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Teaching Portfolio

of

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Supplementary materials can be found at: https://dearmahmud.github.io

Preface

My aim with this teaching portfolio is to show how I support students' learning, experiment with new teaching approaches, grow as an educator, and contribute to improving teaching within my department and beyond. This portfolio is structured to show the clear connection between principle and practice. It begins with my short biography, then my foundational teaching philosophy, details the teaching and assessment methods that bring it to life. I further demonstrate this through my approach to mentorship, curriculum design, and faculty leadership.

This portfolio is not a static record of courses taught; it is a dynamic map of a fifteen-year journey dedicated to a single, transformative goal: cultivating professionals and engineers who can build a better world. One guiding principle has defined how I teach and why I teach: real learning begins when we can enter the minds of students and ignite the spark that drives their curiosity. I see my role to create an environment where that spark gains fuel and flourishes. To achieve this, I employ a set of teaching methods that are both creative and adaptive, designed to bring out the best in them.

I invite you to explore the pages that follow, where this philosophy becomes visible in my course design, teaching methods, student assessment, learning outcomes, and mentorship, all working together to turn academic concepts into professional mastery and curious students into innovative problem-solvers.

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Biography

I am Mohammad Mahmudul Hasan, and an Associate Professor in the Department of Electrical and Electronic Engineering (EEE) at the University of Information Technology and Sciences (UITS)[1], Bangladesh.

I earned my bachelor's (2004–2008) and master's (2008–2010) degrees from KIIT University, India, and obtained my PhD (2022–2025) from the Norwegian University of Science and Technology (NTNU), Norway. In 2024, I served as a visiting researcher at the Brno University of Technology (VUT), Czech Republic. I worked at UITS as an Assistant Professor from 2011–2022 and held several academic leadership roles, including Head of the Department (2019–2022), Director of the ICT Cell (2020–2022), Advisor to the IT Office (2018–2022), Project Manager (2020–2022) for the university's Enterprise Resource Planning initiative, and Self-Assessment Committee Member (2017–2018), where I worked as a pedagogical learner and trainer. I also chaired several committees (2011–2022), served on the Finance Committee (2020–2022), the Editorial Board (2020–2022), and as Member Secretary to the Faculty (2018–2022). Additionally, I was an industrial trainer for Sanyo Engineering and Construction Inc. (Suntec Group Japan, 2018–2019).

Teaching Philosophy

I have been teaching at the university level since 2009. I have critically reflected on my teaching practice and often wondered: *why are so many of the world's most successful technology entrepreneurs' college dropouts?* These individuals entered the classroom to learn, yet traditional methods failed to engage them. They abandoned conventional learning and pursued knowledge through hands-on experimentation—*doing* what the classroom failed to offer. This observation made me realize that students learn in different ways. While some thrive under traditional, structured methods, others require alternative approaches. The challenge lies not in student ability, but in the flexibility of our teaching strategies. This insight drives my commitment to developing diverse, active learning methods that engage as many learners as possible. With the right tools and approaches, I believe we can create inclusive classrooms where every student can succeed.

In the early years, my approach too was primarily traditional, and lecture based, focused on covering the established curriculum and ensuring students mastered the core concepts of my discipline. Over time, a dynamic interplay of classroom experience, student feedback, and pedagogical training reshaped my practice. My philosophy has evolved from the transmission of information to the cultivation of critical thinking, adaptability, and a lifelong passion for learning. My mentors in academia have profoundly influenced my teaching philosophy. Some instilled values of precision and intellectual discipline, while others demonstrated that the most powerful lessons are taught through example—by embodying the curiosity, rigor, and honesty one hopes to inspire in students. Senior collaborators taught me how to frame complex ideas within compelling narratives that stay long after the lecture ends. And some of the finest professors I encountered showed me that there is no single "*best way*" to teach; the most effective approach is the one aligned with both the subject matter and the specific group of students you are teaching.

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In my view, a classroom rarely benefits from one fixed method. Students learn differently, and concepts demand varying forms of engagement. From experience, I have seen that relying on a single instructional strategy inevitably serves only a narrow portion of the class. Good teaching means adjusting the method to the subject, the task, and the composition of the group. Often, the most productive moments arise from making these adjustments within the same session—responding to how students' reason, where they hesitate, and how they connect new ideas to prior knowledge. What remains constant is the fundamental objective: creating conditions that push students to think critically, solve problems, and justify their decisions. Real learning does not occur through passive reception but through active struggle—when students confront challenges, commit to solutions, and refine those solutions through evidence, reflection, and analysis.

While my approach is adaptive and responsive to each unique group of learners, my practice is anchored by three core principles: (a) fostering a safe and positive learning environment, (b) committing to a student-centered and active learning model, and (c) harnessing the power of collaborative learning.

A Safe and Positive Learning Environment

Effective learning doesn't start with content—it starts with the right learning conditions. I have come to realize that a safe and positive learning environment is essential for creating those conditions. In my opinion, when students feel secure, they are more willing to take intellectual risks and engage deeply. In my practice, I have seen that this sense of safety transforms classrooms into spaces for meaningful learning and collaboration. However, creating a safe learning environment is *not* about shielding students from challenges or placing them in a protective shell. It is the opposite: empowering them to step out of their comfort shell and take intellectual risks. When learners trust that early missteps are part of growth rather than grounds for penalty, they engage more confidently with complex ideas. That sense of security forms the backbone of every collaborative experience I design.

Research by (Thompson & Wheeler, 2008) suggests that intellectual risk-taking thrives only in an atmosphere of psychological safety. As also noted by (Young et al., 2016), students are far more willing to engage, ask questions, and test ideas when the classroom feels safe and supportive. This means designing lessons not as performances but as workshops for dialogue, where mistakes become opportunities and curiosity is actively modeled. Early in my teaching journey, I learned that a classroom should function as a workshop for dialogue rather than a stage for monologue. I build this foundation by modeling the curiosity, rigor, and honesty I hope to inspire in my students—a lesson shaped by influential mentors. When students feel free to hesitate, be wrong, and challenge ideas, they engage in the authentic struggle that defines real learning. This principle, in my view, is the bedrock upon which all other activities rest.

Research supports this: the learning climate strongly influences student behavior, achievement, and satisfaction (Genn, 2001; Seabrook, 2004). Hutchinson (2003) describes a safe environment as one where students can experiment, identify knowledge gaps, and test their limits. The practice of any discipline succeeds only when students learn in a supportive environment. From an intellectual standpoint, this means anchoring new knowledge to what students already understand. In line with constructivist perspectives, new understanding is always built through the lens of prior knowledge, making learning a process of assembling manageable blocks that sustain motivation.

My own teaching journey reinforced this view. When I began teaching at KIIT University in 2009, I had just completed my master's degree and was nearly the same age as my students. This created an immediate tension: I was expected to guide them academically while navigating my own transition from student to teacher. My priority became establishing mutual respect, so students felt comfortable engaging with me not only as a teacher but as someone who understood their perspective. This experience showed me that psychological safety is not about lowering hierarchy, it is about building trust so that learning can flourish. Later, at UITS, the complexity increased. My classroom consisted of two distinct groups: recent secondary-level graduates from diverse backgrounds with varied levels of preparation, and diploma engineers, professional job holders aged 40 to 60, twice my age as they are returning to study after long academic gaps. Many in the latter group had forgotten foundational material and felt insecure about speaking in front of younger peers. This demanded deliberate work to create a safe environment for both groups. On one side were seasoned diploma engineers with decades of field experience but little recent academic practice. On the other were younger students, digitally fluent but new to the professional world. I encouraged the seniors to share their real-world stories as valid lessons, and I tasked the younger students with helping them navigate coursework. Soon, there weren't two separate groups, they were a single, collaborative team. The outcome was real: by the end of the semester, several younger students secured industrial internships through companies where the diploma engineers worked. This proved that a safe, connected classroom doesn't just teach—it opens doors.

