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FROM TAWHID TO CIRCUITS: A CURRICULUM FRAMEWORK FOR INTEGRATING TAWHIDIC EPISTEMOLOGY IN ELECRICAL ENGINEERING EDUCATION

Teddy Surya Gunawan[i]

[i] Professor, Electrical and Computer Engineering Department. International Islamic University Malaysia. tsgunawan@iium.edu.my

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Abstract

Engineering students are not shaped by ethics courses alone; they are also shaped by how they learn to model a circuit, interpret a signal, and justify a design decision. This paper develops a conceptual curriculum framework to integrate Tawhidic Epistemology into electrical engineering education, so that ethical responsibility is built into technical learning rather than added at the margins. Methodologically, the paper uses an analytical synthesis of the literature on Tawhidic Epistemology, engineering ethics, and outcome-based curriculum design to construct a discipline-specific framework and illustrate its translation into selected electrical engineering courses. The framework begins from the unity of knowledge under Tawhid and connects revelation, reason, amanah, ibadah, and maqasid al-shari'ah to curriculum design, course structuring, learning outcomes, assessment, and continuous quality improvement. In foundational courses such as Electric Circuits and Signals and Systems, the framework emphasizes disciplined reasoning, transparent assumptions, and awareness of consequence; in design and ethics-related courses, it requires students to justify trade-offs involving safety, sustainability, public interest, and professional accountability. The paper also distinguishes between primary courses, where Tawhidic integration is explicit and assessable, and supportive courses, where it is embedded through technical framing and contextual reflection. Rather than claiming validated implementation, the paper presents a structured, academically grounded model for curriculum development in Islamic higher education. Its contribution lies in showing how Tawhidic Epistemology can move from philosophical principle to concrete educational design in a way that preserves technical rigor, strengthens ethical judgment, and remains compatible with outcome-based education and continuous quality improvement.

Keywords: *Engineering, Education, Curriculum, Tawhidic, Epistemology*.

INTRODUCTION

A circuit that is numerically correct can still be educationally incomplete. A filter that meets its frequency specification can still distort what matters to a patient, a listener, or a user. A power system optimized for efficiency can still distribute risk, access, and environmental burden unevenly. Electrical engineering education, however, is often organized as though technical correctness and ethical consequence belong to separate conversations.

Curricula tend to reward accuracy, optimization, and problem-solving, while ethical reflection is frequently confined to a later course, a professional code, or a brief discussion

at the margin. That separation is becoming increasingly difficult to defend. A substantial body of scholarship in engineering ethics has shown that technical decisions are never detached from their consequences; they shape safety, social equity, environmental sustainability, and patterns of human behavior (Banks & Lachney, 2017; Colby & Sullivan, 2008; Martin et al., 2021).

When engineering knowledge is treated as value-neutral, the result is not neutrality, but a narrowing of responsibility and a thinning of professional judgment. As engineered systems become more deeply embedded in daily life, engineering education can no longer be concerned only with producing competent problem-solvers. It must also cultivate graduates who can recognise consequence, exercise judgment, and justify decisions responsibly (Monteiro et al., 2019; Miller, 2021).

Within the Islamic intellectual tradition, such a concern is not an external addition to knowledge but part of its very nature. *Tawhidic Epistemology* offers a coherent way of understanding why. Grounded in the principle of Tawhid, it affirms that knowledge is unified in source, ordered in purpose, and inseparable from moral accountability. Revelation (*wahy*) and human reason (*ʿaql*) are not rival ways of knowing, but complementary ones.

Knowledge, therefore, is not merely descriptive or instrumental; it is an amanah that must be pursued and applied in ways that serve justice, human well-being, and accountability before God (Bakar, 2008, 2011, 2012, 2015). From this perspective, the familiar separation between the "technical" and the "ethical" is already a distortion. Engineering is not simply the application of neutral tools to external problems. It is a morally situated form of action in which design choices, modeling assumptions, and system decisions carry consequences for people, society, and creation.

Electrical engineering makes this issue especially clear. The discipline sits close to the infrastructures that organize modern life: electrical energy, communication systems, signal processing, control, automation, sensing, and increasingly intelligent and data-driven technologies. Decisions made in these domains are rarely trivial. A modeling shortcut in circuit analysis may later become an unsafe design assumption.

A signal-processing choice can affect intelligibility, privacy, or fairness. A system optimized for cost or performance can still produce unequal access, hidden vulnerabilities, or environmental harm. These are not exceptional cases at the edge of the discipline; they arise from its ordinary practice. Prior studies have noted that engineering fields linked to digitalization, automation, and the energy transition are especially exposed to ethical tensions because design choices in such fields quickly scale into societal consequences (Korhonen-Yrjänheikki & Takala, 2011; Swartz, 2021).

For that reason, electrical engineering is not merely a convenient example for discussing Tawhidic Epistemology. It is a revealing site in which the limits of value-neutral engineering education become visible. Yet, despite growing interest in ethics, sustainability, and social responsibility in engineering education, integration remains uneven and often superficial.

Much of the literature approaches the issue through secular ethical frameworks, compliance-based models, or graduate-attribute language that sits alongside the technical curriculum rather than reshaping it. Within Islamic higher education, the challenge takes a different form. Tawhidic Epistemology has been articulated persuasively at the philosophical level, especially in the work of Osman Bakar, but its translation into discipline-specific curriculum design remains limited.

The gap is especially visible in engineering, where the language of integration is often present in mission statements, but less visible in course design, assessment logic, and program structure. What is still lacking is a clear framework that shows how Tawhidic Epistemology can move from principle to curriculum: from worldview to learning outcomes, from ethical aspiration to assessable educational practice, and from isolated value statements to a coherent pattern across foundational, design, and ethics-related courses.

This paper addresses that gap by proposing a curriculum framework for integrating Tawhidic Epistemology into electrical engineering education. The contribution of the paper is not to claim completed implementation or validated outcomes, but to clarify how such integration can be designed in a structured, academically defensible, and discipline-sensitive manner.

Specifically, the paper connects Tawhidic epistemological commitments to curriculum organization, course-level practices, and evaluative mechanisms aligned with outcome-based education and continuous quality improvement. It also distinguishes between courses in which Tawhidic integration should be explicit and assessable and those in which it should be lighter but still intentional.

The central argument is simple: ethical and spiritual responsibility in engineering education will not become meaningful through occasional reminders or stand-alone ethics content alone. It becomes meaningful when it is built into how students learn to analyze, design, justify, and evaluate engineering work. The sections that follow first clarify the epistemological basis of Tawhidic integration, then present the proposed curriculum framework, and finally discuss its implications for electrical engineering education and for the wider project of knowledge integration in Islamic higher education.

RESEARCH DESIGN AND METHODOLOGY

This paper is designed as a conceptual curriculum-framework study. Its purpose is not to report the results of a classroom intervention, measure student attainment, or claim validated implementation. Instead, it addresses a different but equally important problem: how Tawhidic Epistemology, often discussed at the level of philosophical principle, can be translated into a form that curriculum designers and engineering educators can actually use.

In other words, the study asks not whether a particular intervention has already worked, but how a coherent framework can be constructed so that future implementation, teaching, and evaluation can proceed on firmer intellectual and curricular ground. This design choice is deliberate. In the absence of a clear framework, calls for integrating ethics, spirituality, and technical education often remain aspirational, fragmented, or overly general.

Methodologically, the paper proceeds through analytical synthesis. It brings together three bodies of knowledge that are too often treated separately. The first is the literature on Tawhidic Epistemology, especially its emphasis on the unity of knowledge, the complementary roles of revelation and reason, and the moral responsibility attached to knowledge as amanah.

The second is the literature on engineering education, particularly work on ethics integration, socially responsible engineering, and the limitations of treating technical knowledge as value-neutral. The third is the logic of outcome-based education and continuous quality improvement, which provides the curricular language through which educational intentions are translated into course structures, learning outcomes, teaching activities, assessment tasks, and program review.

The methodological task of this paper is to synthesize these strands into a single framework that is conceptually coherent, educationally operational, and discipline-sensitive. The analytical process was carried out in four stages. First, the study identified the core epistemological commitments of Tawhidic Epistemology that are most relevant to engineering education, including Tawhid, wahy, ʿaql, amanah, ibadah, khilafah, and maqasid al-shariʿah.

Second, these commitments were examined in relation to recurring concerns in engineering education, such as ethical responsibility, design judgment, societal impact, and the need to preserve technical rigor. Third, the study translated this conceptual relationship into a curriculum design logic, specifying how epistemological commitments can shape course categories, learning outcomes, teaching strategies, assessment criteria, and evaluative indicators.

Fourth, the paper illustrated the framework through selected electrical engineering courses, not as evidence of completed implementation, but as concrete demonstrations of how the framework could be enacted in practice. This step is important because a framework only becomes meaningful when it can be connected to real curricular sites where students learn to analyze circuits, process signals, justify design decisions, and confront questions of safety, sustainability, and public responsibility.

