# Philosophy for Engineers

## IIT Gandhinagar Experience

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Indian Institutes of Technology (IITs), currently numbering 23, are some of India's most well-funded, competitive, and research-focused technology institutions. After Independence, the Nehru government decided to set up the four IITs – Kharagpur, Bombay, Madras, and Kanpur – on the recommendation of the Sarkar Committee. The objective was to empower independent India with trained engineers to meet its developmental aspirations. The Sarkar Committee report outlined the nature, structure, and curriculum of the IITs, designating the Massachusetts Institute of Technology as the model for these aspirational science-based engineering and technology institutions.



Fig. 1: Jaison Manjaly interacting with undergraduate students. (Photo courtesy of Devarsh Barbhaya, 2022)

As a Professor of Humanities and Social Sciences at IIT Gandhinagar, a second-generation IIT, I have been teaching 'Introduction to Philosophy' as a core Liberal Arts course since the inception of the Institute in 2008. The curriculum across IITs includes provisions for Liberal Arts, promoting a more inclusive educational approach. However, the number of credit requirements varies across institutions. It has been challenging and, at the same time, transformative to engage the engineering community at IITGN with Liberal Arts and its relevance to the overall academic experience and futuristic possibilities. The primary objective of this essay is to provide context and perspective on the Liberal Arts courses at IITGN, specifically my experiences and encounters with teaching philosophy to engineering undergraduate students.

Since the establishment of the first IIT in Kharagpur in 1951, the IITs have evolved into premier institutions known globally for their rigorous academic programs and research. Admission to IITs is highly competitive, with students needing to clear the Joint Entrance Examination (JEE), one of the toughest entrance exams in the world. The IITs have become renowned, mainly due to the remarkable achievements of their alumni, both in India and particularly in the United States. This reputation is not just a result of the academic prowess of the graduates; it also stems from the robust institutional framework. The autonomy and transparency embedded in the IIT system have played a pivotal role in making these institutions accessible to a broader demographic, including those from socially and economically disadvantaged backgrounds and the middle class.

The undergraduate program at IITs has gained such prestige that preparation for the JEE often begins as early as the eighth grade. This early start is driven by the competitive nature of the exam, social prestige, and parental and peer pressure.

As a result, students frequently migrate to coaching hotspots, such as Kota and Hyderabad, known for their specialized JEE coaching centers. This migration and the intense focus on exam preparation have significant implications for the overall learning patterns, outcomes, and well-being of students. In terms of learning patterns, the JEE preparation requires only an advanced ability to crack multiple-choice questions in physics, chemistry, and mathematics. The coaching industry for JEE has evolved into a billion-dollar enterprise in India, exerting considerable influence over the broader educational landscape. Schools and other educational institutions often feel compelled to align their curricula with the demands of the coaching industry, leading to what can be termed a JEE-driven educational framework. This framework dictates not only what students should learn but also what non-essential "distractions" should be minimized or eliminated.

One of the most significant casualties of this JEE-centric education framework is the marginalization of liberal arts and sports. These are often deemed non-essential for cracking the JEE and are consequently neglected or eliminated from the school curriculum. This elimination, however, is not without consequences. It narrows the educational experience, depriving students of a holistic education that fosters critical thinking, creativity, and socio-emotional intelligence. The impact of this system extends beyond curricular choices. The pressure to succeed in the JEE has led to the emergence of "dummy schools," where students are nominally enrolled but rarely attend classes. Instead, they focus solely on JEE preparation, often under the aegis of coaching institutes. These ghost schools represent a significant shift in the educational design, where the traditional role of schools as centers of holistic learning is undermined in favor of a single-minded pursuit of engineering college admissions. Hence, most

students entering the IIT system have minimal exposure to curiosity-driven engagement with the liberal arts.