A truly safe learning environment must attend to the emotional dimension of education. My priority is to ensure that students feel secure in speaking, thinking, and offering opinions without fear of judgment. I build this foundation by learning students' names quickly and maintaining that connection long after they graduate; using a student's name is a simple but profound gesture that makes them feel seen and valued. This personal rapport is strengthened by clear, co-created expectations for respect and openness, established by the first class and reinforced continuously. Finally, I design specific activities—such as small-group discussions, case studies, and reflective writing—to lower the threshold for participation. These collaborative tasks are not just for practicing concepts, but for practicing voice, helping students build the confidence to use their own.

Studies (Clapper, 2010; Thompson & Wheeler, 2008; Young et al., 2016) emphasize the role of trust and mutual respect in promoting active participation. My experiences at KIIT and UITS confirm this: regardless of age, background, or preparation, insecurities always exist. Addressing them directly and cultivating trust is, in my view, the essential prerequisite for meaningful learning.

Student-Centered Active Learning

I believe students are responsible for their own learning, but a teacher is responsible for designing the environment where that learning can thrive. This conviction was forged through 15 years of deliberate experimentation, moving from traditional instruction to a dynamic, student-centered model where learning happens through doing. Early in my career (2009), I believed that clarity and thoroughness in lecturing were enough. As a graduate teaching assistant for embedded circuits, I could explain a circuit diagram with perfect logic, yet watch students struggle to translate that theory into a working prototype on a breadboard. I saw that students in my Embedded Systems course could 'recite' definitions but couldn't design a circuit; they could solve textbook problems but were paralyzed by a real sensor that didn't behave ideally. This palpable disconnect convinced me that engineering competence is not built through listening, but through doing: the active process of designing, building, and troubleshooting.

This realization prompted a shift. I began to explore pedagogical models that placed the student at the center of the learning process. I cycled through multiple instructional styles—traditional lecture, guided problem-solving, tightly scaffolded demonstrations, and content-heavy slide-based teaching (Barrie, 2012; Maor et al., 2025). Each worked for a portion of the class, but none proved effective across the entire class. It became clear to me that a single delivery method was inadequate. I was drawn to the framework of *problem-based learning*, where students learn by actively engaging with complex, real-world problems (Hmelo-Silver, 2004). This resonated deeply with the very nature of engineering. I also incorporated principles of active learning, which asserts that students must "do" something—think, discuss, solve, create—to truly assimilate knowledge (Biggs & Tang, 2011; Bonwell, 1991).

While teaching at KIIT University, India (2009–2010), I gained substantial hands-on experience by running many experiments with students. My earliest efforts began with final-year capstone teams. I reorganized the opening weeks of the semester into an intensive design sprint in which teams mapped problems, drafted risk plans, held daily standups, and produced early prototypes. I limited myself to short micro-lectures and deliberately stepped back so they could own the process. The impact was immediate: teams delivered workable prototypes in 12 weeks instead of 24, and several students transitioned directly into industry on the strength of the projects they developed. That experience made one thing clear: when students take responsibility for defining and defending their decisions, their learning accelerates dramatically.

I extended this into the lab environment by redesigning circuits and instrumentation labs into problem-based sessions. I replaced step-by-step instructions with open engineering challenges such as designing low-cost sensing boards, troubleshooting faulty filters, or optimizing noise floors. Students argued through constraints, tested multiple iterations, and presented their reasoning. Their reports became sharper, more analytical, and grounded in real evidence rather than formula copying. That shift confirmed that active learning cannot be an add-on; it must be the architecture of the course. A clear example was a unit on analog-to-digital conversion. Instead of lecturing on the operating principle, I gave student teams a potentiometer, a microcontroller, and an LED, and challenged them to make the LED's brightness change smoothly with the knob's position. They had to consult datasheets; debate register configurations and troubleshoot noisy voltage readings. This active struggle forced them to understand the theory. The lecture that followed was fundamentally different; students were now listening to answers to questions they genuinely cared about. This time, they wanted to listen to the lecture. My job was to create that "want" in them before the lecture began. Their curiosity was engineered, not hoped for. This confirmed what Bonwell and Eison emphasized: knowledge is constructed through active engagement, not passive reception (Bonwell, 1991).

To strengthen real-world exposure, I integrated industry-driven case assignments. Professional diploma engineers brought real failures from their sites, and student teams diagnosed the issues, selected models, and justified their solutions. Since these cases had no single "correct" answer, assessment focused on the quality of the argument: how precisely they defined the problem, chose assumptions, and balanced trade-offs. This pushed students from memorizing formulas to thinking like practitioners, and several internships emerged directly from this collaboration.

Inspired by educators like (Mazur, 2009), I began integrating active learning in smaller steps within traditional structures. In embedded systems courses, I would pause a lecture and ask students to design a microcontroller routine in pairs. Initially, many resisted as passive listening felt safer. But as they worked together—arguing about register values and fixing timing issues—they started internalizing the engineering intuition behind the circuits. Later, I introduced structured activities like "debugging races," where groups competed to identify faults in deliberately flawed code. The classroom energy changed; previously silent students began contributing, and complex concepts became far easier to teach because students were thinking with the material rather than about it.

As I transitioned to UITS, I continued refining this approach, expanding the toolkit to include short reflection notes, quick in-class design challenges, and peer-teaching moments. In courses like Digital Signal Processing, I implemented a flipped classroom model where students watched short content blocks before class, freeing our time together for challenge problems and conceptual diagnostics using MATLAB in pairs. This transformed class time from a passive transfer of information to an active workshop (Abri and Al-Mekhlafi, 2024). I also implemented case-based learning where students analyzed real-world problems such as noise reduction in communication systems, which encouraged critical thinking and reduced the fear of making mistakes (Das et al., 2021; Kaur et al., 2020).

For my diverse classrooms at UITS, which included younger graduates and senior diploma engineers, I adopted collaborative learning (Hmelo-Silver et al., 2016; Yang, 2023). Seniors shared industry insights, while younger students contributed digital skills. In one project on IoT-based energy monitoring, mixed teams designed prototypes using Arduino boards. This not only reinforced technical concepts but also built confidence and mutual respect among learners (Abramczyk & Jurkowski, 2020). The outcome was real: by the end of the semester, several younger students secured industrial internships through companies where the senior learners worked—a powerful testament to the impact of inclusive, active learning.

The result was unmistakable. Students retained theoretical knowledge more effectively, their project work became more innovative, and the classroom shifted from a hierarchy to a learning community. I could see the change directly in student performance: those who once memorized formulas began questioning assumptions and designing circuits with fewer errors. The transition wasn't always smooth and some students, accustomed to passive learning, initially resisted the increased cognitive demand. However, the outcomes were undeniable. The quality of their final projects improved dramatically. They were no longer just replicating my examples; they were designing, innovating, and, most importantly, learning to learn. The feedback confirmed this shift, with students noting that while the courses were challenging, they felt a sense of mastery and readiness for real engineering work. This evolution from a "*sage on the stage*" to a "*guide on the side*" has been the most rewarding development in my teaching career.

One of the most impactful experiences I had in applying active learning was during a professional training program for a group of recently graduated engineers hired by a Japanese company to work on overhead transmission line construction. These engineers had strong theoretical knowledge but needed practical skills to become work ready. Working with high-voltage systems is both exciting and dangerous, and this was no time to rely solely on classroom theory. To bridge the gap between academic learning and real-world application, I took them to an actual substation site and guided them through the equipment, safety protocols, and operational procedures. The hands-on exposure transformed their understanding instantly. At the end of the day, one participant remarked, "We learned more about this in a single day than we did in four years of engineering." This moment perfectly illustrates the power of active learning—when learners engage directly with authentic tasks in real contexts, theory comes alive, and knowledge becomes practical and memorable.

