bloom Verb → cognitive level
 - Technical Skill/Knowledge → topic to be learned
 - Condition → tools, environment, or problem context
 - Criteria → measurable benchmark

Step 2: Draft Technical Content

- Identify relevant topics, theory, lab exercises, projects, and case studies that support the CO.
- Include practical applications and real-world examples.

Step 3: Map to PSOs and POs


- Ensure content supports:
 - PSOs addressed by the CO
 - POs / graduate attributes

Step 4: Prepare Draft Syllabus for BoS

- Compile draft content into a detailed syllabus including:
 - Topic-wise content distribution
 - Suggested labs/projects
 - Assessment plan
 - References (books, software tools)

Step 5: BoS Review & Feedback

- Submit draft syllabus to the Board of Studies (BoS).

- 
- BoS members discuss content, suggest improvements, ensure alignment with PSOs/POs, and check relevance.
 - Faculty revise content based on feedback.

Step 6: BoS Approval

- Once BoS members are satisfied with the content, the syllabus is formally approved.
- This approved syllabus becomes the official course content for teaching and assessment.

Step 7: Periodic Review

- Annually update content to incorporate:
 - Student feedback
 - Industry trends and emerging technologies
 - Accreditation requirements
 - Changes in COs, PSOs, or POs

7.3 Example of Technical Content Development

Course: Data Structures

CO2: Analyze algorithms in terms of time and space complexity

Bloom Verb: Analyze

Step 1: CO Components

- Action: Analyze
- Knowledge/Skill: Algorithm performance
- Condition: Given problem statements
- Criteria: Correctly compute time/space complexity for $\geq 70\%$ of cases

Step 2: Draft Technical Content

Computer Science & Engineering – Data Structures

Course: Data Structures

CO2: Analyze algorithms in terms of time and space complexity

Bloom Verb: Analyze

Draft Technical Content Table:

CO Component	Technical Content	Example Activities / Lab	Assessment Method
Knowledge	Algorithm complexity (Big O, Big Ω , Big θ)	Lectures, tutorial problems	Quiz, Assignment
Tools / Condition	Given problem statements	Implement sorting/searching algorithms	Lab exercises
Application	Sorting algorithms (Bubble, Merge, Quick), Searching (Linear, Binary)	Mini-project: Evaluate algorithm performance on datasets	Lab report, coding test
Performance Criteria	Accuracy of computation for $\geq 70\%$ cases	Code correctness and efficiency	Lab/project evaluation
Higher-Order Skills	Algorithm optimization, comparing different approaches	Case studies: Algorithm choice for large datasets	Assignment / group project

Mechanical Engineering – Thermodynamics

Course: Thermodynamics

CO3: Analyze thermodynamic cycles for performance evaluation

Bloom Verb: Analyze

CO Component	Technical Content	Example Activities / Lab	Assessment Method
Knowledge	Carnot, Rankine, Otto, Diesel cycles	Lecture + problem-solving sessions	Quiz, Test
Tools / Condition	Given system parameters	Lab: Simulate cycles in MATLAB / Simulink	Lab report
Application	Efficiency calculation, performance analysis	Mini-project: Optimize cycle efficiency under constraints	Assignment / Project
Performance Criteria	Efficiency calculation within $\pm 5\%$ of standard	Compare experimental vs theoretical results	Lab/project grading
Higher-Order Skills	Recommend improvements for energy efficiency	Case study on real engines	Report evaluation

Civil Engineering – Structural Analysis

Course: Structural Analysis

CO2: Analyze structural components under various loads using software tools

Bloom Verb: Analyze

CO Component	Technical Content	Example Activities / Lab	Assessment Method
Knowledge	Beams, trusses, frames, load calculations	Lecture + tutorials	Quiz / Assignment
Tools / Condition	Given structural design problems	Lab: STAAD Pro / ETABS analysis	Lab exercises
Application	Load distribution, stress/strain calculation	Mini-project: Analyze a building frame	Lab/project report
Performance Criteria	Correct simulation results for $\geq 75\%$ of cases	Compare manual calculations with software	Lab/project grading
Higher-Order Skills	Optimize structure for cost and safety	Case study: Real-life structural evaluation	Report evaluation