The predominant motivation for preparing for the Joint Entrance Examination (JEE) is often to secure a place in these prestigious institutions rather than a genuine passion for the subjects. It is also driven by the possibility of securing a high-paying job immediately after the undergraduate program. During the 2023-2024 academic year, approximately 1.5 million students appeared for the JEE, with the majority having undergone at least two years of intensive coaching. These students excel in multiple-choice logical-mathematical problem-solving, a skill honed through rigorous training. This narrow focus leads to cognitive fatigue and a conditioned worldview. As a result, students often find domains of learning outside this framework challenging and uninteresting. For instance, these students struggle significantly if asked to write an essay or to analytically engage with abstract questions. This learning disparity highlights a critical issue: the need for a broader educational approach that cultivates diverse cognitive abilities.

Recognizing these challenges among incoming students, IIT Gandhinagar (IITGN) has embarked on a mission to transform its undergraduate education. The goal is to enable IITGN students who are not only proficient in logical-mathematical problem-solving but also adept at addressing complex problems in social, scientific, and engineering domains. This requires skills such as divergent thinking, design approaches, open-ended problem-solving, thought experiments, the art of argumentation, curiosity-driven learning, encounters with various art forms, and creative thinking. To achieve this holistic educational vision, IITGN has implemented several initiatives. These include a foundation program, general education and liberal arts courses, and a physical education program. Each initiative is designed to offer broad-based education and interdisciplinary engagement.

The 'foundation program' is a four-week, full-time induction program that aims to acclimatize incoming undergraduate students to the broader thinking process, including domains like leadership skills, societal engagement, ethics, and interdisciplinary academic pursuits. A significant initiative involves integrating substantial liberal arts course requirements into the undergraduate engineering curriculum. This inclusion mandates that at least 20 percent of the existing curriculum be dedicated to liberal arts and general education courses.

One such mandatory course has been "Introduction to Philosophy," which provides a foundational understanding of philosophical concepts and critical thinking skills. As the instructor of this course since the Institute's inception in 2008, I have had the privilege of teaching all undergraduate students graduated from IIT Gandhinagar. Teaching philosophy to engineering students, while not uncommon, was a new experience for me when I began. There were 90 students in my class in 2009, and today, it is close to 400 students. I initially struggled to engage them and spark their interest in philosophy. However, when I viewed my class as a theater of philosophy, it changed everything. Central to this theater is the performance of discussions and debates that challenge dogmatic thinking and fundamental assumptions, seeking to define ostensibly inconsequential ideas and concepts that are otherwise considered simple, mundane, and "understood." To make philosophy more accessible and engaging, I incorporate real-life examples and anecdotes into my lectures. This approach helps simplify abstract concepts and demonstrates how these concepts emanate from lived experiences. By context-ualizing philosophical ideas, students can see the relevance of these ideas to their own experiences. As part of the course, I incorporate the screening of four selected films: *12 Angry Men*, *The Matrix*, *Judgment at Nuremberg*, and *Jai Bhim*. Each film serves a distinct educational purpose, contributing to the course's overarching goal of fostering critical thinking, ethical reasoning, and a nuanced understanding of philosophical concepts.

*12 Angry Men* is instrumental in sensitizing students to logical fallacies. This classic film portrays a jury deliberating the guilt or innocence of a defendant, highlighting how personal biases, emotional appeals, and flawed reasoning can influence decision-making. Through the characters' interactions, students learn to identify and critique logical fallacies such as ad hominem attacks, false dilemmas, and hasty generalizations. This film serves as a practical demonstration of the importance of rigorous, unbiased reasoning in reaching sound conclusions. *The Matrix* introduces students to alternative possibilities, thought experiments, and counterfactual thinking. The film's premise – a dystopian reality where humans live in a simulated world – challenges viewers to question the nature of reality and the reliability of their perceptions. This aligns with philosophical discussions on skepticism, the nature of consciousness, and metaphysics. By engaging with the film's narrative, students explore thought experiments similar to René Descartes' evil demon hypothesis or Hilary Putnam's brain in a vat scenario, encouraging their ability to entertain and critically analyze radical philosophical ideas.