Collaborative Learning

In my classroom, collaborative learning is what brings my student-centered philosophy to life within a safe and supportive environment. I view collaborative learning not just as a teaching method but as foundational preparation for the modern engineering workplace. Rarely does an engineer solve a complex problem in isolation; success depends on the ability to work in teams, integrate diverse expertise, and communicate technical concepts effectively. As noted by (Prince, 2004), collaborative learning occurs when students and teachers build knowledge together through interaction, dialogue, and feedback. This philosophy is supported by research showing that cooperative teams achieve higher levels of thought and retain information longer than students working individually, while also developing crucial critical thinking skills through peer interaction and shared problem-solving (Yang, 2023). Collaborative learning also reinforces the active-learning framework that anchors my teaching (Yang, 2023). When students construct knowledge through peer reasoning, shared failure, and collective troubleshooting, they move from passive recipients of information to active participants in their own development. They learn not just concepts, but intellectual behaviors that define engineering practice (Hmelo-Silver et al., 2016; Laal & Ghodsi, 2012; Yang, 2023).

In my teaching practice, I consistently organize students into small work groups, not just to complete tasks, but to cultivate the core engineering competency of solving complex problems in teams. Research clearly demonstrates the benefits of collaborative learning. (Johnson & Johnson, 1999) found that cooperative teams achieve higher levels of cognitive engagement and retain information longer than students working in isolation. This approach also builds the confidence students need to contribute meaningfully to the larger class, creating a more inclusive and dynamic learning environment. For example, in a computer networks course, I organize students into groups to design a simplified local area network for a specific region. Each team analyzes traffic load requirements, proposes network configurations, and justifies their design choices based on cost, scalability, and reliability. This activity compels students to integrate theoretical concepts with practical considerations while negotiating diverse viewpoints (Gokhale, 1995; Laal & Ghodsi, 2012). Similarly, in a control systems class, students collaborate to model and simulate a feedback control loop using computer-based simulation. Responsibilities include parameter tuning, stability analysis, and documentation, ensuring that each member plays an active role in achieving the final solution. These collaborative tasks deepen technical understanding and mirror real-world engineering practices where teamwork and shared problem-solving are essential, as supported by recent research (Mcclunie-Trust et al., 2022).

From my experience, laboratory sessions offer excellent opportunities for collaborative learning. Instead of having students perform experiments individually, I organize them into small teams where they share roles such as circuit assembly, measurement, and data interpretation. For instance, during a high-voltage laboratory, students work together to test insulation breakdown under varying conditions. This collaborative setup not only improves technical accuracy but also fosters communication and decision-making under real constraints. In project-based courses, I encourage students to use digital collaboration tools like Microsoft Teams or Google Docs to co-create reports and presentations, ensuring that teamwork extends beyond the physical classroom.

In my engineering classes, as in most courses for that matter, students cannot hide behind passive listening; they must test ideas, defend assumptions, troubleshooting failures, and refine solutions. Creating a safe learning environment is therefore not about comfort, it is about enabling intellectual risk. When students trust that their early mistakes will not be punished, they engage more boldly with complex systems. That safety forms the foundation of every collaborative activity I design. Collaborative learning is the mechanism through which this environment becomes operational.

I routinely break classes into small, rotating groups where students tackle design tasks, analytical challenges, and modeling problems. These groups compel them to articulate reasoning, negotiate solution strategies, and resolve conflicting interpretations of data or theory. I have observed repeatedly that students who struggle individually often become far more capable when they can verbalize their thinking and critically examine each other's assumptions. I often notice that students who are hesitant to speak in a full lecture will often find their voice within a small, trusted team. As supported by research (Johnson et al., 1991), the result is a higher level of cognitive engagement and stronger retention of technical material.

In my experience, student projects are one of the most effective ways to foster collaborative learning. Working on a project, (class projects, final year design projects) creates a longitudinal learning process where students engage in joint problem analysis, experimentation, interaction, and dialogue to solve problems together toward a shared goal (Gokhale, 1995). In my opinion, collaborative learning offers not only academic benefits but also social and psychological ones—it helps build a learning community, reduces anxiety, and promotes critical thinking (Laal & Ghodsi, 2012). As supported by the research (Gokhale, 1995), and I have observed that when students collaborate, the success of one often supports the success of others. For me, learning should never be a solitary activity; it thrives when ideas are shared and challenged collectively.

One way I use collaborative learning is through random team assignments—and this is intentional (Bansal et al., 2019; Mcclunie-Trust et al., 2022). I shuffle the roster and let the algorithm, not friendship, build the wireless-system or circuit-simulation team. In real-world engineering, whether in wireless system design or sensor development, professionals rarely get to choose their collaborators. They are expected to contribute within diverse, dynamic, and sometimes imperfect teams. By mixing students intentionally, I prepare them for both the technical and interpersonal demands of industry and research environments (Bansal et al., 2019). The goal is not to create ideal teams—it is to teach students how to succeed in non-ideal ones.

Another application of collaborative learning in my classes is project-based coursework, where students collaborate in small teams to design, simulate, and validate large circuits. I enforce mandatory, structured peer-review sessions where each design team presents their architectural diagrams and testing protocols to two other groups, receiving constructive critique on their methodology, adherence to technical specifications, and coding efficiency; this practice not only significantly elevates the quality of the final design but also cultivates professional communication skills vital for industry.

For highly analytical subjects where conceptual gaps can quickly compound, I employ a structured problem-solving approach akin to a modified Think-Pair-Share model (Abri & Al-Mekhlafi, 2024; Guenther & Abbott, 2024; Mundelsee & Jurkowski, 2021). In a typical scenario, a complex stability analysis or filter design problem is introduced, where students first tackle the initial analytical steps individually (Think), then pair up to discuss their varied approaches and reconcile discrepancies (Pair), and finally, in groups of four, synthesize an optimal solution and present the most effective methodology and calculated trade-offs to the wider class (Share), ensuring individual accountability while leveraging group intellect to master the difficult theoretical mechanics.

Most assignments in my courses are group-based because collaborative problem-solving mirrors real engineering practice. When students debate the assumptions behind a propagation model, reconcile different readings from a vector network analyzer, or design a compact microwave resonator, they sharpen their analytical thinking far more effectively than when working alone. They learn to justify choices, challenge weak arguments, and integrate insights from peers—core elements of critical thinking in technical disciplines.

The benefits of these collaborative strategies are evident in student feedback and performance. Working together on complex engineering problems helps students develop critical thinking, adaptability, and leadership skills (Gokhale, 1995). It also mirrors the collaborative nature of professional engineering practice, where multidisciplinary teams must work cohesively to deliver solutions. By embedding collaborative learning into my courses, I aim to prepare students not only to master technical content but also to thrive in environments that demand cooperation and shared responsibility.

Teaching and Assessment Repertoire

In my teaching practice, assessment is not merely a grading mechanism; it is a core driver of learning. I design my teaching strategies to be innovative and purposeful—ensuring that every method aligns with the intended learning outcomes of the course. Guided by global standards such as the Washington Accord[2], I design courses that reflect internationally recognized competencies (Aldridge, 2012; G.A. et al., 2020; Hu et al., 2023; Iqbal et al., 2020). The Accord provides the structural backbone for my approach, shaping how I plan, deliver, and evaluate engineering education. Its emphasis on measurable outcomes encourages programs to evolve beyond content-heavy syllabi toward competency-driven structures.

This approach compels me to adopt an Outcome-Based Education (OBE) curriculum where every course contributes to the graduate profile (Syeed et al., 2022). This profile defines the capabilities students must demonstrate at graduation and informs how I construct Course Outcomes (COs), align them with Program Outcomes (POs), and design assessments that capture evidence of learning rather than task completion. Through this alignment, my teaching ensures that intentions, delivery, and evaluation are integrated, producing graduates whose competencies meet global standards and industry expectations.