Electrical & Electronics Engineering – Control Systems

Course: Control Systems

CO4: Design PID controllers and evaluate performance

Bloom Verb: Design / Evaluate

CO Component	Technical Content	Example Activities / Lab	Assessment Method
Knowledge	PID theory, transfer functions	Lecture + tutorial	Quiz / Assignment
Tools / Condition	Given system specifications	Lab: MATLAB / Simulink simulations	Lab exercises
Application	Design and simulate controllers	Mini-project: Implement PID on real-time system	Lab / Project evaluation
Performance Criteria	Achieve control objectives within $\pm 10\%$ tolerance	Compare simulation and desired output	Lab/project grading
Higher-Order Skills	Optimize control system performance	Case study: Industrial process control	Report / Presentation

Electronics & Communication Engineering – Digital Communications

Course: Digital Communications

CO3: Evaluate performance of digital modulation schemes under noise

Bloom Verb: Evaluate

CO Component	Technical Content	Example Activities / Lab	Assessment Method
Knowledge	ASK, FSK, PSK modulation techniques	Lecture + problem-solving	Quiz / Assignment
Tools / Condition	AWGN and channel noise conditions	Lab: Simulate modulation schemes using MATLAB	Lab exercises
Application	Bit error rate (BER) calculation, SNR analysis	Mini-project: Performance comparison under varying noise	Lab report
Performance Criteria	Correct BER evaluation $\geq 70\%$ cases	Compare theoretical vs simulated BER	Lab/project evaluation
Higher-Order Skills	Recommend optimal modulation scheme	Case study: Wireless communication system	Project report



7.4 Best Practices for Drafting Technical Content

1. **CO-Driven:** Every topic, lab, and project must map to one or more COs.
2. **Traceability:** Ensure alignment with PSOs and POs.
3. **Hands-On & Realistic:** Include labs, mini-projects, and case studies for practical understanding.
4. **Assessment-Ready:** Each content piece should be measurable.
5. **Iterative BoS Review:** Draft content → BoS discussion → revisions → approval.
6. **Continuous Update:** Revise annually based on industry trends, accreditation feedback, and student performance.

8. CO Attainment Target Setting

In Outcome-Based Education (OBE), Course Outcomes (COs) are statements describing what a student should be able to achieve after completing a course.

- CO attainment target is the benchmark set before the semester begins, defining the expected level of student achievement.
- It ensures planning, teaching strategies, and assessments are aligned to achieve program outcomes (POs) and program-specific outcomes (PSOs).
- Fixing CO targets scientifically helps maintain transparency, consistency, and continuous improvement.

8.1 Setting CO Targets

Faculty should consider multiple factors while fixing CO targets:

1. Historical Student Performance

- Review previous batch results for the same course.
- Consider average CO attainment and distribution.
- Example: If last year CO2 was achieved by 65% students, a new faculty may set a similar or slightly higher target.

2. Course Difficulty and Bloom's Level

- Use Bloom's taxonomy to assess cognitive level:
 - Lower-order (Remember/Understand) → Higher attainment target
 - Higher-order (Analyze/Evaluate/Create) → Slightly lower target due to complexity
- Example: CO1 (Understand basic theory) → 75% target, CO3 (Design/Analyze) → 65% target.

3. PSO and PO Alignment

- Identify the importance of each CO in achieving PSOs/POs.
- COs critical for PSO/PO attainment may have higher target thresholds.

4. Assessment Methods

- Consider types of assessment (quiz, lab, project, assignment, end-sem exam).
- Direct assessments are more reliable; indirect assessments (surveys) may require slightly adjusted targets.

5. Student Demographics and Prerequisites

- Consider student background, preparedness, and prior knowledge.

6. Benchmarking

- Use national/global benchmarks (IITs, NITs, ABET, AICTE). Minimum CO attainment target typically: 60–65% students achieving $\geq 60\%$ in assessment.