*Judgment at Nuremberg* and *Jai Bhim* are pivotal in introducing the art of argumentation and the concept of justice. Judgment at Nuremberg recounts the post-World War II trials of Nazi war criminals, delving into complex ethical questions about responsibility, obedience, and the nature of justice. It provides a historical context for discussing moral relativism, the principles of just war theory, as well as the legal versus moral obligations of individuals. Through the powerful courtroom arguments, students learn the structure of persuasive argumentation, the importance of evidence, and the ethical complexities of justice. *Jai Bhim*, on the other hand, focuses on contemporary issues of social justice and legal advocacy in India. The film follows the struggle of marginalized communities seeking justice within a flawed legal system. It offers a compelling narrative that addresses themes of systemic discrimination, human rights, and the rule of law. By examining the film, students gain insights into the practical application of justice theories, the role of empathy in ethical reasoning, and the significance of legal and social reforms in achieving equitable outcomes.

Films, being a popular and engaging medium among students, significantly facilitate the contextualization of the content and objectives of the course. They bridge the gap between abstract philosophical concepts and real-world applications, making the material more relatable and comprehensible. Film screenings in the curriculum create an immersive learning experience that not only captivates students' interest but also deepens their understanding of critical philosophical issues.

While teaching philosophy, I realized that it is insufficient to merely cover topics like metaphysics and epistemology. It is crucial to examine and evaluate students' metaphysical and epistemic worldviews. Just as learning engineering requires designing experiments to test its premises, philosophy necessitates exploring broader topics like knowledge, mind, truth, God, empathy, and justice through thought experiments. These exercises have proven effective in engaging students in discussions and encouraging them to think critically about their beliefs. For instance, discussions on the nature of knowledge can involve examining the classic Gettier problem, which challenges the traditional definition of knowledge as justified true belief. By considering scenarios where one has a justified true belief that does not constitute knowledge, students can explore the nuances of epistemology and the conditions under which knowledge is obtained.

Similarly, exploring the mind-body problem can lead to engaging in thought experiments such as the "philosophical zombie" or the "Chinese room," through which students can delve into the complexities of consciousness and the relationship between mental and physical states. In examining the concept of justice, students can engage with various theories, including utilitarianism, deontology, and virtue ethics. Thought experiments like the "trolley problem" can help students understand the ethical implications of different actions and the trade-offs involved in decision-making processes.

Engaging students and the broader community in philosophical discussions presents significant challenges, particularly when the topics conflict with their existing beliefs and frameworks. Students often react with immediate denial when confronted with ideas that challenge their worldview, such as the possibility that mental functions are identical to brain functions, the notion that mathematics is a language representing reality like any other language, or the idea that experience is not a necessary condition for knowledge. The primary challenge lies in encouraging students to entertain scenarios that do not necessarily align with their preconceived notions. I encourage students to challenge dogmatic beliefs and question fundamental assumptions. Through structured debates and discussions, students learn to articulate their ideas clearly, consider alternative viewpoints, and develop a deeper understanding of complex issues. This process not only enhances their philosophical acumen

but also cultivates essential skills such as analytical thinking, effective communication, and collaborative problem-solving.

I have sought to innovate the course evaluation method to better align with the objectives of the "Introduction to Philosophy" course. Attendance at sessions is not mandatory, allowing students to choose how they engage with the material. However, those who attend class regularly can earn up to 20 percent of their grade, recognizing the value of active participation in discussions. Another 20 percent of the grade is allocated for journal writing and library visits. Students who write a 500-word essay each week on a philosophical topic and visit the library at least three times a week can earn these marks. This encourages consistent engagement with philosophical literature and reflective writing. A significant portion of the grade (30 percent) is based on a one-on-one conversation with the instructor at the end of the semester. During this conversation, students discuss topics of their interest, demonstrating their understanding and ability to engage with philosophical concepts. This personalized evaluation method allows for a more nuanced assessment of the students' intellectual growth and engagement with the course material. The remaining 30 percent of the grade is assigned to two written assignments, one due before the mid-semester and the other after. These assignments require students to explore philosophical issues in depth, apply critical thinking skills, and articulate their ideas coherently. This innovative evaluation approach aims to balance structured assessments with flexible, student-centered learning opportunities. By incorporating diverse methods of evaluation, the course encourages students to engage with philosophy in ways that go beyond traditional exam-based assessments.

