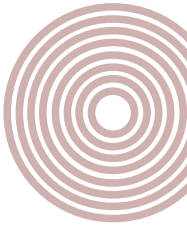




**IARE**  
INSTITUTE OF  
AERONAUTICAL ENGINEERING



# Curriculum Design, Development and Enrichment



## Preface

The curriculum development process at the Institute of Aeronautical Engineering is a comprehensive, multi-stage effort that follows a 360-degree approach. It starts with reviewing the curriculum to evaluate its relevance in the emerging technologies and changing the dynamics of industry context, its effectiveness in meeting program objectives, and its alignment with industry standards, and prepares students for both career opportunities and further studies. This evaluation helps identify gaps, areas needing enhancement, ensuring the curriculum remains current and robust. The curriculum is prepared and refined in a structured manner, ensuring high professional quality and a learner-focused approach. It is designed to achieve three main objectives: Employment, Higher Education, and Entrepreneurship, with the following major steps which guide the process.

### The curriculum is designed to address mainly the following

- ❖ To solve industry challenges in emerging engineering fields
- ❖ To imbibe research knowledge as a part of curriculum
- ❖ To encourage Industry Internship
- ❖ To ensure lifelong learning
- ❖ To enhance higher employability rate
- ❖ To imbibe knowledge to address Global sustainable development goals (SDG)

### Curriculum Design And Development Process

The institute collaborates closely with stakeholders, including faculty, industry experts, alumni, and students, to ensure the curriculum remains relevant, practical, and forward-looking. Their feedback is formally recorded and analyzed to incorporate diverse perspectives into the curriculum.

It is designed to align with current industry trends, technological advancements, and the specific requirements of engineering fields. Industry professionals are invited to participate in curriculum planning sessions and contribute insights that ensure graduates are equipped with current essential technical knowledge and professional skills.

The curriculum development process incorporates Outcome-Based Education principles, focusing on well-defined learning outcomes, skill acquisition, and measurable competencies to prepare graduates for real-world challenges in engineering.

Curricula is periodically reviewed and approved by academic bodies like Academic council, department Board of Studies to maintain relevance and quality.

The process for designing program curriculum is shown in the following Figure 1.