8.2 Procedure for Fixing CO Targets

Step 1: Review CO and Assessment Plan

- Check each CO's Bloom's level, assessment weightage, and mapping to PSOs/POs.
- Example:
 - CO1: Remember & Understand → Quiz + Assignment (weightage 40%)
 - CO3: Analyze & Evaluate → Lab + Mini-project (weightage 60%)

Step 2: Analyze Historical Data

- Collect past CO attainment reports.
- Identify trends: consistently high or low performance for certain COs.

Step 3: Assign Preliminary Target

- Use a rubric based on Bloom's level and difficulty:

Bloom Level	CO Complexity	Suggested CO Target (% of students meeting ≥60%)
Remember / Understand	Low	70–80%
Apply	Moderate	65–75%
Analyze / Evaluate	High	60–70%
Create / Design	Very High	55–65%

- Adjust based on course weightage, assessment methods, and PSO importance.

Step 4: Validate with Peers or HoD

- Discuss preliminary targets with senior faculty or course coordinators.
- Ensure targets are realistic and consistent across similar courses.

Step 5: Document CO Targets

- Record targets in Course Design & Assessment Plan (CDAP).
- Include rationale for each target (Bloom's level, historical performance, assessment type).

Step 6: Communicate to Students

- Share targets with students in the first lecture or course handbook to set clear expectations.

Step 7: Revisit and Adjust (Optional)

- If mid-semester assessments indicate mismatch (too easy/difficult), minor adjustments can be discussed with HoD or course committee.

Example – Computer Science (Data Structures)

CO	Statement	Bloom Level	Assessment	Historical Avg.	Suggested Target	Rationale
CO1	Implement linear and non-linear data structures	Apply	Lab + Quiz	70%	70%	Moderate difficulty, practical coding
CO2	Analyze algorithms in terms of time & space complexity	Analyze	Assignment + Quiz	65%	65%	High cognitive level, requires critical thinking
CO3	Design efficient algorithms for real-world problems	Create	Mini-project + Lab	60%	60%	High-order skill, open-ended tasks
CO4	Demonstrate teamwork through coding projects	Apply / Collaborate	Project report	75%	70%	Group work, collaborative skill

Interpretation:

- CO1 and CO4 have higher targets because they are of moderate cognitive level and students usually perform well.
- CO2 and CO3 have slightly lower targets due to higher complexity.



8.4 Rubric / Scientific Approach Summary

Step 1: Identify COs and their Bloom's level.

Step 2: Review historical performance and assessment weightage.

Step 3: Assign preliminary target based on Bloom's level and course difficulty.

Step 4: Validate with peers / HoD / senior faculty.

Step 5: Record and document CO targets in CDAP.

Step 6: Communicate to students at the beginning of the course.

Step 7: Monitor and adjust if necessary.



8.5 Notes for Faculty

- Always use an evidence-based approach (historical data, assessment method, Bloom level).
- Targets are benchmarks for planning, not punitive measures.
- Document rationale clearly for audit, accreditation, and continuous improvement.
- Include direct (exam, lab) and indirect (survey, feedback) measures for final CO attainment.

9. Assessment, Attainment, and Continuous Improvement

In Outcome-Based Education (OBE), assessment is the backbone of CO attainment, and continuous improvement ensures the teaching-learning process evolves to meet program outcomes (POs), program-specific outcomes (PSOs), and societal requirements.

- Assessment → CO Attainment → Feedback → Continuous Improvement forms a closed-loop process.
- The goal is to monitor, measure, and improve student learning, ensuring graduates are globally competent and industry-relevant.

9.1 Assessment in OBE

9.1.1 Types of Assessment

A. Direct Assessment – Measures actual student performance.

- Internal assessments: quizzes, assignments, lab exercises, mini-projects.
- End-semester examinations.
- Projects, design exercises, and case studies.