Electrical engineering was chosen as the focus of the study for both conceptual and practical reasons. Conceptually, it is a discipline in which the consequences of technical decisions are immediate and far-reaching. Power systems, communication technologies, control systems, sensing, and signal processing do not remain in the laboratory; they shape infrastructure, privacy, safety, access, and environmental burden.

In practice, electrical engineering also offers a useful curricular breadth, from foundational analytical courses to design projects and ethics-related modules, allowing the framework to be examined across different forms of teaching and learning. The study, therefore, does not treat electrical engineering as a generic placeholder for engineering as a whole. Rather, it treats the discipline as a particularly revealing context in which the tension between technical rigor and moral accountability becomes visible and educationally significant.

The scope of the study is intentionally bounded. It focuses on framework construction rather than outcome validation. It does not include experimental comparisons, survey data, classroom observations, or statistical analyses of student performance. Nor does it claim that the proposed framework has already been implemented comprehensively at the institutional scale.

The examples discussed in the paper are therefore illustrative rather than evidentiary. They are used to show how Tawhidic Epistemology can be translated into curriculum practice with sufficient specificity to guide future adoption, adaptation, and empirical testing. This boundary is important because it protects the paper from making claims that exceed its evidence and clarifies its actual contribution: a structured, transferable design model for integrating Tawhidic Epistemology into electrical engineering education.

Within this design, credibility is established not through numerical data but through conceptual coherence, disciplinary relevance, and curricular traceability. A framework of this kind must satisfy three conditions. First, it must remain faithful to the epistemological logic from which it is derived. Second, it must speak to real issues within engineering education rather than remaining at the level of abstract moral aspiration.

Third, it must be traceable into the practical language of the curriculum, so that educators can see where the framework begins, how it moves, and what kinds of educational evidence it would eventually require. For that reason, the paper consistently moves from principle to structure, from structure to course-level practice, and from practice to evaluation and CQI.

The study also recognizes its limitations. A conceptual framework, no matter how carefully constructed, does not guarantee effective implementation. Curriculum change depends on institutional culture, educator readiness, assessment literacy, and the willingness of programs to move beyond symbolic value statements. Ethical and spiritual learning are also more difficult to observe than technical performance, and future empirical work will be needed to test how students interpret, internalize, and apply the framework over time.

Nevertheless, conceptual clarity is a necessary starting point. Before an engineering curriculum can be evaluated for Tawhidic integration, it must first be designed to make such integration visible, coherent, and assessable. This study is intended to provide that starting point.

TAWHIDIC EPISTEMOLOGY AS CURRICULUM FOUNDATION

Tawḥidic Epistemology is not an extra ethical layer added after technical content has already been defined. It is a way of understanding what knowledge is, where it comes from, what it is for, and how it should shape educational practice. For that reason, it functions more appropriately as a curriculum foundation than as a supplementary theme. In electrical engineering education, this matters because students do not simply learn equations, models, and methods; they also learn habits of reasoning, standards of justification, and assumptions about what counts as good engineering.

Figure 1 captures this structure clearly. It begins with Tawḥīd as the epistemological foundation, moves through waḥy and ʿaql as integrated sources of knowledge, frames engineering knowledge through amānah and ʿibādah, evaluates action through maqāṣid al-sharīʿah, and then connects this logic to electrical engineering practice, the formation of the engineer as khalīfah, and finally the curriculum integration layer where learning outcomes, teaching activities, assessment strategies, and CQI/OBE alignment make the framework educationally operational.

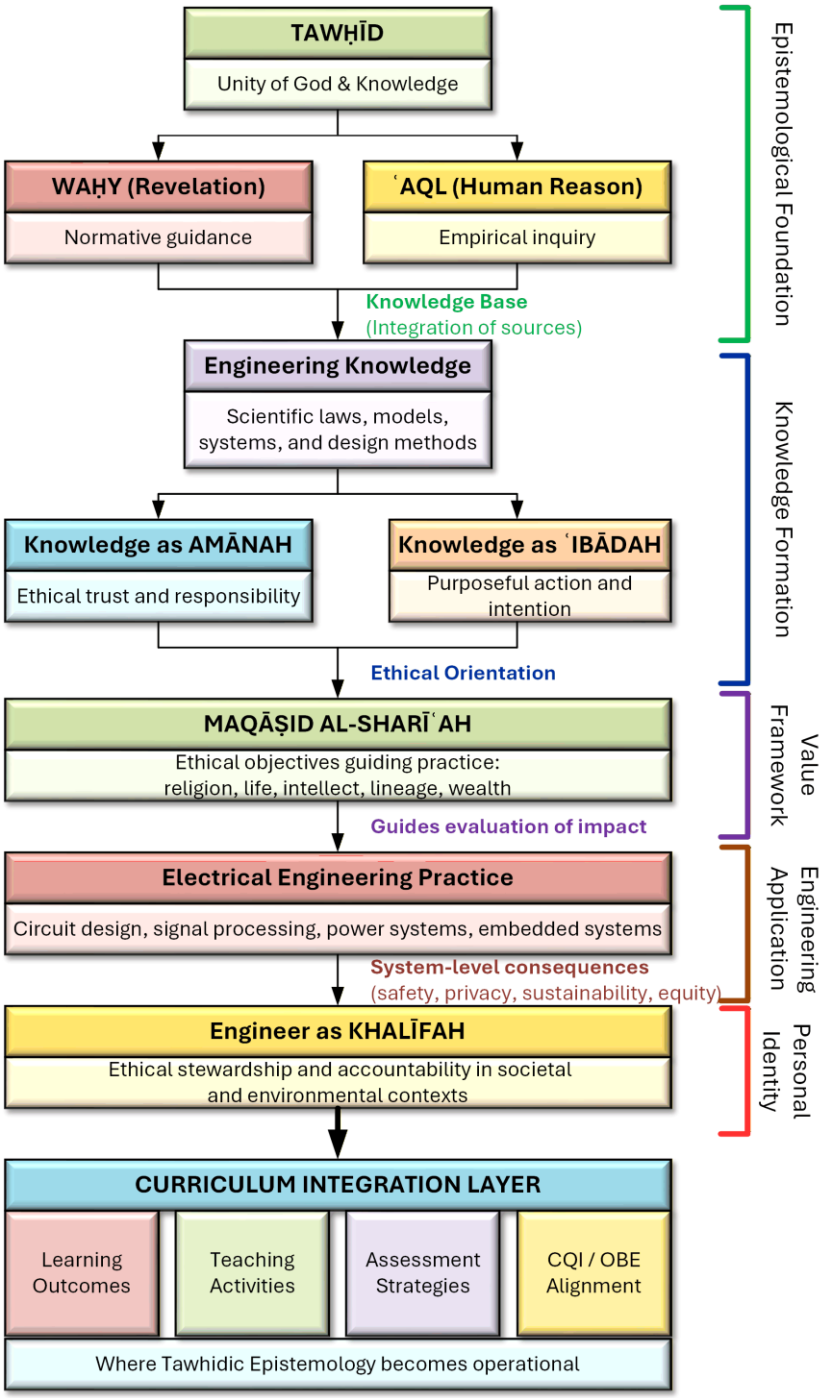

Figure 1. Tawhidic Epistemology as a Foundation for Engineering Curriculum Design

CONCEPTUAL FOUNDATIONS OF TAWHIDIC EPISTEMOLOGY

The conceptual foundation of Tawḥidic Epistemology begins with a simple but demanding claim: knowledge is unified and purposeful. It is not properly divided into isolated "technical" and "ethical" domains, because such a division fractures both meaning and responsibility. Within the Islamic intellectual tradition, knowledge has long been understood as oriented toward recognizing divine order, serving the common good, and guiding human conduct in morally accountable ways (Bakar, 2011; Kamali, 2016).

This has direct implications for curriculum design. If knowledge is unified in source and purpose, then engineering education cannot treat technical mastery as self-contained while leaving ethical reflection to the margins. What is taught, how it is taught, and how it

is assessed must all reflect a coherent view of knowledge as intellectually rigorous, morally bounded, and socially consequential.

This foundation is especially important in contemporary engineering education, where technical competence is often privileged while ethical reasoning is compartmentalized into separate modules. Such compartmentalization may preserve curricular convenience, but it weakens coherence. Tawḥidic Epistemology offers an alternative starting point by insisting that technical knowledge is already morally situated. In curricular terms, this means ethics should not be treated as an afterthought to engineering, but as part of how engineering itself is framed and taught.

TAWHID, WAHY AND 'AQL AS SOURCES OF KNOWLEDGE

At the center of the framework is *Tawḥīd*, which affirms the oneness of God and, by extension, the unity and coherence of knowledge. In Figure 1, Tawḥīd stands at the top of the structure, anchoring everything that follows. Beneath it, *waḥy* and *ʿaql* appear not as competing sources but as complementary ones. Waḥy provides normative guidance, while ʿaql enables empirical inquiry, analysis, modeling, and design. Together, they form what the figure identifies as the *knowledge base*, signaling an integration of sources rather than a split between sacred guidance and rational investigation.

