



An Outcome-Based Bachelor-Master Fast-Track Framework for Mining Engineering

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Abstract

Bachelor-master fast-track programs can improve progression efficiency, but acceleration can also create workload, credit-recognition, research-continuity, and quality-assurance risks. This study develops an Outcome-Based Education (OBE)-oriented academic and governance framework for a Mining Engineering fast-track pathway. The study uses institutional research based on policy and standards review, benchmarking of comparable Indonesian fast-track schemes, structured analysis of institutional documents, gap analysis, and design synthesis. The proposed model selects students at the end of semester six and introduces a controlled transition in semesters seven and eight, while participants retain undergraduate status until undergraduate graduation. The framework integrates undergraduate and master's learning outcomes, approved master-level courses, research continuity, equivalent assessment standards, mentoring, formal credit recognition, staged monitoring, and auditable evidence. Institutional analysis identified conflicting provisions in earlier communication materials and the 2026 guide, particularly concerning GPA, study duration, credits, and the timing of undergraduate graduation. The main contribution is an integrated framework that treats fast-track education not merely as accelerated course-taking, but as an OBE-based quality-assurance system linking admission, curriculum, research, governance, and continuous improvement. The framework should be validated through a limited pilot cohort before wider implementation.

Keywords: *Fast-Track Program, Outcome-Based Education, Engineering Education, Mining Engineering, Quality Assurance*

INTRODUCTION

Engineering education is increasingly expected to demonstrate measurable graduate capabilities rather than only the accumulation of course credits. Outcome-Based Education (OBE) therefore emphasizes alignment among intended learning outcomes, curriculum, teaching and learning activities, assessment, and continuous improvement.

Recent engineering-education studies show that OBE implementation depends not only on curriculum design but also on student readiness, institutional support, assessment reliability, and the capacity to produce auditable evidence (Katawazai, 2021; Yasmin & Yasmeen, 2021; Khan et al., 2023; Ngu et al., 2022). In Indonesia, these expectations operate within a national higher-education quality-assurance framework (Ministry of Higher Education, Science, and Technology, 2025; Republic of Indonesia, 2012). These requirements matter especially when an academic pathway accelerates progression across qualification levels.

A bachelor-master fast-track program can give high-achieving students earlier exposure to advanced coursework and a more continuous research pathway. Official Indonesian schemes at ITB, UGM, ITS, and UI illustrate variations of this accelerated architecture, generally combining undergraduate study with selected master-level learning before formal transition to the master's program (Institut Teknologi Bandung, 2026; Institut Teknologi Sepuluh Nopember, 2026; Universitas Gadjah Mada, 2026; Universitas Indonesia, 2025).

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Indonesian research on fast-track development also indicates that institutional needs analysis and explicit standard operating procedures are important for implementation ([Ekowati et al., 2023](#)). However, acceleration can create additional workload, scheduling, assessment, and administrative risks if the transition is not systematically governed.

OBE provides a useful basis for addressing these risks because the legitimacy of an accelerated pathway depends on demonstrated learning outcomes rather than on the number of semesters saved. Studies of engineering accreditation and outcome assessment emphasize explicit graduate-attribute mapping, valid assessment evidence, and continuous quality improvement ([Alhorani et al., 2021](#); [Goyal et al., 2022](#); [Ngu et al., 2022](#); [Mahalingam, 2026](#)).

Recent work also shows that direct and structured measurement of learning outcomes can strengthen evidence for program improvement and accreditation ([Hernández-Campos et al., 2025](#)). For a bachelor-master pathway, this implies that master-level courses taken before undergraduate graduation should have a defined contribution to higher-level outcomes and should be assessed using academically equivalent standards.

The Mining Engineering Study Program at Universitas Pembangunan Nasional “Veteran” Yogyakarta has prepared a 2026 fast-track implementation guide, along with an associated policy, implementation module, and standard operating procedure package. These institutional documents establish admission thresholds, study loads, research continuity, monitoring provisions, and a ten-semester target.

This institutional analysis also identifies inconsistencies between communication materials and the final guide, including differences in GPA thresholds, credit references, study duration, and the stated semester of undergraduate graduation. Such inconsistencies are not merely editorial issues because they can affect student eligibility, academic status, and the auditability of program implementation.