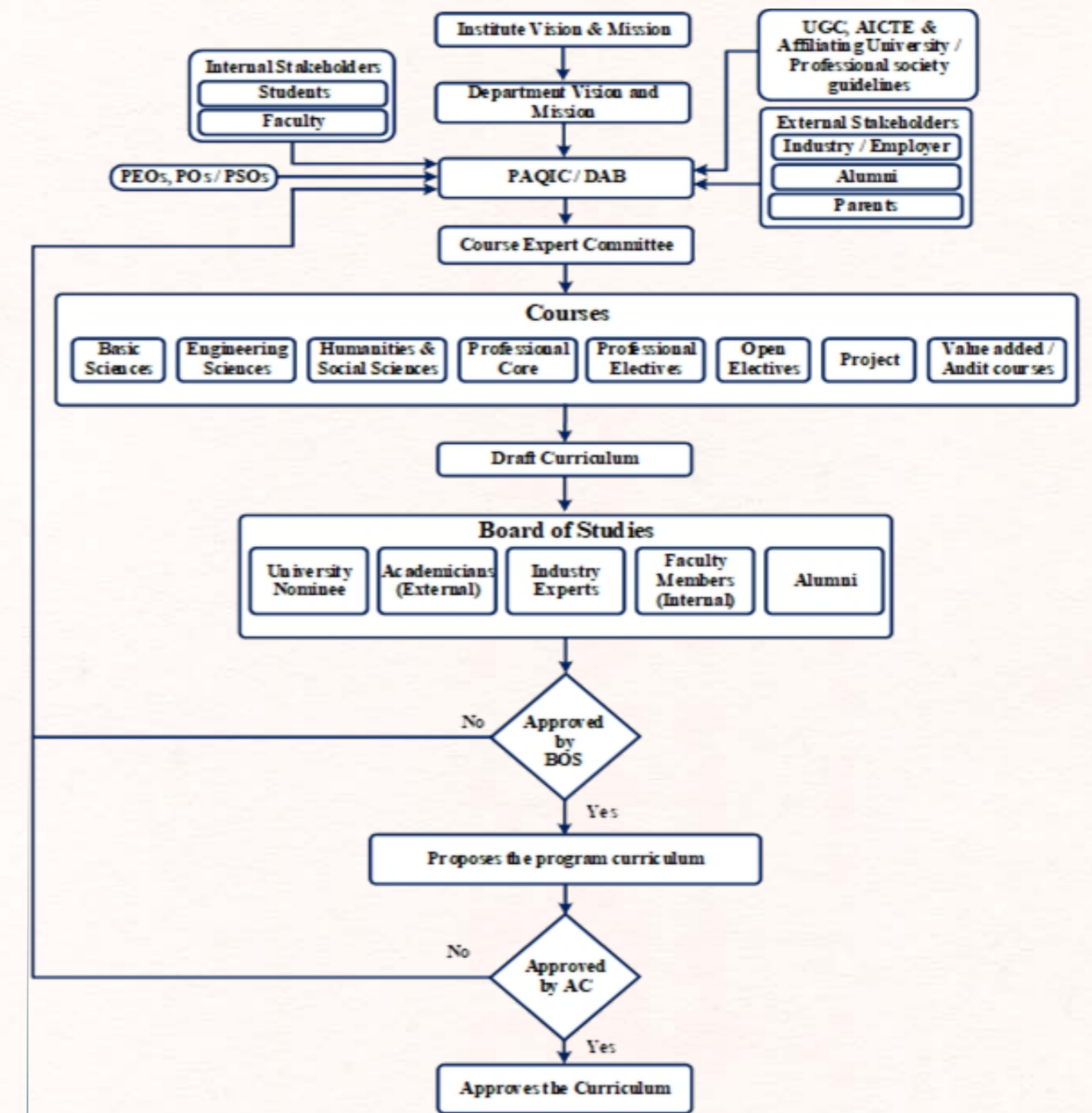


Figure 1. The process for designing the program curriculum

Statutory bodies such as Academic Council and Board of Studies (BOS) are constituted with the guidance of the Governing Body of the institute and guidelines and regulations recommendations of the affiliating university the regulations are framed, course structure and syllabi prepared under autonomous status. The autonomous regulations, course catalogue and syllabi have been prepared after prolonged and detailed interaction with experts solicited from academics, industry and research institutions, in accordance with the vision and mission of the institute and departments in order to produce a quality of graduates / post graduates to the society.

**Step 1:** Based on AICTE / UGC / University / professional bodies, Industry requirements and emerging trends in the domain, Institute Curriculum Committee (ICC) suggests the course structure.

**Step 2:** Departmental Advisory Board (DAB) is responsible to take the inputs from professional bodies, previous compliance reports of the curriculum, department vision, mission, Program Educational Objectives (PEOs), Program Outcomes (POs), Program Specific Outcomes (PSOs), Course Outcomes (COs) and CO - PO / PSO attainment, faculty feedback and consolidated feedback of the stakeholders. The curriculum is revised once in two years in consultation with Board of Studies and Academic Council.

**Step 3:** At department level, the Course Expert Committee (CEC) prepares the course syllabi by incorporating the courses for core, open electives, professional electives, seminars, laboratories and specializations by taking the suggestions given by Departmental Advisory Board (DAB).

**Step 4:** The Departmental Advisory Board (DAB) has been established with the objective of staying up to date with the latest industry requirements and incorporating necessary components into the curriculum wherever possible.

**Step 5:** The draft copy of the curriculum is submitted to Board of Studies (BOS) for their perusal, and necessary instructions and suggestions.

**Step 6:** After final review and ratification by Academic council and BOS, the catalogue and program curriculum will be published in website.