B. Indirect Assessment – Measures student perception of learning.

- Student feedback surveys.
- Peer evaluation.
- Self-assessment and reflective logs.

9.1.2 Mapping Assessment to COs

- Each CO should be measured by one or more assessment tools.
- Weightage of assessment should reflect cognitive level (Bloom's Taxonomy) and PO/PSO relevance.

Example – Data Structures Course:

CO Statement	Assessment Method	Type	Weightage
CO1: Implement linear and non-linear data structures	Lab exercises + Quiz	Direct	30%
CO2: Analyze algorithms	Assignment + Quiz	Direct	20%
CO3: Design efficient algorithms	Mini-project	Direct	30%
CO4: Teamwork in projects	Project report + Peer review	Direct / Indirect	20%

9.2 CO Attainment Calculation

9.2.1 Methodology

Step 1: Set CO Targets (pre-semester)

- Example: CO1 target = 70%, CO2 target = 65%

Step 2: Evaluate Student Performance

- Record scores from internal, lab, and end-sem exams.
- Map each student score to CO performance.

Step 3: Calculate Attainment Level

Direct Attainment Rubric:

Level	Definition	Threshold
Level 1 – Basic	Minimal understanding	≥50% students score ≥60% marks
Level 2 – Proficient	Adequate understanding	≥65% students score ≥60% marks
Level 3 – Advanced	High-level achievement	≥80% students score ≥60% marks

Example – CO Attainment for CO2:

- 40 students took the course.
- 27 students scored ≥60% in CO2 assessment.
- Attainment = $27/40 \times 100 = 67.5\%$ → Level 2 (Proficient)
- Target = 65% → Achieved

Indirect Attainment

- Example: Student survey (1–5 Likert scale) on “Ability to Analyze Algorithms”
- Average rating ≥4 → Good attainment.
- Can supplement direct attainment data.

9.3 Continuous Improvement Process

Step 1: Data Collection

- **Collect data from:**
 - Direct assessments (lab, project, exams)
 - Indirect assessments (feedback, self-assessment)

Step 2: Analysis

- Compare actual attainment with pre-set targets.
- **Identify gaps:**
 - COs below target → analyze reasons (teaching methods, difficulty, resources)
 - COs above target → identify good practices for replication

Step 3: Action Plan

- **For COs below target:**
 - Modify teaching strategies (more interactive lectures, flipped classroom, additional tutorials)
 - Revise technical content or exercises
 - Introduce remedial sessions or online resources
- **For COs achieving target:**
 - Maintain or enhance teaching methods
 - Incorporate advanced topics or additional projects for high-performing students

Step 4: Implementation

- Implement improvements in the next iteration of the course or immediately for current semester if possible.
- Document actions taken in Course File / CDAP.

Step 5: Feedback Loop

- Evaluate effectiveness of corrective actions in subsequent assessment cycles.
- Record outcomes to continuously refine teaching and learning.

Example – Data Structures (CO2 & CO3)

CO	Target	Actual Attainment	Gap Analysis	Improvement Action
CO2: Analyze algorithms	65%	58%	Students struggled with Big O calculations and time/space analysis	Conduct additional tutorial sessions, provide solved examples, peer-learning exercises
CO3: Design algorithms	60%	70%	Achieved beyond target	Encourage higher-order problem-solving, introduce optional mini-projects

Outcome:

- CO2 improved in the next assessment cycle to 68% → target achieved.
- CO3 advanced students engaged in new challenges → better preparedness for PSOs.



9.5 Best Practices for Faculty

1. Document everything: COs, targets, assessment methods, attainment, and improvement actions.
2. Use both direct & indirect measures for a holistic view.
3. Analyze trends over multiple semesters to refine targets.
4. Involve students in feedback and reflection.
5. Collaborate with peers and HoD to ensure alignment with PSOs/POs.
6. Link improvements to PSO/PO mapping – every CO contributes to program-level outcomes.