This has important consequences for engineering education. Scientific laws, mathematical models, and design methods are not treated as self-justifying tools detached from moral meaning. Rather, they are understood as disciplined ways of engaging creation under a larger order of meaning and accountability (Bakar, 2008, 2012). This view resists the reductionist tendency to regard reason as sufficient on its own for determining both what can be done and what ought to be done.

As Nasr (2018) and Kamali (2021) argue in different ways, reason is indispensable but not morally self-directing. For curriculum design, the implication is clear: analytical courses are not value-free spaces. They form habits of reasoning, and those habits should be directed toward responsible, transparent, and reflective practice rather than mere instrumental efficiency.

KNOWLEDGE AS AMANAH AND ʻIBADAH

Once engineering knowledge is formed through the integration of waḥy and ʿaql, Figure 1 reframes that knowledge through two ethical orientations: *knowledge as amānah* and *knowledge as ʿibādah*. These are especially useful for curriculum purposes because they move the discussion from an abstract worldview to an educational disposition. *Amānah* frames knowledge as trust.

It emphasizes that technical knowledge is not simply possessed; it is held and exercised under conditions of responsibility. In engineering, this means assumptions must be stated honestly, limitations must be recognized, and consequences must not be ignored. A student who reaches the correct numerical answer while hiding unjustified assumptions may appear technically competent, yet still fail in the ethics of knowledge use. In this sense, amānah connects epistemology to accuracy, transparency, accountability, and intellectual discipline (Bakar, 2015).

ʿIbadah, by contrast, emphasizes intention and purposeful action. It frames engineering work not merely as technical execution but as morally directed practice. When carried out with sound intention and beneficial purpose, engineering becomes part of a larger vocation of service rather than a neutral act of problem-solving. This does not replace professional standards or external regulation; rather, it deepens them by adding internal moral orientation to external compliance (Hashim & Rossidy, 2017; Sardar, 2020).

Taken together, amānah and ʿibādah provide a powerful curricular pair. Amānah sharpens responsibility in technical work, while ʿibādah gives that work meaning and direction. In educational terms, these concepts should become visible in learning outcomes, teaching tasks, and assessment criteria so that they shape how students reason, justify, and act.

MAQASID AL-SHARI'AH AND ENGINEERING RESPONSIBILITY

The next layer of the framework is *maqāṣid al-sharīʿah*, which serves as the value framework for evaluating engineering action. In Figure 1, this layer sits beneath knowledge formation and above engineering practice, indicating that it does not replace technical knowledge but guides its ethical application. The maqāṣid provide a structured way to consider whether engineering decisions contribute to or undermine the protection of religion, life, intellect, lineage, and wealth (Auda, 2018; Kamali, 2019).

This is particularly important in engineering because technical optimization alone does not guarantee ethical adequacy. A system may be efficient but unsafe, affordable but exclusionary, or high-performing but environmentally harmful. In electrical engineering, this is not a remote concern. Power systems affect sustainability and resilience. Communication and signal-processing systems influence privacy, access, and fairness.

Embedded and automated systems affect safety, accountability, and control. Under a maqāṣid-informed framework, such consequences are not secondary considerations appended after design; they are part of the evaluation of engineering judgment itself. In curriculum design, maqāṣid serve as a bridge between performance metrics and human impact.

Students are still expected to optimize, calculate, and justify designs technically, but they are also expected to ask broader questions: Who benefits? Who bears the risk? What is protected, and what may be harmed? In this way, maqāṣid expand the meaning of engineering evaluation without weakening technical rigor.

REFRAMING ELECTRICAL ENGINEERING FOR CURRICULUM INTEGRATION

Electrical engineering provides a particularly revealing context for this framework because the discipline is closely aligned with infrastructures and technologies that shape everyday life. Circuit design, signal processing, power systems, embedded systems, sensing, communication, and intelligent control all carry consequences that extend beyond technical performance.

Figure 1 makes this explicit by placing electrical engineering practice beneath maqāṣid and identifying its system-level consequences as safety, privacy, sustainability, and equity. This is a strong curricular statement: technical decisions in electrical engineering already have social and ethical effects, even when they are taught as if they were purely analytical.

This reframing changes the educational task. Foundational courses can no longer be viewed only as places where students learn neutral techniques; they are also places where students learn how to reason responsibly. Design-oriented courses become sites where trade-offs must be justified in light of both performance and impact. Ethics-related courses should no longer exist in isolation from technical content, but should help students interpret the moral meaning of technical decisions encountered elsewhere in the curriculum.

In this sense, the goal is not to expand the curriculum by adding disconnected ethical content, but to restructure it so that technical learning and moral responsibility are taught as part of the same educational formation. The endpoint of this reframing, as shown in Figure 1, is the formation of the engineer as khalīfah: a technically competent, ethically grounded, and socially accountable professional.

This identity is not produced by philosophy alone. It requires a curriculum. For that reason, the final layer of the figure, the curriculum integration layer, is essential. It shows where Tawḥidic Epistemology becomes operational through learning outcomes, teaching activities, assessment strategies, and CQI/OBE alignment. That is the step that transforms Tawḥidic Epistemology from a worldview into an educational design.

The next section builds on this foundation by presenting a curriculum framework that translates these principles into course roles, integration strategies, and evaluative mechanisms across electrical engineering education.

PROPOSED CURRICULUM FRAMEWORK

A curriculum does more than distribute content across semesters. It quietly tells students what counts, what can be ignored, and what kind of engineer they are becoming. That is why Tawḥidic Epistemology cannot be integrated through occasional reminders, isolated ethics lectures, or symbolic references placed around an otherwise unchanged technical program. If Tawḥidic Epistemology is to matter educationally, it must enter the curriculum at the level where programs actually shape learning: how courses are structured, how outcomes are written, how teaching is organized, how assessment is judged, and how improvement decisions are made. Figure 2 captures this movement clearly. On the left side, the framework moves downward from Tawḥidic Epistemology as a worldview to curriculum design principles, then to curriculum structure, and finally to curriculum implementation through measurable outcomes, teaching activities, and assessable tasks.

On the right side, the framework moves upward through OBE-aligned outcomes, continuous quality improvement, and finally the graduate profile, linking curriculum action to the formation of a technically competent, ethically grounded, and socially responsible engineer. The figure, therefore, presents more than a sequence. It presents a cycle: worldview shapes curriculum, curriculum shapes learning, learning produces evidence, and evidence reshapes curriculum. That cyclical logic is crucial because TE becomes credible in engineering education only when it can survive the ordinary tests of curriculum design, assessment, and review.

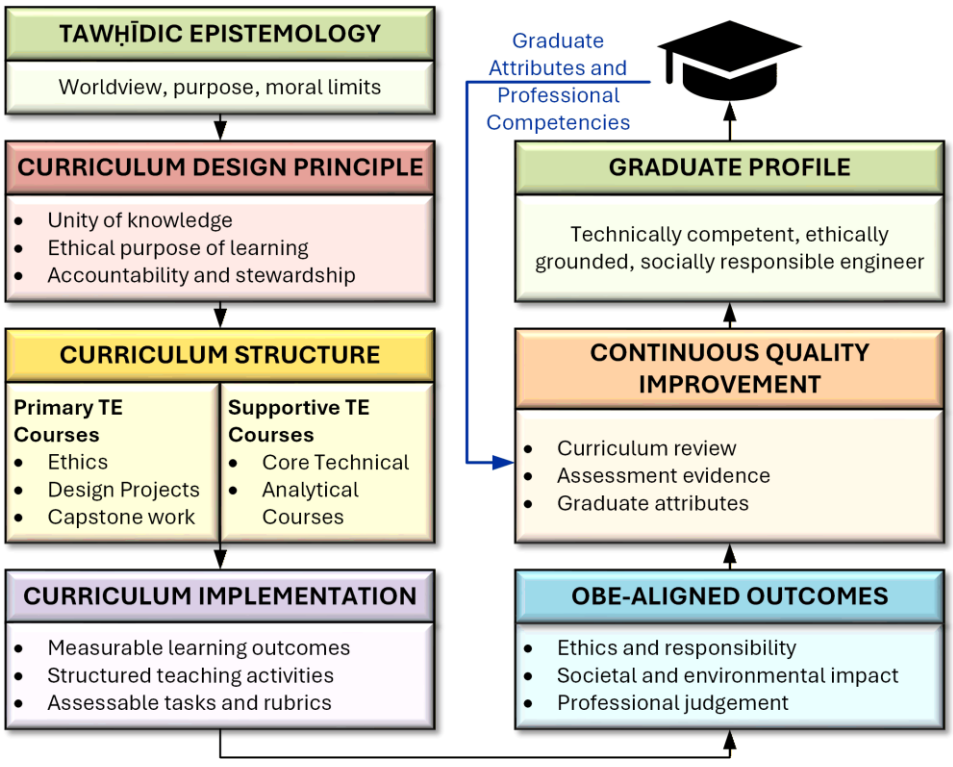

Figure 2. A Curriculum Framework for Integrating Tawhidic Epistemology in Electrical Engineering Education

DESIGN PRINCIPLES FOR TAWHIDIC CURRICULUM INTEGRATION

Three design principles guide the framework. The first is that integration must be epistemological rather than decorative. Tawḥidic Epistemology should not appear as moral language attached to technical subjects after the real curriculum has already been decided. It must shape how engineering knowledge itself is framed, including its purpose, limits, and moral significance.