Accordingly, this study addresses three questions: (1) what institutional conditions and design gaps affect the proposed fast-track program; (2) how should admission, curriculum integration, research continuity, mentoring, credit recognition, and quality assurance be designed; and (3) what controls are required before implementation?

The objective is to develop a coherent OBE-based academic and governance framework for a Mining Engineering bachelor-master fast-track pathway. The framework is intended to complement, rather than replace, formal institutional regulations and accreditation requirements.

LITERATURE REVIEW

OBE shifts attention from what institutions teach to what students can demonstrate at the end of a learning process. In engineering education, this principle is operationalized through graduate attributes, program outcomes, course outcomes, assessment evidence, and continuous improvement, consistent with international graduate-attribute expectations ([International Engineering Alliance, 2021](#)).

[Katawazai \(2021\)](#) reported that OBE implementation can be constrained by curriculum, assessment policy, infrastructure, and faculty workload, while [Yasmin and Yasmeen \(2021\)](#) found that OBE can improve course learning outcomes but requires institutional and faculty readiness. These findings indicate that an OBE-based fast-track program must be designed as an institutional system rather than as an isolated acceleration mechanism.

Engineering accreditation increasingly requires reliable evidence that intended outcomes are actually attained. [Ngu et al. \(2022\)](#) describe alternative models for measuring engineering graduate-attribute attainment, while [Goyal et al. \(2022\)](#) demonstrate the value of linking course-level assessment with broader program attainment. [Hallberg and Ölvander \(2022\)](#) show how curriculum design can affect engineering student performance, while [Hu et al. \(2023\)](#) further show

that OBE-oriented curriculum reform benefits from systematic alignment of learning objectives, learning activities, assessment, and student development.

More recent work by [Hernández-Campos et al. \(2025\)](#) emphasizes standardized direct measurement of learning outcomes, and [Mahalingam \(2026\)](#) proposes a scalable framework using anchor assessments and performance indicators to support quality assurance. Together, these studies support an undergraduate-master learning-outcome matrix, equivalent assessment standards, and auditable evidence in an accelerated pathway.

Fast-track pathways aim to shorten progression from undergraduate to postgraduate study without lowering qualification standards. In Indonesia, [Ekowati et al. \(2023\)](#) demonstrate the importance of needs analysis and SOP development when establishing a fast-track pathway. Official university schemes further show that advanced courses may be introduced during the final undergraduate stage and subsequently recognized after the bachelor's degree is completed ([Institut Teknologi Bandung, 2026](#); [Universitas Gadjah Mada, 2026](#)).

Evidence from engineering accreditation practice also suggests that curriculum planning, documented processes, and continuous improvement are central to sustaining quality ([Alhorani et al., 2021](#)). The literature therefore suggests that the key design problem is not simply how to compress study duration, but how to control the academic transition between two qualification levels.

Existing literature provides substantial guidance on OBE implementation, graduate-attribute assessment, curriculum reform, accreditation, and selected fast-track practices. However, these strands are rarely integrated into a single operational framework for Mining Engineering that simultaneously specifies admission readiness, cross-level curriculum mapping, undergraduate-master's research continuity, credit recognition, governance, monitoring, and evidence management.

This study addresses that gap by synthesizing those elements into an institutional framework. Its novelty lies in treating the fast-track pathway as an OBE-based quality-assurance architecture in which acceleration is permitted only when readiness, learning-outcome progression, assessment equivalence, research continuity, and documentary accountability are controlled together.

RESEARCH METHOD

The study applied institutional research with an academic policy-design orientation. The methodological design combined document analysis, benchmarking, and gap analysis. Document analysis systematically examined institutional and regulatory documents to identify relevant provisions, inconsistencies, and implementation requirements ([Bowen, 2009](#)).

Benchmarking identified comparable institutional practices, organized benchmark partners according to predefined criteria, and compared recurring design features for adaptation to the institutional context ([Spendolini, 1992](#)). Gap analysis identified differences between existing institutional arrangements and the desired OBE-based fast-track framework ([Kim & Ji, 2018](#)).