9.6 Integrated OBE Cycle Summary

1. CO Assessment: Use lab, project, quiz, and exam data.
2. CO Attainment: Compare with pre-set target → Level 1 / 2 / 3.
3. Gap Analysis: Identify reasons for under-attainment.
4. Continuous Improvement: Plan, implement, and monitor corrective actions.
5. Documentation: Maintain records for accreditation and transparency.
6. Repeat Cycle: Refine COs, content, and assessment strategies iteratively.

10. Calculation of PO and PSO Attainment

- PSOs: Program-specific skills/knowledge that students should achieve by the end of the program.
- POs: Broad abilities expected from all graduates, often aligned with NBA / ABET / AICTE outcomes (e.g., engineering knowledge, problem-solving, teamwork, ethics).
- Attainment of PSOs and POs measures how well the program equips students with the expected competencies.
- Linkage: COs → POs & PSOs. Attainment is calculated from CO performance.

10.1 Basis for PO & PSO Attainment

1. CO-PO / CO-PSO Mapping

- Each Course Outcome (CO) is mapped to relevant POs and PSOs.
- Use a correlation weight (1–3) to indicate the strength of contribution:

Weight	Description
3	High contribution
2	Medium contribution
1	Low contribution

2. CO Attainment Data

- Derived from direct assessments (tests, labs, assignments, projects).
- Supplemented by indirect assessments (student surveys, peer feedback).

10.2 PO/PSO Attainment Calculation

Step 1: Calculate CO Attainment

- Example: CO2 in a course → 65% students achieved ≥60% marks → CO Attainment = 65%.

Step 2: Weighted CO Contribution to PSO

Formula:

$$\text{PSO Attainment} = \frac{\sum(\text{CO Attainment} \times \text{CO-PSO Weight})}{\sum \text{CO-PSO Weight}}$$

Example – PSO1 (Programming Skills)

CO	Attainment (%)	CO-PSO Weight	Weighted Attainment
CO1	70	3	210
CO2	65	3	195
CO3	60	1	60
Total	-	7	465

PSO1 Attainment=465/7=66.43%

Interpretation: Target ≥65% → Achieved.

Step 3: Weighted PSO Contribution to PO

Formula:

$$\text{PO Attainment} = \frac{\sum(\text{PSO Attainment} \times \text{PSO-PO Weight})}{\sum \text{PSO-PO Weight}}$$

Example – PO1 (Engineering Knowledge)

PSO	Attainment (%)	PSO-PO Weight	Weighted Attainment
PSO1	66.43	3	199.29
PSO2	70	2	140
PSO3	65	1	65
Total	-	6	404.29

PO1 Attainment= $404.29/6=67.38\%$

Interpretation: Target $\geq 65\%$ → Achieved.

10.3 Attainment Levels / Rubrics

Level	Definition	Attainment Range (%)
Level 1 – Basic	Minimal achievement	50–59
Level 2 – Proficient	Meets expectations	60–74
Level 3 – Advanced	Exceeds expectations	≥75

Notes:

- CO → PSO → PO is a traceable hierarchy.
- Weightings reflect contribution strength, ensuring accurate aggregation.

10.4 Continuous Improvement

1. Gap Analysis

- PSOs or POs below target → identify under-performing COs.
- Determine causes: difficulty, assessment misalignment, content gaps.

2. Action Plan

- Revise teaching methods, assignments, and labs.
- Introduce remedial sessions or additional resources.
- Modify COs if necessary for better alignment.

3. Documentation

- Maintain records in Program Review Reports for accreditation (NBA, ABET).

4. Feedback Loop

- Implement corrective actions in the next iteration of the course.
- Track improvements across semesters.

Integrated Example – Computer Science Program

CO	CO Attainment (%)	Mapped PSO	Weight	Weighted Attainment
CO1	70	PSO1	3	210
CO2	65	PSO1	3	195
CO3	60	PSO2	3	180
CO4	75	PSO3	2	150
PSO1	66.43%			
PSO2	60%			
PSO3	70%			
PO1 (mapped from PSOs)	67.38%			

Observation:

- PSO1, PSO2, PSO3 → targets achieved or slightly below → corrective actions planned for next semester.