Figure 2 reflects this by placing Tawḥidic Epistemology above the curriculum design principle layer, which includes unity of knowledge, ethical purpose of learning, and accountability and stewardship. This arrangement is not merely visual. It makes a curricular claim: before deciding what students should learn in circuits, signals, power systems, or embedded systems, the program must determine what kinds of knowledge these subjects represent and what responsibilities accompany them.

When this epistemological grounding is absent, ethics tends to be appended as commentary. When it is present, ethical responsibility begins to influence how problems are framed, how models are interpreted, and how design decisions are justified (Bakar, 2015; Hashim, 2014). The second principle is that integration must be discipline-sensitive. Electrical engineering is not a single kind of intellectual activity.

It includes analytical reasoning, mathematical abstraction, system modeling, design under constraint, safety-sensitive implementation, and increasingly, decisions involving privacy, automation, sustainability, and equity. A first-year circuits course does not teach responsibility in the same way a capstone design project does. In one context, TE may appear through disciplined reasoning, transparent assumptions, and careful interpretation of results.

In another, it may appear through the structured evaluation of trade-offs involving safety, environmental burden, accessibility, or public interest. Figure 2 recognizes this by moving from design principles to curriculum structure, where different types of courses carry different levels of depth and modes of TE integration. This is educationally important because a uniform model of ethical infusion usually fails.

It either overloads technical courses with abstract moral content or reduces ethics to a thin set of repeated reminders. A discipline-sensitive design avoids both extremes by calibrating integration to the actual cognitive and professional demands of electrical engineering (Monteiro et al., 2019). The third principle is that integration must be *explicitly aligned*.

Good intentions do not produce curriculum change unless they are translated into course outcomes, classroom practices, and assessment criteria. Figure 2 makes this point through the *curriculum implementation* layer, which identifies measurable learning outcomes, structured teaching activities, and assessable tasks and rubrics. This is where TE stops being a philosophical aspiration and becomes curriculum work.

In practical terms, it means that if a program claims to value accountability, stewardship, or ethical judgment, those values must appear in what students are expected to demonstrate and in how their work is evaluated. Outcome-based education is especially useful here because it requires programs to articulate what students can actually do, not merely what the curriculum hopes they will absorb. TE, then, becomes operational not when it is declared, but when it becomes teachable, assessable, and reviewable within the ordinary machinery of curriculum design (Biggs & Tang, 2011).

CURRICULUM STRUCTURE: PRIMARY AND SUPPORTIVE TE COURSES

Once the design principles are established, the next question is practical: where and how deeply should TE be embedded in an electrical engineering curriculum? Figure 2 answers this through the curriculum structure layer, which distinguishes between Primary TE Courses and Supportive TE Courses. This distinction is one of the most important features of the framework because it prevents two common mistakes.

The first is to confine TE to a single ethics course and assume the problem has been solved. The second is to force every technical course to carry the same ethical weight, which often produces repetition, superficiality, and curriculum fatigue. The Primary-Supportive distinction offers a more realistic architecture, as shown in Table 1.

Table 1. Roles of Primary and Supportive TE Courses

Course Type	Primary Purpose	Mode of TE Integration	Typical Courses	Assessment Focus	Expected Student Capability
Primary TE Courses	Develop ethical reasoning, integrative thinking, and professional judgment	Explicit and assessable integration of TE concepts in CLOs, learning tasks, and rubrics	Engineering ethics; integrated design projects; industrial training; final-year project	Structured evaluation of decision-making, justification, reflection, and societal impact	Ability to justify engineering decisions ethically, evaluate trade-offs, and articulate responsibility in real-world contexts
Supportive TE Courses	Reinforce contextual awareness within technical knowledge	Selective and contextual integration through examples, prompts, and brief reflections	Circuits; signals and systems; control systems; other analytical and core technical subjects	Limited but intentional evaluation of awareness, reasoning assumptions, and implications	Ability to recognize ethical implications within technical problems without compromising analytical rigor

Primary TE courses are the places where TE is introduced, applied, and assessed in direct and substantial ways. These are typically courses in which students must make judgments under real or realistic constraints, such as engineering ethics, integrated design projects, industrial training, and capstone or final-year project work. In such settings, students are not merely applying formulas; they are deciding what matters, what trade-offs are acceptable, what risks can be justified, and what consequences their solutions may carry.

This is where concepts such as amānah, maqāṣid, stewardship, and public responsibility can be explicitly connected to engineering practice. In a capstone project, for example, students designing a low-cost embedded monitoring system may need to defend choices involving accuracy, reliability, accessibility, and user safety. In a signal processing design project, they may need to justify why a technically efficient method is or is not acceptable when privacy, interpretability, or fairness are taken into account.

In these courses, TE should be visible in learning outcomes, project briefs, assessment rubrics, and structured reflection because that is where ethical reasoning becomes part of professional judgment. Supportive TE courses, by contrast, remain primarily technical in orientation, but they still contribute to the formation of responsible engineering judgment.

These include core analytical subjects such as electric circuits, signals and systems, control systems, electronics, and related mathematical or theoretical courses. The purpose here is not to interrupt technical rigor with frequent moral commentary. It is to make students aware that technical reasoning is never entirely detached from consequence. In a circuits course, this may mean requiring students to state assumptions clearly, justify simplifications, and recognize that weak modeling logic can lead to unsafe design choices later.

In signals and systems, it may mean using carefully chosen examples that illustrate how signal fidelity, filtering decisions, or sampling strategies can affect intelligibility,

privacy, or reliability in real-world applications. The TE presence is lighter, but it is not accidental. It appears through problem framing, brief reflective prompts, and assessment criteria that reward responsible reasoning alongside correct answers. This layered structure preserves analytical depth while ensuring that the ethical meaning of technical work is not postponed indefinitely.

The educational advantage of this model is that it gives the curriculum both *depth and spread*. Depth is achieved in Primary TE courses, where students must engage ethical reasoning directly and defend engineering choices in context. Spread is achieved in Supportive TE courses, where students repeatedly encounter the idea that technical work has assumptions, consequences, and responsibilities.

Over time, this prevents ethics from feeling like a sudden add-on introduced late in the program. Instead, it becomes part of the educational atmosphere of engineering itself. That is why the distinction is not simply administrative. It is developmental. It gives students repeated exposure in technically focused courses, then asks for deeper judgment when the curriculum reaches design, integration, and professional practice. This staged approach is consistent with calls in Islamic curriculum reform to avoid both tokenism and overload by embedding values progressively and coherently across the curriculum (Hashim & Rossidy, 2017).

ALIGNMENT WITH OUTCOME-BASED EDUCATION AND ACCREDITATION REQUIREMENTS

A framework in engineering education becomes persuasive only when it can live inside the language of curriculum quality, not outside it. Figure 2 addresses this directly through the right-hand side of the model, where OBE-aligned outcomes, continuous quality improvement, and the graduate profile form the upward path from curriculum implementation to program-level educational identity. This is one of the strongest features of the framework because it shows that TE does not require a parallel evaluation system. It can work through structures that engineering programs already recognize.

At the level of OBE-aligned outcomes, the figure identifies ethics and responsibility, societal and environmental impact, and professional judgment. These are not foreign additions to engineering education. They are already familiar with graduate attributes in many accreditation systems, including those associated with professional competencies and Washington Accord-style expectations.

What TE does is not replace these outcomes, but deepen their meaning. Ethical responsibility can be interpreted through amānah and justice. Societal and environmental impact can be framed through stewardship and maqāṣid-guided evaluation of consequences. Professional judgment can be understood not simply as technical decision-making but as decision-making under moral accountability.

This is important because it prevents TE from becoming symbolic. Once its concepts are connected to outcome language, they begin to guide assessment design, rubric construction, and program review. Figure 2 then moves from outcomes to continuous quality improvement, represented through curriculum review, assessment evidence, and graduate attributes.

This upward movement is significant because it shows that TE is not meant to remain a fixed philosophical template. It is meant to be tested against evidence. If students can solve equations accurately but cannot responsibly justify design trade-offs, the curriculum must respond. If ethics outcomes appear in course documents but are invisible in assessment tasks, the curriculum must respond. If students show awareness in isolated courses but not across the program, the curriculum must respond.