## The curriculum is designed to address mainly the following

- 1. Foundational Knowledge:** Providing a strong base in essential theories, principles, and concepts relevant to the field of study.
- 2. Skill Development:** Emphasizing practical skills that prepare students for professional roles, such as critical thinking, problem-solving, communication, and teamwork.
- 3. Experience learning / Research:** Encouraging students to engage in research, project-based learning, research-based learning or field projects / field practicum / internship to deep understanding and apply knowledge in real-world contexts.
- 4. Career Readiness:** Equipping students with the competencies needed for employment, including technical skills, soft skills, and industry-specific expertise.
- 5. Ethics and Professionalism:** Fostering an understanding of ethical practices and professional behavior expected in the workplace.
- 6. Sustainable Development Goals (SDGs):** It can be aligned by incorporating curriculum elements that emphasize sustainable solutions, ethical innovation, and cross-disciplinary approaches to address global challenges

## The outcomes of curriculum design include

- 1. Program Objectives and Outcomes:** A clear outline of the program's goals and expected learning outcomes should emphasize the acquisition of both students' knowledge and skills.
- 2. Course Structure and Content:** Detailed descriptions of each course, including topics covered, course duration, prerequisites, and sequencing.
- 3. Learning Activities and Teaching Methods:** An overview of instructional strategies, such as lectures, discussions, labs, field projects, and research-based learning activities.
- 4. Assessment Methods:** Information on how students' knowledge and skills will be evaluated, including exams, assignments, projects, presentations, and practical assessments.
- 5. Skills and Competencies Developed:** A summary of the core skills and competencies students are expected to acquire upon completion, such as critical thinking, problem-solving, and technical skills.
- 6. Resource Requirements:** A list of necessary resources, including faculty, facilities, equipment, technology, and learning materials.
- 7. Alignment with Standards and Accreditation:** An explanation of how the curriculum aligns with industry standards, accreditation requirements, and any relevant regulatory guidelines.
- 8. Feedback and Continuous Improvement Plan:** A process for gathering feedback from students, faculty, and industry partners to continuously refine and enhance the curriculum
- 9. Career and Professional Relevance:** An outline of how the curriculum prepares students for specific career paths or further academic study.
- 10. Global and Cultural Competencies:** Sections that highlight how the curriculum fosters cultural awareness and prepares students for a global work environment.

## Curriculum Sailable Features

- ❖ The curriculum is intended to provide both breadth and depth and specific program criterion. The curriculum is developed by considering the program educational objectives, program outcomes and program specific outcomes.
- ❖ A 100% implementation of the Choice Based Credit System (CBCS) and elective course system across all programs ensures students can customize their learning paths.
- ❖ The curriculum is designed with a focus on Sustainable Development Goals (SDGs), integrating courses and projects that emphasize sustainability, environmentally friendly and social responsibility, preparing students to contribute meaningfully to global challenges.
- ❖ Each course includes one or more components: Theory, Practical, field study, to provide a comprehensive learning experience.
- ❖ To align with industry trends, more skill-based courses are introduced across each program and offered in every semester. These courses focus on practical, job-relevant skills and are updated annually to remain aligned with evolving industry needs.
- ❖ MOOCs, field projects / field practicum, internships, and are integrated into each program, giving students opportunities for hands-on learning experience.
- ❖ The curriculum is aligned with digital platforms, like enabling students to expand their learning beyond traditional curriculum.
- ❖ More than 95% of the courses are designed to enhance employability, entrepreneurship, research and industry-ready skills.
- ❖ A wide range of value-added courses, including yoga and meditation, are offered to support the overall well-being and development of students.
- ❖ The institution is aligning educational outcomes with broader societal goals.

## Design Of Syllabus, Course Plan And Curriculum Appropriation

Each course catalogue in the curriculum of a program, is assigned to department BoS to develop syllabus based on the feedback received from stakeholders with course objectives and course outcome course outline, practice/project component, text and reference books, online resources and evaluation criteria. The syllabus is presented in BoS for discussion and its approval respectively. After due approval the course is assigned to faculty to develop session wise course plan and course materials, which is uploaded in institute website for the access of students.

During course delivery students will be given an opportunity to provide feedback on each course registered by login through Student Management Portal (SMS) in a prescribed format. These reports are accessed and analyzed by academic committee and then it is shared with concerned faculty with specific remarks/suggestions for improvement in pedagogy etc.

Efforts are made by the departments to ensure the quality of the curriculum design comparing the courses with premier institutions to ensure high level of standard which is essential for the digital age and using technology to enhance changing requirements of the corporate, business enterprises and society.

The quality of the curriculum is maintained by introducing skill enhancement courses that focus on employability skills, aiming to enhance students' communication and leadership skills.

The curriculum is designed not only to develop skilled professionals but also to foster entrepreneurship. An entrepreneurial mindset is cultivated by encouraging innovative thinking and promoting new ideas through courses such as Entrepreneurship Development.