PO1 → target achieved → maintain good practices



10.6 Notes for Faculty

- Always maintain a CO → PSO → PO mapping table.
- Document weightages, attainment, and rationale for transparency.
- Use direct assessments primarily; indirect assessments can complement.

Periodic review ensures alignment with program objectives and accreditation standards

11.Examples of PEOs, PSOs, and COs Across Programs

Mechanical Engineering

- PEO1: Graduates will establish careers in design and manufacturing industries.
- PSO1: Apply CAD/CAM tools for product design and development.
- **Course: CAD & Manufacturing**
- COs:
 - CO1: Use CAD software to create 3D mechanical models.
 - CO2: Analyze stress/strain in machine elements using FEA tools.
 - CO3: Design a product prototype integrating sustainability principles.

Civil Engineering

- PEO2: Graduates will contribute to infrastructure development with sustainable practices.
- PSO2: Design and evaluate structures considering safety and sustainability.
- **Course: Structural Analysis**
- COs:
 - CO1: Analyze beams and frames using classical methods.
 - CO2: Model and simulate structures using STAAD/ANSYS.
 - CO3: Evaluate sustainability of materials for rural infrastructure projects.

Electrical & Electronics Engineering (EEE)

- PEO3: Graduates will apply electrical engineering knowledge to societal energy needs.
- PSO1: Analyze and design efficient power systems.
- **Course: Power Systems**
- COs:

- CO1: Apply load flow analysis to model power distribution.
- CO2: Simulate fault analysis and suggest protection schemes.
- CO3: Evaluate renewable energy integration in smart grids.

Electronics & Communication Engineering (ECE)

- PEO1: Graduates will succeed in the communication and embedded systems industries.
- PSO1: Design communication systems for industrial and societal applications.
- **Course: Digital Communication**
- COs:
 - CO1: Apply modulation techniques to transmit signals.
 - CO2: Analyze noise impact on system performance.
 - CO3: Design IoT-based communication prototypes for healthcare.

Information Technology (IT)

- PEO2: Graduates will pursue careers in IT services and data analytics.
- PSO2: Develop data-driven solutions using modern IT tools.
- **Course: Database Systems**
- COs:
 - CO1: Design normalized relational databases.
 - CO2: Implement SQL queries for real-time applications.
 - CO3: Develop a mini-project linking database solutions to e-governance.

Management

- PEO2: Graduates will become effective managers and entrepreneurs.
- PSO2: Apply management principles for business sustainability.



- **Course: Financial Management**

- COs:

- CO1: Analyze financial statements to assess business performance.
- CO2: Evaluate investment decisions using capital budgeting techniques.
- CO3: Develop business strategies integrating sustainability and ethics.



11.1. Continuous Improvement Cycle

- CO Attainment Analysis → Gap Identification → Corrective Actions → Feedback → Revised Targets.
- Example: If CO3 of Data Structures (design efficient algorithms) fails target → introduce coding hackathons, case-based problems, or industry mentorship → reassess next cycle.

12. Roles & Responsibilities



12.1. Faculty Members / Course Coordinators

- Frame Course Outcomes (COs) aligned with Bloom's Taxonomy.
- Map COs with Program Outcomes (POs) and Program Specific Outcomes (PSOs).
- Prepare Course Design and Assessment Plan (CDAP) with attainment targets.
- Conduct assessments (tests, labs, projects) and analyze attainment.
- Document CO attainment, gap analysis, and action taken.



12.2 Head of Department (HoD)

- Ensure department-level CO–PO–PSO mapping is maintained.
- Consolidate attainment reports across all courses.
- Facilitate Department Advisory Board (DAB) and Board of Studies (BoS) meetings for approval/revision of PEOs, PSOs, and COs.
- Review and approve CDAPs and attainment targets before semester begins.
- Initiate corrective actions such as remedial classes, industry exposure, curriculum enrichment.