According to the Washington Accord, OBE-based curriculum development, teaching and learning methods, and assessment strategies ensure certain qualities a graduate must have. Every assessment instrument I design is anchored in this OBE architecture, which has guided my courses since 2009. PEOs outline who graduates should become five years after completing the program. POs translate those expectations into measurable attributes. COs specify the contributions of individual courses, written using Bloom's taxonomy to reflect the cognitive demands of each lesson. This hierarchy creates purposeful assessment aligned

[2] Washington Accord is a global agreement that ensures international recognition of accredited engineering programs and graduate competencies.

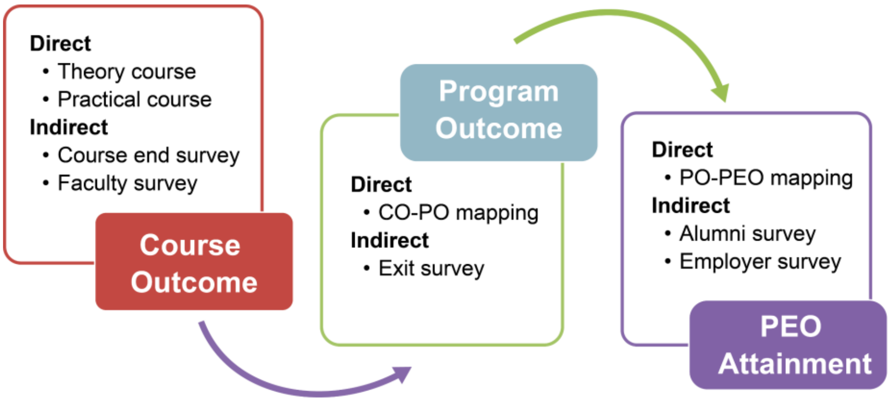


Figure 1. Framework for Mapping CO, PO and PEO in OBE.

with the program's strategic vision. This structure guarantees that students build the knowledge, skills, and professional attitudes required for long-term success and lifelong learning (Katawazai, 2021; Mahrishi et al., 2025; Paramasivam et al., 2013).

Figure 1 captures the essence of how I design, align, and implement learning and assessment in my courses through OBE principles. In my practice, every assessment is designed to serve a clear purpose within this framework. It starts with COs, which I measure through direct methods like class tests, assignments, and projects, and indirect methods such as student feedback. For example, in my Digital Signal Processing course, CO1 and CO2 are assessed through algorithm implementation tasks, while surveys provide insight into clarity and relevance.

These COs are not isolated; they map directly to POs (see Appendix C). When students successfully design and implement signal-processing algorithms, they demonstrate PO(a) Engineering Knowledge and PO(b) Problem Analysis. I also use exit surveys to confirm whether graduates feel confident applying these skills in real-world contexts.

The chain continues to PEOs, which define who graduates should become five years after completing the program—problem solvers, competent professionals, and lifelong learners. Evidence of PEO attainment comes from alumni and employer feedback. For instance, when alumni reports applying DSP concepts in industry projects, it validates PEO1 and PEO2, showing that what I teach translates into professional competence.

This cascading alignment means that every activity, from a single quiz to an alumni survey, supports long-term goals beyond grading. To maintain this alignment, I design assessments using Bloom's taxonomy to target cognitive levels (Adams, 2015; Thompson et al., 2023). Foundational skills like remembering and understanding are checked through quizzes, while higher-order skills such as analysis and synthesis are assessed through design projects and case studies. For example, in circuit analysis, I start with conceptual quizzes before moving to simulation-based assignments that require application and evaluation.

My rubrics are more than scoring guides; they are part of a deeper mapping system that links each question to a specific cell in the PO matrix (Noushad, 2024). This structure gives me agility. When industry partners revise a PEO, such as adding sustainability leadership, I can trace the change through the entire chain—from PEO to PO, from PO to CO, and down to the assessment items—within hours. This responsiveness keeps my courses aligned with evolving professional demands.

I use a mix of formative and summative assessments to capture different dimensions of learning. In-class problem solving, peer discussions, and reflective journals provide immediate feedback, while exams, projects, and presentations measure attainment of intended outcomes. Rubrics shared in advance ensure transparency and clarify expectations.

Continuous improvement is central to my practice. I analyze performance data against CO and PO targets to identify gaps and redesign instruction. When I noticed students struggling with Fourier–Laplace transitions, I introduced scaffolded tasks early in the semester, resulting in measurable improvement in the next cohort. This iterative cycle—diagnosing, adjusting, and re-evaluating—keeps assessment alive and responsive (West, 2023; Widiana et al., 2023). By integrating OBE principles with Bloom's taxonomy, my approach promotes deep learning, critical reasoning, and practical competence, preparing students for real engineering challenges and fulfilling the mission of global engineering education (Aldridge, 2012; Noushad, 2024; Rani et al., 2024).

Table 1 provides an overview of courses I have developed and taught together with chosen teaching methods, assessment methods, and teaching level.

Table 1: Courses Taught at KIIT University, India (2009 – 2010)

Course	Time	Teaching methods	Assessment tools	Level
EC 504 Digital Signal Processing	2009 – 2010	Class lectures with presentation and whiteboard, problem-solving, case discussions, flipped classroom, simulation with MATLAB	Class tests, projects, presentations, coding assignments, design reviews, assignments, mid-term examinations, final examination	Bachelor
EC 602 VLSI Design	2009 – 2010	Class lectures with presentation and whiteboard, blended learning, case work, fabrication videos, packaging, flipped sessions, class projects	Class tests, class projects, homework, simulation exercises, assignments, mid-term examinations, final examination	Bachelor
EC 703 Computer & Communication Networks	2009 – 2010	Class lectures with presentations and whiteboard, problem-solving activities, case discussions, blended learning, flipped-classroom, consulting projects, company visits, hands-on sessions with networking devices	Class tests, class projects, quizzes, assignments portfolio, prototype demonstrations, simulation tasks, mid-term examinations, final examination	Bachelor

Table 2: Courses Taught at UITS, Bangladesh (2011 – 2022)

Course	Time	Teaching methods	Assessment tools	Level
ECE 429 Wireless Communication	2012 – 2022	Lectures with presentations and whiteboard, problem-solving activities, case discussions, blended learning, flipped-classroom tasks, consulting projects, company visits, hands-on with networking devices	Class tests, projects, presentations, homework, assignments, mid-term examinations, final examination	Bachelor
EEE 207 Electronic Measurement and Instrumentation	2015 – 2017	Lectures with demonstrations, lab experiments, instrumentation setup practice, case discussions, blended learning, hands-on measurement sessions	Lab reports, class tests, quizzes, assignments, viva, mid-term examinations, final examination	Bachelor
EEE 313 Microprocessor and Microcontrollers	2015 – 2017	Lectures with board work, coding demonstrations, lab programming,	Coding assignments, lab tests, quizzes, class tests, projects, viva,	Bachelor