People within and outside IIT Gandhinagar are often surprised to learn that I teach "Introduction to Philosophy" to undergraduate engineering students. Their surprise stems from the perceived incongruity of having a philosophy professor and a philosophy course at an IIT, which, according to them, is primarily focused on engineering and technology. They also hold misconceptions about philosophy, viewing it as esoteric or synonymous with spirituality, religion, or abstract discussions about life and the divine. When I engage in conversations about my role, a common question arises: Do I teach Western philosophy or Indian philosophy? My response has been that philosophy transcends geographical or cultural boundaries; it is fundamentally an approach and inquiry into the essential aspects of existence and thought. Philosophy encompasses a broad range of subjects, including facts, ideas, being, truth, knowledge, justice, god, mind, and self. Philosophy, in essence, encourages a deeper examination of the world around us. This inquiry is not confined to any tradition or culture but is a universal endeavor. By emphasizing that philosophy is an approach rather than a collection of doctrines, I try to highlight its relevance and applicability across different contexts and disciplines.

Further, they are keen to know: "What is the purpose of philosophy, and how is it important for engineering?" These are often not curiosity-driven questions but presumptive ones intended to trivialize humanities, social sciences, and liberal arts as irrelevant to engineering. This perception is common among engineering students, faculty, and parents. Many faculty members, products of the same educational and societal framework, have not been exposed to liberal arts education and are unsure of its relevance and potential impact. Another significant challenge is the faculty's understanding of liberal arts, often equating them with communication skills, writing, and management courses, which are viewed solely for their utility in professional development. This narrow perspective is compounded by the liberal arts faculty's minimal interdisciplinary engagement and inability to position themselves within a predominantly engineering and science academic environment. Many liberal arts faculty members are reluctant to innovate,

create new possibilities, or acknowledge the need for new pedagogical frameworks to address an audience different from typical university cohorts. Furthermore, their limited exposure to cross-disciplinary engagement often results in a failure to capture the imagination and attention of engineering and natural sciences students.

To create a truly interdisciplinary educational experience, it is crucial for faculty members from both engineering and humanities disciplines to actively engage with each other. This requires a willingness to step outside traditional disciplinary boundaries and collaborate on developing integrated curricula that highlight the interconnectedness of different fields. For example, co-teaching courses that combine engineering principles with ethical and social considerations can provide students with a more holistic understanding of their studies. Likewise, liberal arts faculty must be willing to innovate and adapt their teaching methods to resonate with engineering students. This might involve incorporating case studies, project-based learning, and interactive simulations that bridge theoretical concepts with practical applications. Additionally, embracing new technologies and digital platforms can enhance student engagement and facilitate more dynamic and interactive learning experiences.

Encouraging and facilitating cross-disciplinary research initiatives can also help bridge the gap between engineering and the humanities. By involving students in research projects that require both technical and philosophical insights, they can appreciate the value of integrating diverse perspectives. This approach not only broadens their academic horizons but also prepares them to tackle complex, real-world problems that require multifaceted solutions.

A significant hurdle in teaching philosophy to engineering students is overcoming their preconceived notions about the irrelevance of liberal arts. Engineering students often view these fields through a utilitarian lens, influenced by societal and educational frameworks that prioritize technical skills over critical and reflective thinking. To address this, I strive to make philosophical concepts relevant to their engineering studies and personal lives. For instance, I draw parallels between ethical theories and professional engineering ethics, highlighting how philosophical inquiry can inform their decision-making processes in real-world scenarios.