CQI is therefore not an administrative afterthought in this framework. It is the mechanism that keeps TE from becoming rhetorical. It forces the curriculum to ask whether integration is actually visible in learning and whether the program is truly producing the kind of graduate it claims to value. This leads to the final element on the right side of the

figure: the graduate profile/attribute, described as a technically competent, ethically grounded, and socially responsible engineer.

That phrase matters because it shows the framework's endpoint. The goal is not simply to have more ethical language in the curriculum. The goal is to shape graduates whose technical excellence is inseparable from accountability, judgment, and awareness of consequence. In that sense, Figure 2 turns accreditation logic into something more educationally meaningful. It shows that graduate attributes are not only reporting categories. They are expressions of the kind of engineer the curriculum is deliberately trying to form.

POSITIONING THE FRAMEWORK WITHIN ISLAMIC HIGHER EDUCATION

The framework also responds to a longstanding tension within Islamic higher education. Many institutions speak persuasively about the integration of faith and knowledge, yet struggle to show what that integration looks like once the curriculum reaches technical subjects, laboratory work, design tasks, and accreditation requirements. The result is often a familiar split.

The institutional mission speaks the language of integration, while the curriculum continues to operate largely through inherited models of technical training. Figure 2 is valuable because it addresses that split directly. It does not stop with worldview. It follows the worldview into curriculum design, course structuring, implementation, outcomes, review, and graduate formation. In other words, it offers a way for Islamic higher education to move from declaration to design.

This matters especially in electrical engineering because the discipline sits close to some of the most pressing questions facing contemporary societies: energy transition, automated decision systems, digital privacy, system resilience, equitable access to infrastructure, and the social consequences of intelligent technologies. These are not merely technical matters.

They are questions of responsibility, limits, and public consequence. A curriculum that treats them as purely technical risks, producing graduates who are highly capable yet insufficiently reflective about the worlds their systems create. A curriculum informed by TE does not reject modern engineering. Rather, it insists that modern engineering be taught with moral seriousness.

That is why the framework is not only relevant to Islamic institutions as identity-bearing organizations. It is also relevant to broader debates in engineering education about responsibility, sustainability, and the human meaning of technical work (Kamali, 2016; Sardar, 2020). Seen in this light, the framework does two things at once. Internally, it offers Islamic higher education a structured and curriculum-level method for making Tawḥidic commitments educationally visible in a demanding technical field.

Externally, it offers the wider engineering education community an example of how a faith-grounded epistemology can enter curriculum design without abandoning rigor, outcome-based assessment, or accreditation compatibility. That is an important point. TE is not positioned here as a retreat from professional standards, but as a way of enriching them.

It gives the curriculum a stronger account of why engineering knowledge should be pursued with accountability, how its consequences should be judged, and what kind of graduate the program seeks to form. The next section builds on this architecture by showing how the framework can be translated into course-level practice across selected electrical engineering courses, where Tawḥidic integration becomes visible in actual teaching, assessment, and student work.

TRANSLATING THE FRAMEWORK INTO COURSE-LEVEL PRACTICE

A framework becomes real only when it changes what students are asked to notice, justify, and defend. That is the purpose of this section. Tawḥidic Epistemology does not enter electrical engineering education by inserting religious language into existing lectures while leaving the logic of teaching untouched.

It becomes visible when a student in a circuits class is asked not only for the correct answer, but also for the assumptions behind that answer; when a student in signals and systems is asked to consider what may be lost when a signal is filtered, compressed, or sampled; when a design team must explain not only whether a system works, but whether it should be implemented in that form; and when a future engineer is trained to see professional judgment as more than compliance with rules.

In that sense, course-level practice is where the framework is tested. The technical syllabus remains intact, but the educational emphasis changes. Accuracy is tied to responsibility, abstraction to consequence, and design to accountability. The examples below are selective rather than exhaustive. Their purpose is not to claim completed institutional implementation, but to show how the same epistemological foundation can take different forms depending on the nature of the course and the kind of judgment the course is meant to develop.

FOUNDATIONAL COURSES: SHAPING ANALYTICAL DISCIPLINE

Foundational courses are where students first learn what counts as good engineering thinking. For that reason, Tawḥidic integration at this stage does not begin with a long ethical discussion. It begins with intellectual discipline. Many students entering electrical engineering quickly learn to value the final numerical answer, the neat derivation, or the apparently correct waveform.

What they do not always value at the same pace is the quality of the reasoning that produced it. In repeated teaching encounters, it is common to find students who can reproduce a solution pattern but cannot clearly explain the assumptions, approximations, or logical steps embedded in it. That weakness matters. In engineering education, a weak habit formed early rarely stays small.

It reappears later in design work, system integration, and professional judgment. For that reason, foundational courses are the first place where TE becomes educationally important: they teach students that technical reasoning is not only a matter of arriving at the answer, but of arriving at it responsibly. *ECEE 1301 Electric Circuits* provides a strong example.

At one level, the course is about familiar analytical tools: Ohm's law, Kirchhoff's laws, network theorems, equivalent circuits, and systematic solution procedures. Yet these tools always operate under assumptions. Sources are idealized, components are treated as linear, parasitic effects are often ignored, and operating conditions are simplified. None of this is wrong; simplification is part of engineering.

The educational question is whether students learn to treat those assumptions as invisible shortcuts or as accountable choices. Within a Tawḥidic framing, this is where *amānah* becomes pedagogically meaningful. Students are required not only to solve, but to state assumptions clearly, justify model selection, and verify whether a result remains plausible under the stated conditions.

A correct answer reached through opaque reasoning is treated as incomplete. The point is not to moralize ordinary calculations. It is to teach that sloppy reasoning in an introductory circuit model can later become a safety, reliability, or inefficient design problem when translated into hardware. In this way, precision becomes more than a technical virtue; it becomes a form of responsibility.

Assessment can reflect this directly by allocating marks to reasoning transparency, model justification, and validation steps, not only to final answers. When that happens consistently, students begin to understand that good engineering is not merely fast problem-solving, but trustworthy problem-solving. *ECEE 2304 Signals and Systems* deepens this formation in a different way.

Here, the challenge is not only correctness but also distance from consequences. Students work with transforms, convolution, sampling, system response, and filtering, all of which are mathematically elegant and powerful. The risk is that abstraction can make

consequences feel remote. A signal becomes an expression, a filter becomes a transfer function, and a system becomes a block diagram.

The curriculum task is therefore to reconnect abstraction to what it shapes in the real world. A Tawḥidic approach does this without diluting analytical rigor. Students are still expected to master Fourier methods, time-frequency reasoning, and system analysis, but they are also invited to see that these tools affect actual human outcomes. A sampling choice may influence whether a biomedical signal preserves clinically meaningful information.

A filter may reduce noise while also distorting intelligibility in speech or suppressing low-amplitude features that matter for interpretation. A signal-processing pipeline used in surveillance or automated recognition may optimize performance while raising questions of privacy, fairness, and access. These are not separate "ethics topics" added after the mathematics.

They are examples that reveal why mathematics matters. Teaching activities can include short contextual prompts, brief design-oriented discussions, or tutorial questions that ask students what is gained, what is lost, and whose interests are affected by a technical choice. Assessment at this level remains light, but intentional. Students may be asked to justify a method choice, explain the limitations of an idealized signal model, or discuss the practical implications of the distortion introduced by a system. The message is subtle but important: abstraction does not remove responsibility. It concentrates it.

Taken together, these foundational courses show that TE does not require the curriculum to become less technical. It requires it to become more honest about what technical learning is already doing. In circuits, students learn that correct reasoning must be transparent and accountable. In signals and systems, they learn that elegant analysis still carries human consequence.

By the time students move beyond the foundational stage, the desired habit is not simply that they can solve accurately, but that they can explain, justify, and anticipate the implications of their technical choices. That is the beginning of professional formation.

DESIGN COURSES: EMBEDDING ETHICAL JUDGMENT IN DECISION-MAKING

Design courses mark a shift in educational demand. In analytical subjects, students usually work toward a bounded answer. In design, they must choose among alternatives, weigh trade-offs, and accept responsibility for what their chosen solution makes possible or impossible. This is where TE becomes more explicit, not because design is the first place where ethics appears, but because design is the place where judgment can no longer hide behind procedure.

Electrical engineering students designing a system must decide what to optimize, what to sacrifice, what constraints are negotiable, and what consequences are acceptable. Those decisions are never purely technical. They are technical decisions with social, environmental, and moral shape. *ECEE 3300 Integrated Design Project* is, therefore, a crucial site for operationalizing the framework.