		hardware interfacing, project-based learning, flipped-classroom tasks	mid-term examinations, final examination	
EEE 253 Computer Networking and Data Communication	2014 – 2018	Lectures with diagrams, case discussions, packet-tracing labs, network configuration exercises, blended learning, hands-on with routers and switches	Lab reports, configuration tasks, quizzes, class tests, projects, mid-term examinations, final examination	Bachelor
EEE 309 Communication Theory	2011 – 2020	Lectures with mathematical derivations, simulation demos, problem-solving activities, case discussions, blended learning	Quizzes, class tests, MATLAB assignments, presentations, mid-term examinations, final examination	Bachelor
EEE 315 Digital Signal Processing	2012 – 2020	Lectures with board explanations, MATLAB simulations, coding tasks, problem-solving sessions, flipped-classroom activities	MATLAB tasks, quizzes, class tests, mini-projects, mid-term examinations, final examination	Bachelor
EEE 305 Signal and Systems	2011 – 2018	Lectures with board work, problem-solving, MATLAB-based demonstrations, conceptual discussions	Quizzes, class tests, problem-solving assignments, mid-term examinations, final examination	Bachelor
EEE 431 Optical Fiber Communication	2014 – 2016	Lectures with diagrams, hardware demonstrations, simulation tasks, case discussions	Class tests, quizzes, assignments, project work, mid-term examinations, final examination	Bachelor
EEE 151 Electrical Engineering	2016 – 2018	Lectures with board work, problem-solving, demonstrations, basic lab activities	Quizzes, class tests, lab assessments, assignments, mid-term examinations, final examination	Bachelor
EEE 108 Circuit Simulation	2018 – 2020	Lectures with software demos, simulation exercises, design tasks, hands-on circuit modeling	Simulation tasks, lab reports, quizzes, class tests, projects, mid-term examinations, final examination	Bachelor
ECE 544 Data Communication[3]	2018 – 2022	Lectures with diagrams, case discussions, protocol analysis, simulation tasks	Quizzes, class tests, protocol analysis tasks, assignments, mid-term examinations, final examination	Master
ECE 540 Telecommunication Networks	2018 – 2022	Lectures with network design problems, case studies, simulation tasks, configuration exercises	Quizzes, class tests, simulation tasks, design assignments, mid-term examinations, final examination	Master
ECE 542 Advanced Telecommunication Networks	2018 – 2022	Lectures with advanced case discussions, simulation studies, protocol evaluations	Quizzes, class tests, simulation tasks, protocol evaluation assignments, mid-term examinations, final examination	Master
ECE 463 Satellite Communication	2018 – 2022	Lectures with link-budget problems, case discussions, simulation tasks	Quizzes, class tests, link-budget tasks, assignments, mid-term examinations, final examination	Master
ECE 545 Digital Modulation Techniques	2018 – 2022	Lectures with mathematical analysis, simulation tasks, problem-solving activities	Quizzes, class tests, simulation tasks, assignments, mid-term examinations, final examination	Master

Table 3: Courses Taught at Suntec Sanyo Engineering (Japan), (2018 – 2019)

Course	Time	Teaching methods	Assessment tools	Level
Overhead Transmission Line Design and Construction	2018 – 2019	Class lectures with presentations and whiteboard, problem-solving activities, case discussions, consulting projects, company visits, site visits, hands-on sessions with high voltage devices	Class quizzes, class tests, formative assessment through questioning, time-constrained practical assessment, oral examinations	Professional engineers

[3] New courses introduced and developed.

In theory-heavy courses such as Signals and Systems (EEE 305), my assessments begin at the lower and middle levels of Bloom's taxonomy because students must first develop the conceptual clarity needed to tackle more complex problems. Quizzes and class tests are designed to diagnose foundational gaps early, often revealing misconceptions about convolution, system linearity, or frequency responses. These formative assessments allow me to adapt my teaching midstream. When I notice recurring mistakes—such as confusing impulse response symmetry or misinterpreting Laplace-transform poles—I modify subsequent lectures and homework tasks to rebuild those fragile conceptual blocks. By the time students reach the final exam, they are assessed on their ability to interpret system behavior rather than recite formulas. This trajectory, from remembering and understanding to applying and analyzing, is not accidental; it is designed into the assessment sequence from day one.

EEE 315: Digital Signal Processing				
CO No.	CO Statement	Domain/level of learning taxonomy	Delivery method and activities	Assessment Tools
1.	Apply the principles of discrete-time signal analysis to perform various signal operations.	Cognitive/ Apply	On class lectures	Class tests, Homework, Final Examination
2.	Apply the principles of Fourier transform analysis to describe the frequency characteristics of discrete-time signals and systems.	Cognitive/ Apply	On class lectures	Class tests, Homework, Final Examination
3.	Use computer programming tools (usually MATLAB or C/C++) to process and visualize signals	Cognitive/ Apply, Affective/ Receiving Phenomena	On class lectures	Class tests, Homework, Final Examination

Laboratory courses require a different approach. In Communication Theory Lab (EEE 312), the COs sit squarely in the psychomotor and analytical domains, so I assess students through a combination of experimental accuracy, interpretation of measurements, technical documentation, and oral reasoning during viva exams. A lab on amplitude modulation, for instance, does not end when the waveform appears on the oscilloscope; it ends when students can explain why sidebands behave as they do, why their envelope detector distorted, or why their measured SNR diverges from theoretical predictions. I have seen that this type of assessment builds engineering intuition far more effectively than written tests alone. The same principle drives my assessment practice in Digital Signal Processing. Students first compute transformations by hand, then recreate those same operations in MATLAB, and finally interpret where the simulation diverges from ideal behavior due to sampling, quantization, or windowing effects. Assessing this full cycle of concept, implementation, interpretation, allows me to evaluate not just what students know, but how they think.

EEE 316: Digital Signal Processing Lab				
CO No.	CO Statement	Domain/level of learning taxonomy	Delivery method and activities	Assessment Tools
1.	Illustrate the handling of continuous signals using MATLAB.	Cognitive/ Understand	Class lectures and practical demonstration	Lab performance, Quiz, Viva, Assignment, project, presentation
2.	Illustrate the handling of discrete/digital signals using MATLAB	Cognitive/ Understand	Class lectures and practical demonstration	Lab performance, Quiz, Viva, Assignment, project, presentation

EEE 490: Thesis/Project/Internship				
CO No.	CO Statement	Domain/level of learning taxonomy	Delivery method and activities	Assessment Tools
1.	Review research literature relevant to engineering problems	Cognitive/ Understand	Guided literature reviews, database search workshops, annotated bibliographies, and key paper discussions.	Teamwork, communication skills, interview, survey, observation records, monitor development of skills, presentation
2.	Investigate complex problems using research-based knowledge and research methods.	Cognitive/ Analyze	Research design workshops, problem-based learning, case studies, and supervised data collection.	Teamwork, communication skills, interviews, survey, observation records, monitor development of skills, presentation
3.	Select and apply appropriate resources and/or modern engineering tools	Cognitive/ Apply	Simulation software training, lab demonstrations, project-based applications, and peer-learning.	Teamwork, communication skills, interviews, survey, observation records, monitor development of skills, presentation
4.	Write effective reports and make effective presentations.	Cognitive/Remember, Affective/ Responding to phenomena	Academic writing workshops, peer-review sessions, presentation rehearsals, and supervised report drafting.	Meet timeline, report writing and team presentations
5.	Demonstrate the depth for continuous learning.	Cognitive/Apply, Affective/Valuing, Psychomotor/ Complex Overt Response	Reflective journals, self-directed tasks, research seminar participation, and collaborative discussions on emerging technologies.	Teamwork, communication skill, interview, survey, observation records, monitor development of skills, presentation

In more advanced, design-intensive courses such as Microprocessor and Microcontroller Systems (EEE 313), assessment must capture higher layers of Bloom's taxonomy, particularly creation, innovation, and evaluation. My students build real systems, debug actual hardware, and justify their design decisions during viva examinations. I use iterative project milestones, version-controlled submissions, and code reviews to evaluate progress. For example, a group working on a temperature-controlled fan system must submit an initial architectural sketch, then a functional interrupt-driven prototype, followed by optimization for timing, reliability, and documentation clarity. When I ask students to defend why their ADC sampling interval was chosen, or why they selected a particular timer mode, I am assessing design thinking—not just the final product. These assessments intentionally mimic the engineering workplace, where reasoning matters as much as results.