In addition to building a solid foundation in technical and functional disciplines, the curriculum focuses on developing essential leadership skills. Leadership development is further encouraged through participation in various activities, organizing technical and management fests, and involvement in leadership initiatives under different student associations.

## Involvement Of Stakeholders In Curriculum Design

The publication and dissemination of curriculum design serve three essential purposes.

- ❖ Communicate the purpose of the Program / Department to stakeholders.
- ❖ Inform strategy development using the feedback from the stakeholders.
- ❖ Develop the measurable goals and objectives by which to gauge the success of the program.

These interdependent, cascading roles, and the relationships among them, are summarized in Figure 2.

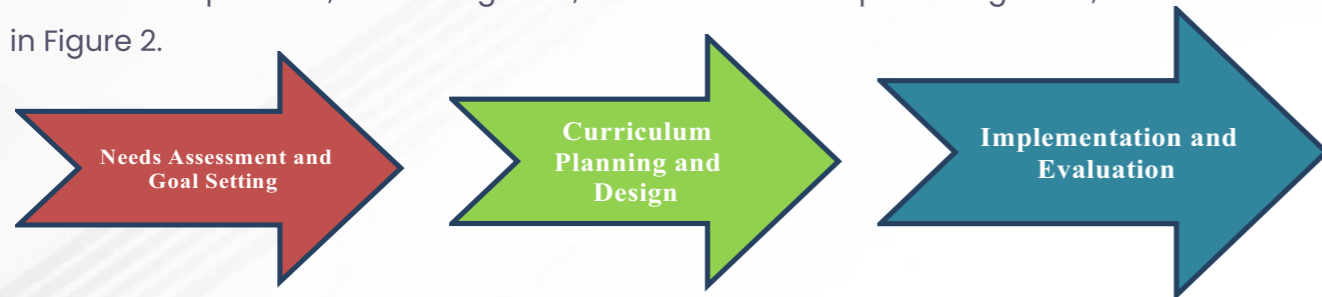


Figure 2. Cascading roles of the curriculum design

The stakeholders play an important role in the advancement of curriculum framework.

### Involvement of Stakeholders

1. Students : Feedback on curriculum by questionnaire, classroom feedback,
2. Faculty : Curriculum committees, course content review, industry alignment.
3. Parents : Feedback during parent-teacher meetings on curriculum
4. Alumni : Input via alumni meeting, and online platforms for real-world insights
5. Industry / Employer : Advisory boards, surveys, and consultations for industry relevance.
6. Affiliating University : Updates via email and website, ensuring guideline compliance
7. AICTE / NBA : Model Curriculum and accreditation alignment with national standards

### Process of Dissemination Among Stakeholders

#### The process of curriculum dissemination among stakeholders as described as follows

- ❖ The curriculum framework and objectives are explicitly communicated to newly admitted students and their parents during orientation.
- ❖ Detailed discussions on curriculum structure, objectives, and program outcomes will take place during student induction programs.
- ❖ Updates on curriculum revisions are shared with alumni during alumni meeting.
- ❖ Industry and employers are informed about curriculum developments through presentations during industrial visits and industry-institute interactions.
- ❖ The syllabus is published on the institute's website for easy access, and academic regulation booklets of each department are provided to students at the beginning of the semester.

### The role and how the process is related to stakeholders are as below: Students

- ❖ Play a key role in shaping the curriculum through feedback.
- ❖ Students input is crucial for introducing new elective courses and emerging areas of study.
- ❖ Student feedback helps improve teaching and learning methodologies.

### Faculty

- ❖ Vital in curriculum development and execution.
- ❖ Participate in committees to review the program's alignment with goals.
- ❖ Provide inputs on course design, outcomes, and assessments to ensure relevance and quality.

### Alumni

- ❖ Serve as a benchmark for the program's long-term success.
- ❖ Alumni feedback contributes to curriculum updates to reflect industry and professional trends
- ❖ Offer guidance grounded in their own experiences to support the career development of students.

### Employer

- ❖ Offer valuable insights to align the curriculum with industry needs and close gaps between academia and industry.
- ❖ Provide guidance on skills and knowledge which is critical for employability.