Students in this course are no longer solving pre-structured textbook problems. They define problems, propose architectures, evaluate alternatives, and defend their decisions to others. That change in educational setting matters because it makes responsibility visible. Within this framework, design is treated as a form of stewardship. Students are expected to ask not only whether a solution meets specifications, but also whether it is safe enough, fair enough, sustainable enough, and appropriate for the context in which it will be used.

For example, a team designing an embedded monitoring device may be tempted to prioritize low cost and rapid implementation, yet those choices may reduce reliability, shorten operating life, weaken safety margins, or make the system harder to use for certain groups. Similarly, a power-related project may achieve efficiency targets while ignoring resilience, environmental burden, or unequal distribution of system risk.

The educational value of TE here lies in making these questions part of the design process itself rather than objections raised after the design is complete. This can be structured clearly across stages of the project, as shown in Table 2.

Table 2. Operationalizing Tawhidic Epistemology in the Integrated Design Project

Design Stage	Technical Focus	Tawhidic Orientation
Problem definition	User needs, constraints, design context	Social responsibility and public interest
Concept development	System architecture, feasibility, resource choices	Stewardship and sustainability
Evaluation	Performance, cost, reliability, trade-offs	Ethical trade-offs and societal impact
Reflection	Design justification and defense	Accountability and moral reasoning

At the problem-definition stage, students are required to identify not only technical requirements but also the public or user context into which the solution will enter. During concept development, decisions about feasibility, architecture, and resource allocation are made alongside considerations of stewardship and sustainability. During evaluation, performance and cost remain essential, but students are also asked to consider what trade-offs their design imposes and on whom.

Reflection then becomes more than a concluding exercise; it is the stage where students justify why their design is defensible on both technical and moral grounds. This changes assessment in meaningful ways. Marks are no longer awarded only for whether a system functions, but also for the quality of judgment shown in choosing, defending, and reflecting on the design. Students learn that optimization is not the only virtue in engineering. Sometimes, the more important question is whether the optimized solution is responsible.

Over time, this shift changes how students approach engineering work. They begin to see that design is not simply a search for the best numerical outcome under constraints, but a structured exercise in judgment under responsibility. That insight is important because many of the most serious engineering failures do not arise from a lack of technical knowledge. They arise from narrow definitions of success. A design course informed by TE helps broaden that definition before students reach professional practice.

ETHICS AND PROFESSIONAL PRACTICE: CONSOLIDATING MORAL REASONING

Courses focused explicitly on ethics and professional practice play a different but equally important role. They do not introduce ethical awareness for the first time. Rather, they gather, sharpen, and test forms of reasoning that students should already have begun to develop in foundational and design courses. This distinction matters because ethics courses often lose force when students experience them as detached theory.

Within the proposed framework, they function instead as places where prior technical experiences are interpreted more carefully and where moral reasoning is tested under conditions of ambiguity. In a course such as *GENE 4302 Engineering Ethics, Safety, and Environment*, students encounter professional codes, regulatory expectations, environmental responsibilities, and safety obligations.

These provide an important baseline, but professional life rarely presents cases in which a code automatically supplies the full answer. Engineers often work with incomplete data, multiple stakeholders, conflicting priorities, and uncertainty about long-term consequences. For that reason, the educational emphasis shifts from rule recall to disciplined judgment. Case-based analysis is especially useful here.

Students may be asked to evaluate scenarios involving automation, infrastructure failure, surveillance technologies, unsafe design shortcuts, or environmentally harmful but commercially attractive solutions. In such cases, they must justify a position by drawing on

technical feasibility, professional obligations, likely consequences, and broader ethical principles.

The goal is not to produce identical conclusions. The goal is to produce clear, defensible reasoning. Within this context, Islamic ethical concepts such as justice, trust, preservation of life, and accountability are introduced not as replacements for professional frameworks, but as additional lenses that deepen them. They help students see that professional responsibility is not exhausted by compliance. An engineer may satisfy a minimum code requirement and still fail in judgment if the broader consequences have been ignored.

Assessment in this kind of course should therefore reward argument quality rather than doctrinal conformity. Students can be evaluated through case analyses, written reflections, structured debates, oral defenses, or position papers in which they explain what they would do, why they would do it, and what principles guide their judgment. Clarity, coherence, evidence, and consequence-awareness matter more than whether every student reaches the same conclusion.

This is consistent with the framework's broader logic. TE is not intended to produce a scripted response to professional dilemmas. It is intended to form engineers who can reason responsibly when the easy answer is not available. Across these course types, the underlying educational movement is consistent. Foundational courses shape disciplined reasoning.

Design courses require accountable decision-making. Ethics and professional practice courses consolidate and test moral judgment. Taken together, they show that Tawḥidic Epistemology becomes operational not through symbolic inclusion, but through repeated curricular encounters in which students are asked to think carefully, justify openly, and act responsibly. That is how a framework becomes formation.

EVALUATING TE INTEGRATION: METRICS AND CONTINUOUS QUALITY IMPROVEMENT

A curriculum reveals its real priorities not only through what it teaches, but also through what it measures. If Tawḥidic Epistemology is described only in program documents yet disappears in assessment, feedback, and review, then its curricular presence remains rhetorical rather than educationally credible. For that reason, evaluation is not an optional appendage to the proposed framework.

It is the mechanism that shows whether TE has moved from aspiration to observable practice. In this paper, evaluation does not mean trying to quantify inner spirituality or reduce moral seriousness to a checklist. It means examining whether the curriculum makes students more able to reason transparently, justify decisions responsibly, recognize consequences beyond technical performance, and carry professional judgment with greater accountability.

Figure 3 captures this logic as an evidence-driven CQI loop. On the left side, Tawḥidic curriculum design shapes TE-aligned CLOs and course structure, which then guide TE-embedded teaching and learning through activities, cases, and design integration. These, in turn, generate evidence of student assessment that includes both technical performance and ethical reasoning.

On the right side, that evidence is aggregated through multi-level evidence analysis, then used in CQI-based curriculum review and refinement, which feeds back into the next cycle of curriculum design. The figure is therefore not simply a process diagram. It expresses a central claim of this section: TE becomes educationally meaningful only when it can survive ordinary curriculum scrutiny through evidence, review, and revision.

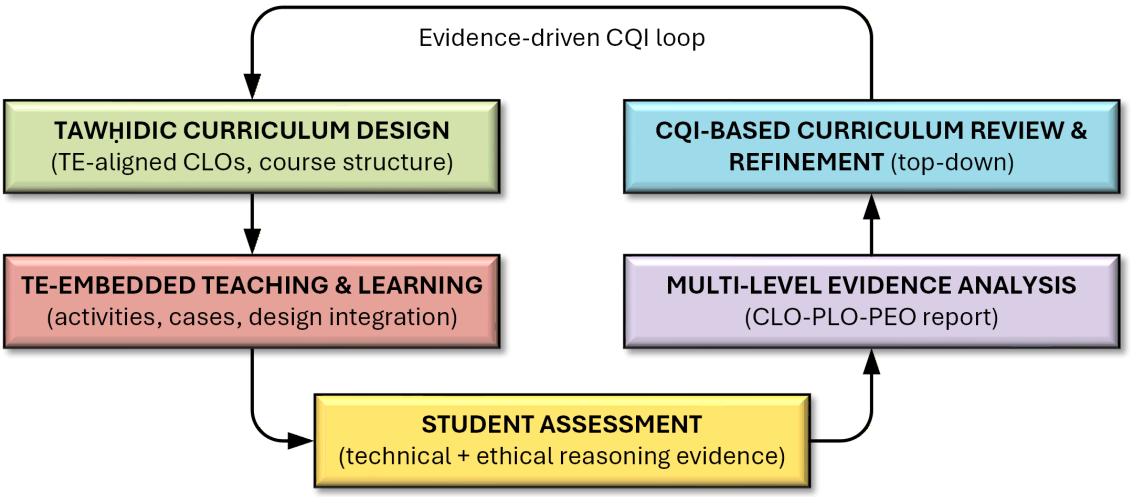

Figure 3. Continuous Quality Improvement Cycle for Integrating TE

WHY EVALUATION OF TE INTEGRATION MATTERS

Evaluation matters because what is not assessed is often treated as secondary, even when it appears strongly in mission statements or program aspirations. In engineering education, students quickly learn to pay attention to what counts toward marks, what appears on rubrics, and what instructors consistently require them to demonstrate. If TE is meant to shape engineering reasoning rather than remain symbolic language, it must be visible in those same places.

This is especially important in a framework such as the one proposed here, where integration is not confined to a single ethics course but distributed across course design, teaching practice, and assessment strategy. Without evaluation, it becomes difficult to tell whether TE is actually influencing learning or merely decorating curriculum documents. Evaluation also matters because TE integration makes a strong educational claim.

It claims that technical competence and ethical responsibility should develop together. That claim should be open to evidence. A student who solves problems accurately but cannot responsibly justify assumptions, clearly defend design trade-offs, or recognize broader consequences may be technically trained yet educationally incomplete within the logic of this framework.