12.3 Controller of Examinations (CoE)

- Align examination and evaluation processes with OBE principles.
- Ensure question papers reflect COs and Bloom's Taxonomy levels.
- Maintain transparency and fairness in internal and end-semester examinations.
- Provide CO-wise and course-wise performance data to faculty for attainment calculation.
- Assist departments with result analysis, moderation, and CO/PO/PSO mapping validation.
- Store and safeguard all exam-related documentation as evidence for audits and accreditation.



12.4 Institutional Quality Assurance Cell (IQAC)

- Frame institutional OBE policies, templates, and guidelines.
- Conduct periodic training and orientation for faculty.
- Audit course files, attainment records, and continuous improvement documentation.
- Consolidate attainment reports submitted by departments.
- Monitor alignment with accreditation frameworks (NBA, NAAC, ABET).



12.5 Students

- Actively participate in academic and co-curricular activities mapped to COs.
- Provide genuine feedback in exit surveys, course surveys, and alumni surveys.
- Take part in class committee meetings for continuous improvement.
- Uphold academic honesty and integrity in assessments.



12.6 Principal

- Provide overall leadership and policy direction for OBE implementation.
- Approve institutional attainment benchmarks recommended by IQAC/Academic Council.
- Ensure resources (labs, faculty development, industry linkages) for effective OBE execution.
- Monitor consolidated PEO, PO, and PSO attainment at the institutional level.
- Ensure compliance with NBA, NAAC, and accreditation standards.

12.7 Governance & Review Cycle

- **Course Outcomes (COs):**
 - Reviewed every semester by faculty/course committee.
 - Verified by HoD and CoE during result analysis.
 - Continuous improvement actions implemented in the next cycle.
- **Program Specific Outcomes (PSOs):**
 - Reviewed annually by HoD and DAB.
 - Based on consolidated CO attainment, exit survey, projects, internships.
 - Adjustments approved in BoS.
- **Program Educational Objectives (PEOs):**
 - Reviewed once in 3–4 years.
 - Evaluated via alumni surveys, employer surveys, placement/higher education statistics.
 - Revised if Vision/Mission or external requirements change.
- **Governance Structure:**
 - Faculty & Course Committee → CO formulation, attainment, gap analysis.
 - HoD & DAB → Review PSO attainment annually.
 - Controller of Examinations (CoE) → Align exams with COs, provide attainment data.
 - Board of Studies (BoS) → Approve changes in COs, PSOs, curriculum.
 - Academic Council → Final approval of policies, benchmarks, and major changes.
 - Principal → Leadership, monitoring, resource allocation.
 - IQAC → Audits, training, and accreditation compliance.



12.8 Documentation & Audit

1. Course-Level (Faculty)

- CO statements with Bloom's Taxonomy levels.
- CO–PO–PSO mapping matrix.
- Course Design and Assessment Plan (CDAP).
- Question papers, rubrics, assignments, project guidelines.
- Attainment analysis with action taken report.

2. Department-Level (HoD)

- Consolidated CO/PO/PSO attainment reports.
- Minutes of DAB and BoS meetings.
- PEO development documents with stakeholder feedback.
- Department Continuous Improvement Reports.

3. Examination-Level (CoE)

- Question paper blueprints (CO mapping, Bloom's level).
- End-semester result analysis (course-wise CO attainment).
- Moderation and verification reports.
- Records of assessments maintained for accreditation audits.

4. Institution-Level (Principal & IQAC)

- OBE Policy Manual.
- Consolidated PEO/PO/PSO attainment across departments.
- Accreditation compliance reports (NBA, NAAC, ABET).
- Audit reports and action taken at institutional level.



5. Audit Mechanism

- Internal Audit (IQAC): Every semester (course files, attainment verification).
- Departmental Audit (HoD + CoE): After each exam cycle (result analysis, CO attainment validation).
- Principal Review: Semester-wise review of consolidated attainment.
- External Audit (AAA): Annual external audit for academic & administrative quality.
- Accreditation Audit: NBA/NAAC as per cycle (2–5 years).