Assessment in thesis and internship courses demands yet another layer of nuance. Here, students must demonstrate research judgment, methodological integrity, communication clarity, and the ability to navigate uncertainty. My assessment includes continuous supervision logs, proposal defenses, mid-semester progress presentations, and a final oral exam where students justify their assumptions, validate their models, and defend their conclusions. When a student working on an IoT energy-monitoring prototype realizes midway that the chosen sensor lacks the required dynamic range, the assessment becomes less about penalizing the mistake and more about evaluating how effectively they diagnose the issue, refine their requirements, and redesign their solution. This mirrors real engineering practice, where adaptability defines competence.

Across all courses, I rely heavily on formative assessments, short analytical problems, in-class design challenges, debugging exercises, and reflective notes—to identify learning gaps. These tools shape my instructional decisions. If several groups misinterpret noise behavior in a communication link, I adjust the next session to include a small, targeted activity where students simulate noise effects and compare them with theoretical predictions. Summative assessments, on the other hand, allow me to evaluate cumulative mastery: midterms that probe analytical reasoning, finals that require multi-step problem solving, and design projects that demand integration of theory and practice. Rubrics play a central role. My rubrics are not separate documents; they are the visible edges of the OBE mapping system. Each criterion—accuracy, reasoning, professionalism, design clarity—is directly tied to a CO and PO. Students receive these rubrics early, so assessment becomes transparent and predictable. When a student's project receives a lower score in "evaluation and justification," they can trace that score back to the corresponding PO on professional judgment, creating a clear feedback loop.

The assessment structure in this example demonstrates a systematic approach to aligning COs with POs and ultimately with PEOs (see Figure 1). Each component of the evaluation—attendance, class tests, assignments, and the final exam—has a defined weight, ensuring that students are assessed on both continuous engagement and comprehensive understanding. Attendance and assignments encourage consistent participation and application of concepts, while class tests and the final exam measure depth of knowledge and analytical skills. This balanced distribution reflects a deliberate design to cover multiple dimensions of learning.

The CO-PO mapping is evident in how individual questions and tasks are linked to specific COs. For instance, class test questions and assignment tasks are tagged to CO1, CO2, and CO3, which represent distinct learning objectives within the course (see Appendix A). By aggregating student performance across these mapped tasks, the achievement level of each CO is calculated. In this case, CO1 achieved 91%, CO2 achieved 100%, and CO3 achieved 87%, indicating strong attainment of intended learning outcomes. These CO achievements are then mapped to relevant POs, such as PO(a), PO(b), and PO(e), which correspond to broader competencies like problem-solving, application of engineering knowledge, and design skills. The PO achievement summary shows high percentages, confirming that the course contributes effectively to the program-level goals. Achievement levels are determined based on a performance scale, where a score of 60% or above is considered satisfactory for attaining a CO or PO. For a student to be considered as having achieved a particular CO or PO, the performance scale is applied. A score of 60% or above is classified as satisfactory, while higher ranges indicate exemplary attainment. This benchmark ensures that attainment calculations reflect meaningful competency rather than mere participation.

This cascading alignment, from individual assessments to COs, then to POs, and finally to PEOs, ensures that every activity in the course serves a purpose beyond immediate grading. It validates that the teaching-learning process is outcome-based and supports long-term objectives such as preparing graduates for professional practice and lifelong learning. By documenting this process, the portfolio demonstrates not only the rigor of assessment but also the intentionality behind curriculum design. It shows that the evaluation system is not arbitrary; rather, it is a structured mechanism to guarantee that students acquire the competencies envisioned by the program and the institution. This approach exemplifies how OBE translates into measurable achievements that align with the overarching mission of engineering education.

I also use performance data to drive continuous improvement. After each term, I map student results against CO achievement targets to identify strengths and weaknesses. When I noticed that students were consistently underperforming on Fourier–Laplace transitions in Signals and Systems, I embedded scaffolded formative tasks early in the semester. This adjustment strengthened CO2 and supported POs such as engineering knowledge and problem analysis. The following cohort showed significant improvement in the same CO. This iterative refinement, identifying gaps, adjusting instruction, redesigning assessment, and measuring the effect, is how I ensure that assessment remains a living, responsive element of my teaching. For me, assessment is not a judgment; it is a dialogue between expectation, evidence, and growth. It is the mechanism through which I ensure that students do not simply accumulate knowledge but develop into capable, thoughtful, and industry-ready engineers, fulfilling PEOs of problem-solving, competence, and lifelong learning.

I designed my teaching methods with the principles of OBE because they create the conditions for students to achieve the competencies defined by COs, POs, and ultimately PEOs. A safe and positive environment is the foundation of this approach. When students feel respected and supported, they are more willing to engage with complex engineering problems, ask questions, and take intellectual risks. This openness is essential for developing problem-solving skills, which directly supports PEO1 and POs such as problem analysis (PO-b) and investigation (PO-d).

I use strategies like real-time problem-solving, interactive demonstrations, and short quizzes during lectures. For example, in Digital Signal Processing, I often ask students to implement algorithms on real signal data during class. This hands-on activity reinforces CO1 and CO2 by requiring students to apply mathematical and engineering principles, which maps to POs like engineering knowledge (PO-a) and modern tool usage (PO-e). These experiences go beyond memorization and help students achieve the satisfactory or exemplary levels defined in the performance scale.

Collaborative learning complements this by fostering teamwork and communication skills. Group assignments and peer discussions encourage students to share ideas, debate solutions, and work collectively on design tasks. This not only improves technical understanding but also builds competencies like teamwork (PO-i) and communication (PO-j), which are essential for meeting PEO2 and PEO3—producing competent graduates and promoting lifelong learning. Through these methods, students consistently perform above the 60% threshold for attainment, and more importantly, they develop the habits and attitudes that the program envisions: problem-solving ability, professional competence, and continuous development.

Pedagogical Materials

My pedagogical materials are built around a single expectation: engineering students must learn by doing. Every resource I design is structured to push students beyond passive understanding into the domain of hands-on experimentation, digital problem-solving, and iterative design. The materials I create transform abstract theory into tasks that demand intellectual precision, experimentation, and engineering judgement.

In theory-intensive courses, I design materials that deliberately confront students with the physical reality behind mathematics. When teaching convolution, Fourier–Laplace transitions, or sampling, I avoid long derivations without context. Instead, students begin with short conceptual diagnostics that expose misconceptions. The primary material that follows is hands-on and computational: MATLAB notebooks, interactive scripts, and guided simulation environments where students manipulate parameters and immediately see the effect. For example, when exploring aliasing, the materials let students change sampling rates in real time and observe folding frequencies emerge in the spectrum. When working on windowing or filter design, students use editable MATLAB templates that I provide, where they can inject noise, distort signals, and measure the difference between theoretical predictions and actual outputs. These digital materials turn mathematical theory into a manipulable object.

I integrate hands-on digital tools extensively. In Signal Processing, DSP and Communication Theory, I prepare Python-based notebooks for students who prefer open-source tools, and I include embedded visualization widgets that allow them to sweep frequencies, change filter orders, or introduce quantization errors interactively. These materials allow students to test edge cases, observe unexpected behavior, and discover limits of idealized formulas. I deliberately design the notebooks with incomplete sections so students must finish the code, interpret outputs, and justify design decisions. This structure mirrors real engineering work, where incomplete information is the norm.

In courses that involve hardware, my materials emphasize physical experimentation. In Microprocessor and Microcontroller Systems, I provide modular hardware templates, annotated circuit diagrams, and step-by-step debugging scaffolds. Students use these materials to build interrupt-driven systems, communication routines, and sensor interfaces. One example is a material package where students connect a temperature sensor, process the signal through an ADC, and visualize it on a digital dashboard coded in MATLAB or Python. The materials include troubleshooting logs that students must maintain to document and explain each failure and fix. These hands-on practices give them experience that can never be achieved by reading alone.