There is a prevailing belief that philosophy is not important to becoming an engineer. I do not contest this idea; in my opinion, philosophy is not a necessary condition for obtaining an engineering degree. However, it is an essential approach for evolving into a leader, which aligns with one of the major missions of IIT Gandhinagar. As an institution, we believe that the educational experience at IITGN enhances students' ability to be more creative thinkers rather than just technically proficient engineers. It is crucial to avoid logical fallacies, be empathetic, avoid prejudices, and understand foundational concepts. All of these skills collectively make students more effective in their professional and personal lives.

When philosophical ideas conflict with students' existing beliefs about religion, science, technology, and other aspects of their worldview, it can be excruciating for them to consider alternative possibilities, even if these alternatives are logically valid and sound. The instant dismissal of alternative possibilities often manifests deep-rooted biases and prejudices that they hold unconsciously, without malicious intent. Although students have been exposed to physics, chemistry, biology, and math, the underlying principles and frameworks of science and mathematics are quite new to them. For many, science is synonymous with solving equations or analyzing the properties of matter. The broader understanding of science as a framework to comprehend the world, a methodology of inquiry, and an ideological stance has never been part of their intellectual landscape. Incorporating philosophical inquiry into their education helps bridge this gap. Philosophy encourages students to question the assumptions underlying their knowledge and beliefs. For

instance, when discussing the philosophy of science, students can explore the works of Karl Popper and Thomas Kuhn, who introduced concepts such as falsifiability and paradigm shifts. Understanding these concepts can lead students to appreciate science not just as a body of knowledge, but as a dynamic process of discovery and refinement of understanding.

Moreover, philosophical engagement fosters critical thinking and ethical reflection, which are crucial for leadership. Leaders in any field must navigate complex ethical landscapes, make decisions under uncertainty, and inspire others. By grappling with philosophical questions about morality, justice, and human nature, students develop a nuanced understanding of the ethical dimensions of their decisions. For example, discussions on utilitarianism versus deontological ethics can help future engineers consider the broader impact of their work on society and the environment.

Empathy is another essential quality for effective leadership. Philosophical inquiry into human nature, consciousness, and emotions can enhance students' ability to understand and relate to others. Topics in philosophy of mind and ethics can introduce concepts such as theory of mind and moral reasoning, helping students develop a more empathetic and inclusive perspective. This is particularly important in diverse environments where leaders must navigate various cultural norms and values.

Understanding foundational concepts across disciplines enriches students' intellectual versatility. Philosophy encourages interdisciplinary thinking by connecting ideas from different fields. For instance, examining the philosophical implications of quantum mechanics or artificial intelligence can inspire students to think beyond traditional disciplinary boundaries and innovate at the intersections of knowledge. Engaging with the works of philosophers like Alan Turing, who contributed to both philosophy and computer science, or Niels Bohr, who explored the philosophical implications of quantum physics, can illustrate the profound connections between disciplines.

While philosophy may not be essential for becoming an engineer, it is invaluable for becoming a leader. At IIT Gandhinagar, we strive to cultivate thought leaders who are empathetic, ethically aware, and capable of interdisciplinary innovation. By challenging students to engage with philosophical ideas, we aim to equip them with the critical thinking, ethical reflection, and intellectual versatility necessary for success in both their professional and personal lives. This holistic approach to education prepares students not only to excel in their technical fields but also to contribute meaningfully to society as thoughtful and informed leaders.

Teaching philosophy to engineering students at IIT Gandhinagar has been a transformative experience, both for myself and my students. Overcoming the initial challenges of engaging students with minimal exposure to liberal arts requires innovative teaching methods, contextualized content, and fostering an environment of critical thinking and debate. By bridging disciplinary divides and promoting interdisciplinary engagement, we can create a more holistic and enriching educational experience. This approach not only enhances students' philosophical understanding but also equips them with the critical thinking and problem-solving skills essential for addressing the complex challenges of the modern world. The goal is to cultivate open-minded individuals who can think deeply about complex issues and consider multiple perspectives. Teaching philosophy to engineering students requires innovative approaches that challenge their existing beliefs and encourage them to engage with alternative viewpoints. This approach not only enhances their philosophical knowledge but also equips them with valuable skills for navigating and contributing to a complex and interconnected world.

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