### Parent

- ❖ Expect the curriculum to prepare students for successful careers and higher education.
- ❖ Play a role in curriculum validation by offering feedback during parent meetings.

The dissemination of curriculum updates to various stakeholders, such as faculty members, the Board of Studies (BOS), Program Assessment and Quality Improvement Committee (PAQAC), and Department Advisory Board (DAB), occurs during regular meetings for reviewing and improving the program's design and implementation.

## Curriculum appropriation

A culturally responsive curriculum acknowledges and values diverse student backgrounds, enhancing inclusivity and engagement across the learning process. Key elements include :

- ❖ **Choice-Based Learning:** The curriculum's flexibility through choice-based credits empowers students to personalize their learning journey, allowing them to select courses that resonate with their cultural identities and interests.
- ❖ **Project-Based Learning (PBL):** Real-world, project-based assignments enable students to connect academic knowledge with practical applications, encouraging them to explore and celebrate their own and others' cultural heritage within an academic framework.
- ❖ **Research-Based Learning (RBL):** is an educational approach that integrates research activities into the learning process, encouraging students to actively engage in research to deepen their understanding of a subject. In RBL, students learn by participating in the process of inquiry, where they investigate questions, solve problems, or explore topics through data collection, analysis, and critical evaluation.
- ❖ **Complex Engineering Problems:** A professionally or occupationally competent person has the attributes necessary to perform the activities within the profession or occupation to the standards expected in independent employment or practice. The engineering competence (EC) profiles - complex engineering problems (CP) and complex engineering activities (CA) record the elements of competence necessary for performance that the professional is expected to be able to demonstrate in a holistic way the stage of attaining registration. Complex Engineering Problems have characteristic WK1 and some or all of WK2 to WK9. Also, there are a Range of Complex Engineering Activities (CA) involved in when solving complex engineering problems.
- ❖ **Term Work:** Term work typically encompasses a variety of components designed to assess students' understanding, skills, and engagement throughout a course.
- ❖ **Self-learning:** Self-learning components in a curriculum are designed to encourage students to take initiative in their education, utilizing various resources and platforms.
- ❖ **Field Project:** A Field Project is a hands-on, practical learning experience where students apply their knowledge and skills in a real-world environment outside the traditional classroom. These projects involve students working on specific tasks, research, or problem-solving activities within actual organizations, communities, or industries related to their field of study.
- ❖ **Industry Internships:** Offering internships with industries and national research labs provides students with hands-on experience, preparing them to navigate a diverse professional environment. Internships also offer insights into industry practices across cultural contexts.

## Fostering Critical Thinking and Cultural Competence

A curriculum focused on diversity promotes critical engagement and empathy, equipping students with skills for a multicultural world. This is achieved by:

- ❖ **Skill-Based and Value-Added Courses:** Courses designed to develop cultural competence and critical thinking, empowers students to challenge assumptions and analyze complex societal issues from multiple viewpoints.
- ❖ **Inclusive Course Content:** Elective and core courses integrate diverse perspectives, allowing students to experience and analyze varied cultural narratives, fostering empathy and understanding.
- ❖ **Integration of Digital Platforms:** Digital resources provide access to global perspectives, supporting students as they engage with content beyond their immediate environment, further developing cultural awareness.

### Promoting Equity and Empowerment

A responsive curriculum plays a critical role in addressing bias and promoting equity.

This aspect is highlighted through:

- ❖ **Accurate Representation:** Courses include diverse resources that depict various cultural histories and experiences, mitigating stereotypes and promoting balanced perspectives.
- ❖ **Socially Conscious Learning Objectives:** By addressing historical and current societal issues, the curriculum empowers students to recognize systemic inequities, encouraging them to contribute to a more inclusive society.
- ❖ **Sustainable Development Goals (SDGs) Alignment:** Many projects and assignments are designed with a focus on sustainable development, promoting students' awareness of global issues and encouraging environmentally and socially responsible thinking.

### Enhancing Employability and Global Citizenship

By integrating cultural competence and real-world skills, the curriculum prepares students for successful careers and responsible global citizenship:

- ❖ **Professional and Personal Growth:** Elective and skill-based courses contribute to the holistic development of students, supporting employability, entrepreneurship, and cultural competence.
- ❖ **Global Competency and Citizenship:** Internships, field projects, and MOOC integration equip students with global awareness and cross-cultural communication skills, preparing them to thrive in a multicultural society.