Conversely, a curriculum that gives students repeated opportunities to connect reasoning, judgment, and consequence should produce visible traces of that development. Evaluation, then, is not an external audit imposed after the fact. It is part of the educational design itself. It helps determine whether the curriculum is forming the kind of engineer it says it values.

CURRICULUM-LEVEL INDICATORS OF TE EMBEDDING

At the curriculum level, the key issue is coherence. TE should not appear only in an isolated ethics subject or in a few aspirational lines in a course outline. It should be visible throughout the program's structure in ways that demonstrate intentional design. This includes the presence of TE-related elements in course learning outcomes, the balance between Primary and Supportive TE courses, the alignment between outcomes and assessment, and the progression of responsibility from foundational courses to design and professional practice.

In other words, the curriculum should tell a consistent story: students first learn to reason carefully, then to justify technical decisions under constraint, and finally to defend professional judgment in more complex settings.

Table 3. Multi-Level Indicators for Evaluating Tawhidic Epistemology Integration

Level	Indicator	What to Examine	Evidence Source	Observable Outcome
Curriculum	Learning outcome alignment	Presence of ethical, societal, and responsibility elements in CLOs	Course outlines	Explicit integration of TE across courses
	Course structure	Distribution of Primary and Supportive courses across programme	Programme structure	Balanced and progressive exposure to TE
	Assessment alignment	Inclusion of ethical reasoning in assessment tasks and rubrics	Rubrics, assignments	Ethical dimensions are assessable, not implicit
	Curriculum coherence	Logical progression from foundational to design and ethics courses	Curriculum map	Structured development of reasoning across years
Student	Ethical reasoning	Ability to justify decisions beyond technical correctness	Design reports, reflections	Clear articulation of trade-offs and consequences
	Decision justification	Consistency between technical choices and stated values	Project presentations	Defensible and coherent arguments
	Awareness of impact	Recognition of societal, environmental, and safety implications	Case analysis, reports	Context-aware engineering reasoning
Programme	Outcome attainment	Performance in ethics, responsibility, and societal impact outcomes	OBE reports	Measurable attainment of graduate attributes
	CQI feedback	Use of assessment data to refine curriculum	CQI documents	Evidence-based curriculum improvement

Figure 3 supports this view by placing Tawḥidic curriculum design at the start of the CQI loop and explicitly linking it to TE-aligned CLOs and course structure. That detail matters because it shows where evaluation begins. It begins not with student performance alone, but with the curriculum's own design commitments. A program can therefore be evaluated by asking straightforward questions.

Are TE-related expectations explicit in CLOs? Are they distributed progressively across the curriculum? Do assessment tasks actually require students to demonstrate ethical reasoning, or is that dimension left implicit? Do course structures distinguish appropriately between deep integration in design- and judgment-heavy courses and lighter contextual integration in analytical courses? Curriculum mapping is especially useful here because it can reveal both gaps and overload.

A program may find, for example, that ethics language is concentrated in one course while foundational and design courses remain silent, or that responsibility is mentioned

repeatedly but never assessed. Such findings are not minor technicalities. They reveal whether the curriculum is genuinely integrated or merely well-intentioned.

To make the evaluation logic explicit, Table 3 summarizes the principal indicators of TE integration across curriculum, student, and program levels, together with the corresponding evidence sources and observable outcomes. The framework does not rely on a single indicator; it evaluates TE integration by examining aligned evidence across curriculum design, student performance, and program-level review.

STUDENT LEARNING AND ASSESSMENT METRICS

At the student level, evaluation shifts from curriculum design to observable capability. The question is no longer whether TE is present in course plans, but whether students can demonstrate the kinds of reasoning and judgment the framework intends to cultivate. This is where assessment must become precise. The framework does not seek to evaluate personal piety or inner moral states.

It evaluates what students can demonstrate in technical and professional contexts: how they explain assumptions, justify choices, identify trade-offs, interpret consequences, and align technical decisions with stated responsibilities consistently. In practical terms, this evidence may come from design reports, reflective commentaries, oral presentations, project defenses, case analyses, and written justifications embedded within technical assignments.

In a circuits course, a student might be evaluated on whether assumptions are made explicit and whether model limitations are acknowledged. In a design project, a team might be assessed on how clearly it defends trade-offs involving safety, cost, sustainability, accessibility, or reliability. In an ethics-related course, students may be asked to construct a defensible position in response to a complex scenario rather than merely identify the relevant code.

Across these contexts, the underlying metrics are similar: clarity of reasoning, transparency of justification, consistency between technical choice and ethical claim, and awareness of wider consequence. For that reason, rubrics play a central role. They translate broad curricular intentions into criteria that students can see and that instructors can apply consistently.

A strong rubric in this framework does not reward agreement with a predetermined moral answer. It rewards disciplined reasoning. Students should be credited for identifying relevant consequences, weighing competing priorities, explaining why a choice is defensible, and recognizing limitations in their own position. This keeps assessment rigorous while avoiding the mistake of turning spiritual-ethical learning into an ideological test.

PROGRAM OUTCOMES, GRADUATE ATTRIBUTES, AND CONTINUOUS QUALITY IMPROVEMENT

At the program level, the task is to aggregate evidence across courses and determine whether the intended graduate profile is actually emerging. This is where Figure 3 becomes especially valuable. After student assessment produces evidence of technical and ethical reasoning, the framework moves to multi-level evidence analysis, explicitly labeled in the figure as a CLO-PLO-PEO report.

That detail is important because it anchors TE evaluation in the ordinary architecture of program review. Rather than inventing a separate moral-evaluation system, the framework uses the same mechanisms that engineering programs already use to analyze outcome attainment and educational effectiveness. This means TE integration can be reviewed through familiar program-level questions.

Are students across the curriculum demonstrating growth in professional judgment and responsibility, or only in technical performance? Do course-level assessments collectively support the graduate attributes the program claims to value? Are there

recurring weaknesses, such as strong analytical performance paired with weak consequence-awareness, or strong ethical language paired with weak justification quality?

When such patterns appear, they become actionable evidence rather than vague impressions. This is where CQI-based curriculum review and refinement, shown at the top right of Figure 3, becomes essential. The evidence does not remain descriptive. It leads to revision. Learning outcomes may need clarification. Design tasks may need stronger prompts for justification.

Rubrics may need clearer treatment of trade-offs and consequence-awareness. Some courses may need deeper TE integration, while others may need better sequencing within the curriculum. The loop then closes as curriculum refinement feeds back into Tawḥidic curriculum design. This is the deepest educational value of CQI in the present framework.

It prevents TE from becoming a frozen philosophical claim that programs merely repeat. Instead, it treats TE integration as something that must be tested, reviewed, and improved over time. In that sense, CQI does more than support administrative accountability. It protects curricular honesty. It ensures that the graduate profile described in the framework, a technically competent, ethically grounded, and socially responsible engineer, is not simply an aspiration stated at the end of a document, but a profile that curriculum evidence is continually asked to support.

CHALLENGES IN EVALUATING SPIRITUAL-ETHICAL LEARNING

Despite the importance of evaluation, this section must end with caution. Spiritual-ethical learning is more difficult to observe than technical accuracy, and it does not develop in a smooth or uniform way. Students may show strong judgment in one context and weak judgment in another. Some may become more reflective over time, while others may comply with the rubric language without deeply internalizing the underlying responsibility. There is also a genuine risk of oversimplification.

Once programs begin to assess ethical reasoning, they may be tempted to reduce it to checklist behavior or superficial keywords. That would weaken the framework rather than strengthen it. For that reason, evaluation in this area must remain balanced. Quantitative indicators are useful, but they are not sufficient on their own. They should be complemented by qualitative evidence such as reflective writing, project narratives, oral defense, instructor observations, and documentation of how students explain their decisions under uncertainty.

Just as importantly, the framework should state clearly what it is not trying to measure. It is not measuring spirituality as a private interior state, nor is it claiming to rank students by personal virtue. It evaluates how students reason, justify, decide, and respond to consequences in engineering contexts. That boundary is essential for academic credibility.

Seen in this way, the challenge of evaluation is not a weakness of the framework but part of its seriousness. Engineering education already accepts that important outcomes such as teamwork, leadership, and professional judgment require layered evidence rather than a single-dimensional measure. Spiritual-ethical learning should be treated with the same maturity. The goal is not perfect quantification. The goal is responsible educational judgment supported by evidence. When approached in that spirit, evaluation does not flatten TE into bureaucracy. It gives the curriculum a way to remain accountable to what it claims to value.

DISCUSSION

A curriculum not only determines what students know. It also shapes what they take seriously to learn. That is the larger significance of the framework proposed in this paper. Its contribution is not merely to place Islamic ethical language beside electrical engineering content, but to challenge the assumption that technical knowledge can be taught as if its moral meaning begins only after the equations are solved, and the system is built.