The unit of analysis was the proposed bachelor-master fast-track system in Mining Engineering. Internal sources comprised the 2026 fast-track implementation guide, the associated policy-module-SOP document, the institutional research proposal, proceedings manuscript, communication materials, and the eight-month research schedule. External sources comprised Indonesian higher-education regulations, engineering-accreditation and OBE literature, and official information on comparable fast-track programs.

Benchmark institutions were included when four criteria were met: (1) an official bachelor-to-master or integrated fast-track pathway was publicly documented; (2) the scheme allowed master-level learning before or immediately after undergraduate completion; (3) sufficient

information was available on admission, study structure, or credit recognition to permit comparison; and (4) the institutional context was sufficiently comparable to engineering higher education. ITB, UGM, ITS, and UI met these criteria and were used to identify recurring design features rather than to claim statistical representativeness.

Document analysis used a structured extraction matrix covering admission criteria, student status, curriculum and credit recognition, research continuity, mentoring, monitoring, quality assurance, and implementation risks. The authors extracted relevant information from the documents using this structured matrix. The authors then cross-checked the extracted information. Any differences in interpretation were discussed and resolved by consensus based on the source documents. Unresolved differences were reported as documented inconsistencies.

Table 1. Institutional Research Stages

Stage	Activity	Output
1	Policy and standards review	Regulatory map and quality requirements
2	Benchmarking and needs synthesis	Design criteria and institutional needs
3	Academic and operational design	Program architecture, admission, curriculum, and SOPs
4	Consistency, risk, and quality analysis	Document corrections and implementation controls
5	Scientific and institutional outputs	English paper, final report, policy recommendations

FINDINGS AND DISCUSSION

Institutional Rationale and Benchmarking

The proposed program has three institutional rationales. First, it creates a structured progression route for high-achieving undergraduate students. Second, it strengthens research continuity by positioning the undergraduate final project as a foundation for the master's thesis. Third, it adds an academically distinctive pathway to the Mining Engineering program. These benefits are conditional. Acceleration can generate overload, delayed undergraduate completion, and weak credit administration when governance is incomplete.

Benchmarking indicates a common architecture across Indonesian fast-track schemes. Admission occurs near the end of the sixth semester. Master-level courses are taken during semesters seven and eight. Students remain subject to undergraduate graduation requirements before formal transition to the master's program. GPA thresholds, English proficiency, credit prerequisites, and faculty approval are widely used as readiness controls ([Institut Teknologi Bandung, 2026](#); [Institut Teknologi Sepuluh Nopember, 2026](#); [Universitas Gadjah Mada, 2026](#); [Universitas Indonesia, 2025](#)). The UPNVY model follows this architecture but uses institution-specific thresholds.

The proposed framework extends existing fast-track schemes by integrating six controls into one OBE-oriented architecture: readiness-based admission, explicit undergraduate-master learning-outcome mapping, controlled cross-level coursework, research continuity, formal credit recognition, and evidence-based quality assurance. Existing benchmark schemes provide useful structural precedents, but this framework explicitly links these components to governance roles, staged monitoring, and document harmonization in a Mining Engineering context.

Table 2. Benchmark-Derived Design Principles

Design feature	Benchmark pattern	Institutional implication
Admission Timing	End of year three or semester six	Allows academic records and research readiness to be evaluated.
Overlap Period	Semesters seven and eight	Provides time for approved master's courses without removing undergraduate obligations.
Academic Threshold	GPA, credits, language, and faculty approval	Controls overload and progression risk.
Status Transfer	After undergraduate graduation	Preserves the legal and academic distinction between degrees.
Research Integration	Undergraduate project linked to master's thesis	Reduces duplication while requiring greater research depth.

Proposed Academic Architecture

The proposed pathway comprises 144 Indonesian semester credit units (sks) at undergraduate level and 54 sks at master's level. Students apply at the end of semester six and enter the transition phase in semester seven. During semesters seven and eight, participants remain undergraduate students, complete approved master-level courses, and prepare an undergraduate final project with a documented thesis-development pathway. The university issues formal master status and a master student identification number only after undergraduate graduation. Semesters nine and ten focus on the remaining master's courses, thesis completion, presentation, and publication.