## Feedback Analysis

The periodic feedback received from various stakeholders are analyzed, discussed and specific action plans are developed for continuous improvement in the curriculum, pedagogy and meeting learning outcome of each course/program as a whole in line with future goal of students to achieve three specific objectives: Employment, Higher Education and Entrepreneurship

## Curriculum Planning

Curriculum planning is a strategic process that involves designing and organizing an educational framework to guide teaching and learning effectively. It is a collaborative effort often undertaken by educators, administrators, and curriculum specialists to ensure that educational programs align with institutional goals, societal needs, and student development objectives.

Curriculum planning involves effective delivery by providing competence, values, good citizenry skills making students to develop holistically and capable of leading happy and purposeful life to cater the national goals in tune with vision and mission of the institute.

The IQAC conduct meetings on curriculum planning and delivery in the beginning of every academic year. Curriculum committee along with Principal and Head of the Departments (HOD) conduct meetings to develop strategies for implementation of the curriculum. Each department head conducts departmental meeting before the commencement of class works and prepares their departmental activity calendar and conduct all the activities like seminars, faculty development programs, industrial visits, guest lectures and workshops according to the academic calendar /schedule.

Institute follows well defined systematic guide lines / rules for allotment of courses to faculty. Academic committee and HOD will conduct meeting and allocate the courses based on various parameters like experience, area of specialization, number of times the course was taught and previous result analysis of the course. Faculty provides the feedback on curriculum for the further improvements Through SED / FAA.

### Importance of Curriculum Planning:

- ❖ **Provides Direction:** Establishes a clear roadmap for faculty and students.
- ❖ **Enhances Learning:** Ensures coherent progression of knowledge and skills.
- ❖ **Promotes Efficiency:** Avoids redundancy and ensures optimal use of time and resources.
- ❖ **Supports Accountability:** Aligns with institutional and national educational standards.
- ❖ **Fosters Adaptability:** Prepares learners for evolving challenges in society and the workplace.

## Design a Curriculum for Diverse Programs

To effectively support diverse learners, our curriculum design incorporates cultural competence and inclusivity as core principles. Here are the key approaches we follow to promote diversity and meet the needs of students from varied backgrounds.

### Showing Cultural Competence

We prioritize cultural competence throughout our curriculum design to successfully navigate diverse learning settings. Our efforts include:

- ❖ **Avoiding Stereotyping:** We carefully refrain from making assumptions about students based on their cultural backgrounds and ensure every learner is approached with respect and openness.
- ❖ **Pursuing Professional Development:** We continuously seek training in cultural competence to deepen our understanding of diverse cultures, beliefs, and viewpoints.
- ❖ **Creating Inclusive Learning Environments:** Our courses are designed to incorporate diverse voices and perspectives within instructional materials and discussions.
- ❖ **Promotion of Respect and Empathy:** We encourage students to appreciate cultural differences, cultivating a respectful and empathetic classroom culture.

### Incorporating Diversity in Lesson Plans

Curriculum integrates diversity intentionally, reflecting varied perspectives, experiences, and identities across all subject areas. We implement this by:

- ❖ **Selecting Inclusive Resources:** We carefully choose texts, case studies, and materials that reflect the cultural diversity of our student body and society at large.
- ❖ **Encouraging Diverse Discussions:** Multiple viewpoints are included in classroom discussions, assignments, and activities to affirm students' backgrounds and identities.
- ❖ **Celebrating Cultural Identities:** Our curriculum nurtures exploration and celebration of students' cultural identities while promoting curiosity and appreciation for the diversity around them.

By incorporating diversity into every course, we create inclusive learning experiences where all students feel acknowledged, valued, and empowered.

## Committing to Professional Growth

Continuous improvement is essential in our approach to educating diverse classrooms. To ensure we meet our goals:

- ❖ **Reflecting on Practices:** We regularly assess and refine our teaching methods to maximize their positive impact on students.
- ❖ **Seeking Constructive Feedback:** Through active engagement with colleagues, mentors, and students, we gather insights to identify areas for improvement.
- ❖ **Investing in Development:** We participate in professional development focused on cultural competence, equity, and inclusion to enhance our educational practices.
- ❖ **Collaborating with Peers:** Sharing best practices and resources with our peers helps us build a supportive, diversity-centered educational community.