The preceding sections have argued that Tawḥidic Epistemology becomes educationally significant only when it is translated into curriculum structure, course-level practice, assessment, and continuous quality improvement. The question for discussion, then, is not whether values matter in engineering education, since that is already widely recognized, but what changes when those values are treated as epistemological foundations rather than supplementary reminders.

Beyond Value Infusion: Te As An Epistemological Framework

Much of the literature on ethics in engineering education still treats values as something added to a stable technical core (Colby & Sullivan, 2008; Martin et al., 2021). Ethics appears as a module, a code, a checklist, or a reflective discussion placed beside the real work of engineering. This paper has taken a different position. It argues that Tawḥidic Epistemology is not best understood as a strategy of value infusion, but as a framework that changes how engineering knowledge itself is understood, justified, and taught.

That distinction matters because the educational consequences are significant. If ethics is merely appended, it remains vulnerable to marginalization. Students may learn to regard it as important in principle but secondary in practice. If, however, technical knowledge is framed from the beginning as purposeful, accountable, and morally bounded, then ethical reasoning enters the curriculum not as an interruption but as part of disciplinary formation.

This is where the framework makes its clearest conceptual contribution. It moves the discussion beyond the familiar call to "integrate values" and asks a prior question: what conception of knowledge makes such integration coherent in the first place? Tawḥidic Epistemology answers that question by grounding knowledge in unity, purpose, and accountability.

That shift helps explain why foundational courses, design courses, and ethics-related courses should not carry the same kind of integration, yet should still participate in the same curricular logic. It also responds to a long-standing weakness in some Islamization efforts, where moral language is inserted into educational settings without reshaping the assumptions that organize the curriculum itself (Bakar, 2015; Hashim, 2014). In that sense, the proposed framework is not simply more detailed than a value-infusion model. It is more coherent. It asks the curriculum to change its center of gravity.

Technical Rigor As Moral Responsibility

One predictable objection is that a framework grounded in Tawḥidic Epistemology may soften technical rigor by bringing moral and spiritual concerns too close to technical work. This paper argues the opposite. The supposed tension between rigor and responsibility rests on a false contrast. In actual engineering practice, weak assumptions, careless validation, opaque reasoning, and narrow optimization do not remain harmless abstractions.

They travel outward into safety failures, inefficient systems, avoidable risk, and loss of public trust. Rigor, therefore, is never merely procedural. It already has ethical force. The course-level examples in this paper help make that point concrete. In circuits, students are expected not only to solve correctly but to justify assumptions and show why a model is appropriate.

In signals and systems, they are asked to see that fidelity, filtering, and system behavior are not purely mathematical matters once those choices shape intelligibility, privacy, or reliability in real applications. In design projects, students learn that optimization alone is an incomplete measure of engineering success if safety, accessibility, sustainability, or long-term consequences are ignored. None of these expectations weakens technical depth. They intensify it by refusing to separate correctness from responsibility.

This is one of the strongest implications of the framework. Tawḥidic Epistemology does not ask engineering education to become less exact. It asks it to become more answerable. Accuracy, transparency, validation, and defensible judgment remain at the

center, but they are no longer treated as neutral habits of method. They become part of the engineer's moral discipline.

That reframing is powerful because it changes the educational meaning of rigor itself. Students are not simply being trained to solve correctly. They are being trained to justify responsibly. Studies in engineering ethics education support this broader view by suggesting that integrated ethical reasoning can deepen reflection and strengthen accountable decision-making without diminishing technical performance (Banks & Lachney, 2017; Schmidt, 2014).

Transferability Of The Framework Beyond Electrical Engineering

Although this paper focuses on electrical engineering, the proposed framework is not confined to any single discipline. Its transferability, however, should be understood carefully. What transfers is not a fixed set of examples or identical course designs, but a curricular logic. The framework can travel because it operates at the level of epistemological grounding, curriculum structure, learning outcomes, assessment, and CQI.

Those are features shared across engineering education more broadly. What does not transfer automatically is the technical translation. Each discipline would need to work out its own points of ethical pressure, characteristic decisions, and forms of consequence. That distinction is important because earlier versions of the paper risked sounding too generic.

A better claim is therefore a more disciplined one: *the framework is transferable in structure, but not uniform in application*. In civil engineering, the emphasis may fall more heavily on public safety, infrastructure resilience, and environmental stewardship. In computer engineering or computing-related programs, issues such as privacy, algorithmic bias, cybersecurity, and data governance may become more central.

In biomedical engineering, the framework may need to engage more directly with patient safety, regulation, and vulnerability. The underlying logic remains stable, but each discipline must rewrite the framework in its own technical language. This is not a weakness. It is a sign that the framework respects disciplinary reality. Engineering ethics is most educationally effective when it is context-sensitive rather than generic, and the same should be true for a Tawḥidic curriculum model (Monteiro et al., 2019; Swartz, 2021).

The contribution of this paper, then, is not to provide a ready-made template for all engineering programs. It is to show how one technically demanding field can be used to develop a structured model that others may adapt with disciplinary care.

Implications For Islamic Higher Education And Engineering Education

The broader importance of this framework lies in what it makes possible for Islamic higher education. Many institutions speak convincingly about integrating faith and knowledge, yet the practical translation of that aspiration into technical curricula remains uneven. The challenge is not usually at the level of principle. It is at the design level. Mission statements may affirm holistic education, but course structures, assessment systems, and program reviews often continue to operate as though technical and moral formation belong to separate spheres.

The framework proposed in this paper addresses that gap by offering a curriculum-level pathway from worldview to educational practice. That has immediate implications for graduate formation. If programs adopt this approach seriously, students are not only trained to perform technically; they are also trained to justify decisions, recognize system-level consequences, and understand professional work as a form of accountable stewardship.

In this sense, the framework shifts the definition of success. A successful graduate is not merely one who can optimize, calculate, or implement. A successful graduate is one who can do those things while also carrying judgment, responsibility, and awareness of impact. That is a meaningful contribution to the educational aims of Islamic universities,

particularly in technical fields where integration often remains more declarative than operational.

At the same time, the significance of the framework extends beyond Islamic institutions. It also speaks to wider debates in engineering education about responsible innovation, sustainability, safety, and the human consequences of technical systems. The language of Tawḥidic Epistemology is rooted in a specific intellectual tradition, but the curricular challenge it addresses is widely shared: how to educate engineers whose competence is not detached from conscience.

By showing that a faith-grounded epistemology can be translated into learning outcomes, course design, assessment, and CQI without abandoning rigor or the logic of accreditation, the paper opens a broader conversation. It suggests that epistemology matters in curriculum design more than engineering education sometimes admits. That may be its most enduring implication.

A final point of caution remains necessary. The framework is still conceptual. Its long-term value will depend on implementation, institutional willingness, educator readiness, and careful empirical study of how students actually respond to the proposed forms of integration. Not every program will translate the framework in the same way, and not every context will support the same depth of curricular change. Even so, conceptual clarity matters. Engineering curricula cannot be evaluated for meaningful integration until they are first designed to make integration visible, teachable, and assessable. That is the space this paper has tried to open.

CONCLUSION

This paper argues that Tawhidic Epistemology will remain a noble aspiration in engineering education unless it is translated into the ordinary but decisive machinery of curriculum design: course structure, learning outcomes, teaching activities, assessment, and continuous quality improvement. The main contribution of the paper is therefore not to add another call for ethical integration, but to show how such integration can be organized coherently in electrical engineering without weakening technical rigor or disrupting outcome-based and accreditation-driven practices.

By grounding the curriculum in Tawhid, linking knowledge formation to waḥy and ʿaql, framing engineering work through amānah and ʿibādah, and evaluating practice through maqāṣid al-sharīʿah, the proposed framework redefines engineering education from the inside. Foundational courses are no longer only places for mastering equations and methods, but for cultivating disciplined, transparent, and responsible reasoning.

Design courses become spaces where students must defend choices in light of safety, sustainability, equity, and public consequence. Ethics-related courses then consolidate, sharpen, and test forms of judgment that should already be growing across the program. In this way, the paper shifts the meaning of successful engineering education from solving correctly alone to judging responsibly under real constraints.

Its broader significance lies in showing that epistemological integration need not remain symbolic, nor require a parallel educational system; it can be embedded within existing curricular and quality-assurance structures in ways that are both intellectually serious and practically workable. At the same time, the paper's claims remain appropriately bounded.

This is a conceptual curriculum framework study, not a report of full-scale implementation. Its value will ultimately depend on how well institutions, instructors, and programs can translate the model into sustained practice, evidence, and refinement. Future research should therefore examine how TE-informed curriculum design shapes student reasoning over time, how instructors negotiate its demands in technically intensive courses, and how CQI processes can capture meaningful evidence of ethical-professional formation without reducing it to simplistic measurement.

The real test of the framework is whether it can help produce engineers who are not only technically competent but also trustworthy in judgment, accountable in action, and conscious of the human and societal weight of the systems they create.

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