Table 3. Proposed Ten-Semester Academic Pathway

Period	Status	Primary function
Semesters 1-6	Undergraduate	Core and disciplinary learning; GPA maintenance; research interest development.
End Of Semester 6	Applicant	Document verification, academic selection, recommendations, and funding confirmation.
Semesters 7-8	Fast-track participant, undergraduate status	Approved master's courses, undergraduate research, cross-level mentoring, and workload monitoring.
After Undergraduate Graduation	Master student	Formal status transfer and recognition of approved master's-level results.
Semesters 9-10	Master student	Remaining courses, thesis, publication, and final quality evaluation.

OBE and Accreditation Alignment

The critical design requirement is a formal mapping between undergraduate and master's learning outcomes. Master-level courses taken during the transition phase must satisfy prerequisites, extend rather than repeat undergraduate competence, and contribute to master-level outcomes or thesis preparation. Participants should be assessed using the same standards as regular master's students. This maintains qualification-level integrity and produces evidence suitable for internal quality assurance and accreditation review.

Table 4. OBE Alignment and Auditable Evidence

Element	Required instrument	Quality function
Learning Outcomes	Undergraduate-master outcome matrix and course contribution map	Prevents duplication and outcome gaps.
Transition Courses	Prerequisites, workload limits, and program approval	Ensures readiness and manageable study load.
Assessment	Regular master's course rubrics and passing standards	Preserves equivalent academic quality.
Research	Undergraduate-thesis continuity plan and monthly mentoring log	Combines efficiency with increased research depth.
Continuous Improvement	Annual analysis of outcomes, delays, risks, and stakeholder feedback	Closes the quality-assurance cycle.

Admission and Readiness Controls

The 2026 institutional guide requires active undergraduate status, a minimum GPA of 3.25, TOEFL and academic potential test scores of at least 475, two recommendations from doctoral faculty members and/or faculty members holding at least a senior lecturer rank, documented financial support, and an undergraduate research synopsis that can be developed into a master's thesis ([Mining Engineering Study Program, 2026a, 2026b](#)).

These requirements represent complementary controls. Academic records indicate consistency, standardized tests indicate readiness, faculty recommendations provide professional judgment, the synopsis tests research continuity, and funding documentation reduces the risk of non-academic attrition.

Governance, Monitoring, and Institutional Performance

Governance should separate policy authorization, academic delivery, administrative verification, and quality audit. The faculty and university authorize the pathway and appoint the selection team. Undergraduate and master's program leaders approve courses, mentors, and research continuity.

Academic administration manages registration, status, results, and formal transfer. The quality-assurance unit verifies evidence and follow-up. The evidence structure should also support institutional performance monitoring and quality indicators used in higher-education reporting ([Ministry of Education, Culture, Research, and Technology, 2023](#)).

Monitoring should occur at three levels. The first level evaluates admission and transition readiness in semesters six and seven. The second evaluates undergraduate completion, master's course performance, and status-transfer readiness in semester eight. The third evaluates master's GPA, thesis progress, publication, and completion in semesters nine and ten. Annual program evaluation should examine curriculum effectiveness, faculty workload, documentation quality, participant experience, and institutional outcomes.

The model can support graduate progression, research productivity, curriculum relevance, and governance. These contributions require evidence. Participant decrees, study records, assessment results, mentoring logs, graduation data, theses, publications, monitoring reports, and corrective actions should be stored in a structured digital repository.

Document Harmonization and Implementation Risks

Document analysis identified several inconsistencies. Early communication material used a GPA threshold of 3.20, a ten-to-eleven-semester pathway, and a 110-credit reference. In contrast,

the 2026 guide specifies a GPA of 3.25, TOEFL and academic potential test thresholds of 475, 144 undergraduate sks, 54 master sks, and ten semesters.

The guide also states in its general provisions that students receive master's status after undergraduate graduation in semester eight, but its evaluation section requires undergraduate graduation in semester seven. The latter statement should be revised to semester eight to align with the program architecture.