Networking and wireless communication courses require a different type of material, so I design digital ecosystems that simulate real-world infrastructure. I prepare virtual labs using Cisco Packet Tracer, GNS3, and cloud-based platforms where students configure routers, build topologies, analyze packet flows, diagnose routing loops, and quantify congestion. I embed intentionally faulty configurations within the materials so students must identify, isolate, and correct the error. This approach builds deep understanding of protocol behavior because students must justify every configuration choice. I also integrate spectrum visualization tools and software-defined radio (SDR) simulations where students model channel impairments or test modulation schemes using real I/Q data. These resources make wireless communication an experimental subject even without physical RF equipment.

Innovation is a key function of my material design. I create "micro-labs," short 15–20-minute hands-on tasks that fit inside a lecture. Students might analyze a noisy communication link, debug a faulty ADC routine, or design a simple FIR filter using a drag-and-drop interface. These micro-labs break the traditional lecture rhythm and pull students back into active engagement whenever the cognitive load begins to drop. I also integrate real-world datasets from sensor networks, IoT systems, or communication logs so students can analyze practical scenarios instead of idealized textbook examples. When teaching noise sources or interference, I provide recorded waveform data from an SDR-based measurement setup and ask students to classify and quantify the disturbances.

Collaborative materials extend this hands-on philosophy further. I create peer-review templates, design critique forms, and structured problem-solving sheets that guide students through multi-stage reasoning. These materials help them articulate assumptions, negotiate design choices, and evaluate trade-offs with their teammates. In project-based learning settings, I integrate digital collaboration tools such as Git repositories for code review, online simulation dashboards, and shared engineering notebooks where teams track decisions, failures, and redesigns. These materials create authentic engineering environments inside the classroom.

Assessment materials remain tightly aligned with OBE principles. My rubrics, templates, and project briefs are not static documents; they are engines that drive student thinking. Every criterion is mapped to a CO and PO, making expectations clear from the beginning. For hands-on tasks, I design rubrics that evaluate diagnostic steps, interpretation accuracy, design clarity, and the student's ability to justify alternative solutions. For digital-simulation tasks, rubrics evaluate correctness, reproducibility, code quality, and the validity of conclusions drawn from the results. Students see immediately how each task contributes to long-term competencies expected of graduates.

My pedagogical materials evolve every semester. When I detect persistent weaknesses, for example, instability in control-system reasoning or poor interpretation of network traffic—my next iteration of materials includes early intervention tasks, interactive visualizations, or hands-on micro-labs tailored to those weaknesses. This cycle ensures continuous improvement, stronger conceptual foundations, and clearer evidence of PO achievement across cohorts.

Looking ahead, I plan to expand the digital and hands-on components further by integrating remote-access SDR laboratories, browser-based simulators, cloud-hosted microcontroller environments, and virtualized communication networks. These innovations will allow students from classroom to work with real engineering infrastructure anytime, enhancing autonomy, curiosity, and readiness for professional challenges.

Ultimately, my pedagogical materials form a cohesive ecosystem: hands-on lab tasks, digital simulation tools, interactive code templates, conceptual diagnostics, peer-review structures, and OBE-aligned assessment frameworks. Together, they ensure that students do not merely learn engineering—they practice it, question it, experiment with it, and ultimately internalize it as a professional discipline.

Education Management

My first faculty appointment was as a Lecturer in 2010, and later that year, I was promoted to Assistant Professor—a rapid promotion that reflected the institution's confidence in my abilities. From the very beginning, I was entrusted with teaching final-year students, a responsibility rarely given to early-career faculty. While teaching, I quickly noticed a critical gap: students understood theory but struggled to connect it to real-world problems. In response, I began redesigning course components within a short period. I introduced real-life examples, structured clearer learning paths, and guided students through hands-on projects, experiments, and early-stage research work. My approach shifted the focus from rote accumulation of knowledge to practical, application-driven learning. The redesigned courses were so impactful that students highlighted them as best-practice examples within the department.

In 2011, I joined UITS as an Assistant Professor, where I spent more than a decade (2011–2022) teaching undergraduate and post-graduate students, designing and developing laboratories, supervising large cohorts of engineering students. Over these years, I taught students from the Departments of Electronics and Telecommunication Engineering, Electrical Engineering, Electronic and Electrical Engineering, Electronics and

Communication Engineering, Computer Science and Engineering, and Information Technology. Teaching students from interdisciplinary departments requires interdisciplinary knowledge, including electronics, electrical, communication, networking, software, programming, machine learning, and signal processing. This teaching history shows that I have developed and taught various courses (for more details, see my detailed list of courses). I have also taught multiple audiences and developed a range of methods and activities to adapt to my audience. I engage my students with different teaching methods, depending on the course and the level of study. My teaching experience across departments and institutions and the excellent evaluations attest to my teaching versatility and adaptability.

However, the institution soon recognized a potential for leadership beyond the classroom, and I was gradually entrusted with responsibilities that extended my impact. My journey at UITS was not an overnight achievement, it was a steady progression built on trust, reliability, and demonstrated capability. When I joined as an Assistant Professor in 2011, my primary focus was on teaching excellence and student engagement. Over time, the university observed my ability to lead, innovate, and drive initiatives, and began assigning me roles that shaped both my career and the institution's academic and administrative development.

I began by chairing several key academic and administrative committees (2011–2022), which allowed me to develop a deep understanding of institutional governance and collaborative decision-making. In 2017–2018, I was appointed to the Self-Assessment Committee, where I provided pedagogical training to departmental faculty members, demonstrating both my teaching expertise and capacity to lead initiatives focused on educational quality. Building on this foundation, I assumed broader responsibilities: Member Secretary to the Faculty (2018–2022), Advisor to the IT Office (2018–2022), and member of the Finance Committee (2020–2022) and the Editorial Board (2020–2022). These roles required reliability, strategic thinking, and a strong sense of institutional trust, as I contributed to financial oversight, academic standards, and quality scientific publications.

Simultaneously, I took on operational and transformational leadership: Project Manager for the university's Enterprise Resource Planning initiative (2020–2022), Director of the Information and Communication Technology Cell (2020–2022), and Head of the Department of EEE (2019–2022). These positions placed me at the center of curriculum reform, digital transformation, and the institution-wide implementation of outcome-based education (OBE). I authored the university's OBE Handbook, redesigned assessment systems, modernized program structures, and founded several offices, including the Training and Placement Cell (2020) and the ICT Cell (2020). Over this period, I trained hundreds of faculty members across multiple departments, fostering pedagogical excellence and supporting a culture of continuous improvement. Through this progression, the university not only recognized my potential but also enabled me to grow into a trusted leader—someone relied upon driving educational innovation, administrative development, and strategic transformation. My contributions extended beyond academic; for instance, I even designed the official university logo[4], reflecting the depth of trust and responsibility placed in me.

As Director of the ICT Cell (2020–2022), I led a university-wide digital transformation to enhance quality, efficiency, and transparency in education delivery. A key achievement was designing and implementing UCAM[5]—a unified platform for academic operations, student services, and research management. This included ERP systems for scheduling, performance

[4] University of Information Technology and Sciences (UITS)
[5] University Comprehensive Academic Management (UCAM)

tracking, and administrative coordination, as well as centralized research repositories for faculty and students.

My leadership proved critical during the COVID-19 pandemic, when digital infrastructure became the backbone of continuity. I standardized remote teaching platforms, ensured access to digital tools, and provided ongoing technical and pedagogical support. These efforts not only kept classes running but transformed learning through interactive modules, real-time analytics, and automated assessments.