Through our commitment to professional growth, we continually adapt and strengthen our curriculum to support diverse needs and create enriching, inclusive learning environments.

By following these principles, curriculum design actively promotes a culture of inclusivity, empowering every student and paving the way for a diverse, respectful, and engaging educational experience.

## Overall Quality And Level Of Program Curriculum

The categories of criteria for judging the quality of curriculum in four main categories, as illustrated in the following Figure 3.

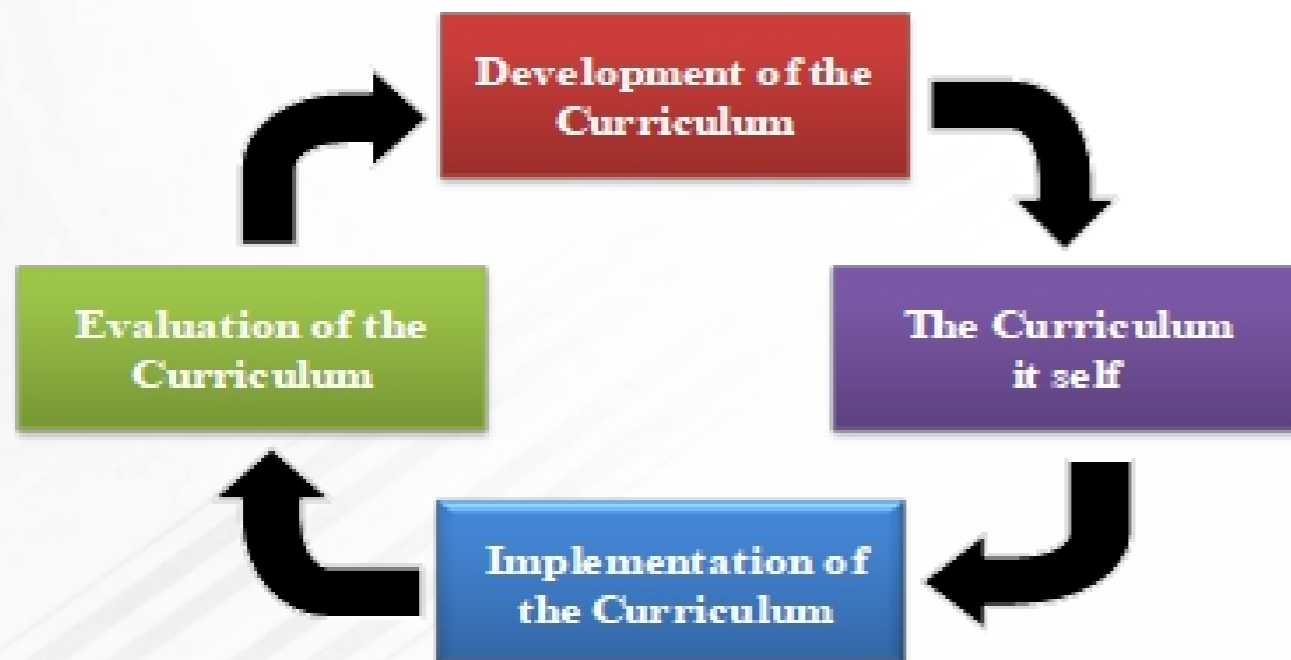


Figure 3 - Categories of criteria for judging curriculum quality

The criteria to be considered within these four categories are summarized below:

**Table 1 - Summary of criteria in categories**

Category	Description
Development of the Curriculum	• Planned and systematic
	• Inclusive and consultative
	• Led by curriculum professionals
	• Cyclical in nature
	• Sustainable
The Curriculum Itself	• Holds values equally to each student
	• Comprises high quality, relevant and appropriate 'content' and contributes to the development of competence
	• Is well organized and structured
	• Is underpinned by a set of assumptions about how children learn
Implementation of the Curriculum	New expectations placed on:
	• Students
	• Faculty / Teachers
	• Learning environments
	• Education systems and authorities
Evaluation	• Systematic and planned
	• Regular
	• Conducted by qualified and experienced people





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