Table 5. Major Implementation Risks and Controls

Risk	Potential effect	Control
Excessive workload	Lower GPA or delayed final project	Limit transition courses and conduct monthly reviews.
Weak research continuity	Thesis restart and longer duration	Require an approved synopsis and early master-supervisor involvement.
Delayed credit recognition	Incomplete master records	Use a formal transfer SOP and documented deadlines.
Different assessment standards	Unverifiable academic equivalence	Apply regular master-course rubrics and standards.
Conflicting documents	Inconsistent information for students and staff	Use one controlled master document and version management.
Incomplete evidence	Weak audit and accreditation readiness	Use a digital checklist and centralized repository.

Implementation Recommendations

Based on the findings and identified implementation risks, the following sequence is recommended for institutional implementation. First, issue formal institutional authorization and appoint responsible units. Second, formally approve the undergraduate-master learning-outcome matrix, transition-course list, credit-recognition rules, mentoring system, and monitoring instruments.

Third, harmonize all guides, posters, forms, and web information under one controlled master document and version-management system. Fourth, the framework should be tested through a limited pilot cohort. Fifth, the institution should evaluate one complete implementation cycle before increasing cohort size. This sequence is intended to reduce regulatory, academic, administrative, and quality-assurance risks identified in the institutional analysis.

CONCLUSIONS

This study addressed three research questions concerning the institutional conditions and design gaps, the required academic and governance architecture, and the controls needed before implementation.

Taken together, the findings clarify the institutional conditions and design gaps, define the academic and governance architecture, and identify the controls required before implementation. The analysis shows that implementation depends on clear student readiness requirements, cross-level curriculum integration, research continuity, formal credit recognition, staged monitoring, and consistent institutional documentation.

The proposed framework integrates selective admission, an OBE-based undergraduate-master learning-outcome matrix, controlled transition coursework, research continuity, equivalent assessment standards, mentoring, and auditable quality-assurance evidence into a single institutional architecture. This approach positions acceleration as a controlled transition between

qualification levels rather than simply a reduction in study duration.

Before implementation, the institution should harmonize conflicting provisions in its operational documents, formally authorize the program, approve the curriculum and quality-assurance instruments, and test the system through a limited pilot cohort. The framework therefore provides an institutional design basis for managing academic and governance requirements while maintaining qualification-level integrity.

The institutional analysis identified several conditions affecting implementation, including student readiness requirements, cross-level curriculum integration, research continuity, credit recognition, monitoring, and documentary consistency. It also identified inconsistencies in earlier communication materials and the 2026 guide concerning GPA thresholds, study duration, credit references, and the stated semester of undergraduate graduation.

In response, the study developed an OBE-based academic and governance framework integrating selective admission, an undergraduate-master learning-outcome matrix, controlled master-level coursework, research continuity, formal credit recognition, equivalent assessment standards, mentoring, and staged monitoring. The framework links acceleration to demonstrated learning outcomes and quality-assurance evidence rather than treating fast-track education as a simple reduction in study duration.

Before implementation, the institution must secure formal authorization, harmonize operational documents, approve curriculum and credit-recognition rules, define mentoring and monitoring instruments, centralize evidence management, and establish a limited pilot cohort. One complete pilot cycle should be evaluated before wider implementation.

Theoretically, this study contributes an OBE-based quality-assurance perspective to bachelor-master fast-track program design by conceptualizing acceleration as a controlled transition between qualification levels rather than solely as a shortened study pathway. This perspective integrates readiness, learning-outcome progression, assessment equivalence, research continuity, governance, and documentary accountability into a single conceptual architecture.

LIMITATIONS & FURTHER RESEARCH

This study develops and evaluates an institutional design rather than empirical program outcomes. No fast-track participant cohort had completed the proposed pathway at the time of analysis, so the framework has not yet been tested against actual completion time, workload, academic performance, thesis progress, or student satisfaction. The benchmark analysis was also limited to officially documented schemes at selected Indonesian universities, and institutional documents may not capture all implementation practices.

Further research should evaluate the framework through a limited pilot cohort and longitudinal monitoring. Future evaluation should examine progression and completion time, course performance, workload, research and publication continuity, mentoring effectiveness, student and faculty experience, credit-recognition accuracy, and quality-assurance evidence. Comparative analysis across additional engineering programs can then test the framework's transferability beyond Mining Engineering.

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