13. Annexures

Annexure 1: CO–PO–PSO Mapping Matrix Template

Course Code & Title	Course Outcomes (COs)	Program Outcomes (POs)	Program Specific Outcomes (PSOs)	Correlation Level*
CSE2101 – Data Structures	CO1: Implement linear and non-linear data structures to solve problems.	PO1, PO2	PSO1	3 (High)
	CO2: Analyze algorithm efficiency in terms of time and space complexity.	PO2, PO3	PSO1, PSO2	2 (Medium)
	CO3: Design efficient algorithms for real-world applications.	PO3, PO4	PSO2	3 (High)
	CO4: Demonstrate team work through coding projects.	PO9, PO10	PSO3	1 (Low)

Legend:

- 3 = High correlation
- 2 = Medium correlation
- 1 = Low correlation

This matrix ensures traceability of CO → PSO → PO and is mandatory for NBA documentation.

Annexure 2: Attainment Calculation Sheet Template

Step 1: CO Attainment (Direct + Indirect)

CO	Direct Attainment (%)	Indirect Attainment (%)	Weighted Average (80% Direct + 20% Indirect)	Target (%)	Attainment Level
CO1	72%	70%	71.6%	70%	Achieved (Level 2)
CO2	65%	68%	65.6%	65%	Achieved (Level 2)
CO3	58%	60%	58.4%	60%	Not Achieved (Level 1)
CO4	75%	72%	74.2%	70%	Achieved (Level 3)

Step 2: PSO Attainment (Weighted CO → PSO)

PSO	COs Mapped	Weighted Attainment	Target (%)	Status
PSO1	CO1, CO2	68.5%	65%	Achieved
PSO2	CO3	58.4%	65%	Not Achieved
PSO3	CO4	74.2%	65%	Achieved

Step 3: PO Attainment (Weighted PSO → PO)

PO	PSOs Mapped	Weighted Attainment	Target (%)	Status
PO1	PSO1, PSO2	66%	65%	Achieved
PO2	PSO3	74%	65%	Achieved

Annexure 3: Continuous Improvement Action Plan Format

Parameter	Target (%)	Actual Attainment (%)	Gap	Reason for Gap	Action Plan	Responsible Person	Timeline
CO2 – Data Structures	65%	58%	-7%	Students struggled with complexity analysis	Additional tutorials, peer learning sessions, coding practice	Course Faculty	Next Semester
PSO2 – Civil Structures	70%	60%	-10%	Limited lab exposure	Introduce STAAD Pro workshops, add mini-projects	HoD& Faculty	

This template documents corrective action → implementation → follow-up, which is essential for accreditation.

Annexure 4: Rubrics for Assessment

Example 1: Mini-Project Rubric

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Problem Understanding	Clearly defines problem and objectives	Defines problem with minor gaps	Problem definition vague	No clear problem definition
Technical Implementation	Innovative and correct solution	Correct but lacks innovation	Partial solution with errors	Incorrect/irrelevant solution
Teamwork & Collaboration	Highly collaborative and effective team effort	Mostly collaborative	Uneven participation	Poor collaboration
Documentation & Presentation	Well-structured, professional	Clear but with minor issues	Incomplete documentation	Poor/no documentation

Example 2: Lab Experiment Rubric

Criteria	Excellent (4)	Good (3)	Average (2)	Poor (1)
Procedure	Follows procedure flawlessly	Minor deviations	Frequent errors	Incorrect procedure
Results	Accurate and complete	Minor errors in results	Partial/incorrect results	No results obtained
Analysis	Insightful and correct	Correct but basic	Limited analysis	No analysis

Rubrics provide standardized and transparent evaluation across all faculty members

Summary of Annexures

1. CO–PO–PSO Mapping Template → Ensures traceability.
2. Attainment Calculation Sheets → Provides quantitative evidence.
3. Sample PEOs, PSOs, COs → Acts as a benchmark for all programs.
4. Continuous Improvement Action Plan Format → Documents corrective action.
5. Rubrics for Assessment → Standardizes evaluation.