Pedagogical Training and Curriculum Development

During my tenure at UITS, my engagement with pedagogical training and curriculum development evolved from active participation in institutional workshops to leading major academic reforms. I took part in an extensive series of quality-assurance and teaching-development workshops organized through the Internal Quality Assurance Cell (IQAC), which were central to the university's shift toward OBE (see Appendix D). These sessions introduced me to structured approaches for academic governance, collaborative decision-making, and continuous improvement. Workshops on team building, self-assessment processes, curriculum concept models, and teaching methodologies, facilitated by distinguished academics from UGC, BUET, UIU, NSU, and other leading universities, sharpened my understanding of how to design learner-centered courses and build assessment strategies that align with international standards. This exposure strengthened my ability to connect theoretical rigor with practical competence and helped me embed active learning principles across the engineering curriculum.

As my involvement deepened, I transitioned from participant to facilitator, contributing directly to the institution's quality assurance processes. I conducted workshops focused on survey data interpretation and stakeholder feedback analysis, guiding faculty and administrative teams in generating evidence-based improvements to teaching and learning. I also developed and administered surveys for students, staff, and alumni as part of the self-assessment cycle, ensuring that academic decisions were grounded in reliable data rather than assumptions. These activities not only enhanced my own pedagogical competence but also helped establish a stronger culture of reflective practice within the department, where structured evaluation and continuous refinement became integral to course and program design.

This foundation in pedagogical training naturally extended into my role as Head of the Department of Electronics and Communication Engineering, where I led major curriculum reform initiatives to modernize and strengthen academic programs. The Bachelor of Science in Electronics and Communication Engineering underwent a comprehensive redesign under my leadership. I revised course structures, updated outdated content, and introduced new modules in IoT systems, advanced wireless communication, embedded systems, and other emerging technologies. These changes were motivated by the need to prepare graduates for a rapidly evolving engineering landscape where cross-disciplinary fluency, hands-on capability, and strong analytical skills are essential.

Recognizing the growing national demand for expertise in telecommunications, I also initiated and designed the Master of Science in Telecommunication Engineering program. The creation of this program responded to Bangladesh's expanding digital infrastructure and the industry's need for professionals capable of managing next-generation communication networks. With an emphasis on advanced theory and research integration, the program incorporated optical fiber communication, satellite systems, and 5G technologies, creating a clear pathway for students to transition from foundational engineering knowledge to specialized, industry-relevant expertise. Establishing this program strengthened both the academic depth and the strategic relevance of the department, positioning it to contribute to national technological development.

Together, these experiences, from pedagogical workshops to curriculum design and program development, have shaped my identity as an educator who not only teaches but also builds educational systems. They reflect my commitment to institutional improvement, digital transformation in engineering education, and the long-term development of programs that prepare students for meaningful contributions in an increasingly complex technological world.

Evidence of Student Learning

Evidence of student learning in my courses comes from what matters most in engineering: how students think, design, reason, and improve over time. My teaching is structured around clear learning outcomes, and every activity, laboratory, and assessment is aligned to these outcomes. The real evidence surfaces not in a single exam score but in the progression, I observe when students tackle hands-on tasks, interpret experimental data, debug their own implementations, and explain their engineering decisions with increasing clarity.

The evidence presented for EEE 315: Digital Signal Processing not only demonstrates attainment of course-level outcomes but also reflects alignment with the graduate profile defined by the PEOs and POs (*see Appendix B*). The strong CO achievement—CO1 at 91%, CO2 at 100%, and CO3 at 87%—indicates that students have developed the ability to apply engineering knowledge, analyze complex problems, and use modern tools effectively, corresponding to PO (a), PO (b), and PO (e). These outcomes directly support PEO1 (Problem Solving) by showing that students can inspect and solve DSP-related engineering problems using analysis and synthesis tools. The high attainment also suggests that graduates are becoming competent and innovative (PEO2), ready to address industrial needs through practical skills and algorithmic reasoning. Furthermore, the emphasis on simulation tools and iterative design aligns with PEO3 (Continuous Development), fostering habits of lifelong learning and adaptability.

If these results were different, for example, if PO (e) were below satisfactory—it would indicate insufficient exposure to modern tools, requiring additional lab sessions or software-based exercises. Similarly, if CO2 (problem analysis) were weak, it would suggest a need for more structured problem-solving activities. Such gaps would not only affect course-level outcomes but also hinder progress toward PEO1 and PEO2, impacting graduates' readiness for industry and their ability to engage in lifelong learning. Conversely, the current strong performance confirms that students are meeting both immediate learning objectives and the broader educational goals of the program.

Although the class attained all the defined COs, POs, and PEOs, individual performance patterns reveal important nuances (*see Appendix B, Figure B5*). For instance, one student achieved only 53% in CO1, which fell below the satisfactory benchmark, while performing better in CO2 (75%) and CO3 (58%). Another student scored 58% in CO3 but excelled in CO1

(75%) and CO2 (91%). These cases illustrate that while the overall attainment metrics are strong, some students struggle with specific competencies—either in applying mathematical and engineering fundamentals or in using modern tools effectively.

Such variations are not unusual in a course like Digital Signal Processing, where conceptual rigor and tool-based implementation intersect. A student weak in CO1 often faces challenges in translating theoretical principles into problem-solving strategies, which corresponds to PO (a): Engineering Knowledge. Conversely, a low score in CO3 typically signals difficulty with simulation environments and algorithmic design, linked to PO (e): Modern Tool Usage. These gaps, if left unaddressed, could hinder progress toward PEO1 (Problem Solving) and PEO2 (Competent Graduates), affecting readiness for industry and lifelong learning habits.

To address these disparities, I adopt targeted interventions. Students struggling with CO1 receive additional conceptual scaffolding through short remedial tutorials and guided problem-solving sessions that reinforce mathematical foundations. Those with lower CO3 attainment are encouraged to engage in extra lab practice with MATLAB and Python, supported by video demonstrations and peer-assisted learning. I also provide iterative feedback loops—mini-assessments and personalized comments—to monitor improvement before the next major evaluation. These strategies not only help students meet course-level outcomes but also cultivate adaptability and resilience, aligning with PEO3 (Continuous Development).

This individualized approach reflects my broader philosophy: evidence of learning is not just about aggregate scores but about ensuring every student moves closer to the graduate profile envisioned by the program. When students who initially struggled later demonstrate confidence in analyzing signals or implementing simulations, it validates the effectiveness of these interventions and reinforces the principle that teaching is as much about guiding diverse learners as it is about achieving overall metrics.

Because my courses involve complex problem-solving and applied reasoning, I design assessments that mirror real engineering practice. This approach directly supports PO (a): Engineering Knowledge, PO (b): Problem Analysis, and PEO1: Problem Solving. Students rarely submit a single, polished solution; instead, they work iteratively. For example, when tackling MATLAB-based DSP tasks or SDR simulations, they begin with preliminary implementations—often procedural and incomplete. My feedback is immediate and technical, pushing them to revise, test again, and justify their changes. By the end of the cycle, students are not just "running code"; they are diagnosing spectral artifacts, optimizing signal paths, and refining microcontroller interrupt routines with engineering confidence. This progression demonstrates mastery far better than a one-shot exam because it reflects how engineers solve problems: through iteration, analysis, and refinement.

Reflection is another cornerstone of my teaching, aligning with PO (d): Investigation, PO (l): Lifelong Learning, and PEO3: Continuous Development. After major labs, students write short analytical notes—not about what they did, but why the system behaved as it did. These reflections reveal depth of understanding that closed questions cannot capture. In DSP courses, for instance, students evolve from simply plotting a spectrum to explaining leakage, aliasing, and filter stability with proper justification. In communication courses, their reflections increasingly incorporate channel impairments, quantization effects, and link-budget reasoning. This qualitative shift—from "*what*" to "*why*"—is one of the clearest indicators that learning outcomes and graduate attributes are being met.

Mid-semester and end-semester evaluations provide another layer of evidence, particularly for PO (j): Communication and PO (i): Individual Work and Teamwork. My evaluation forms use open-ended prompts because engineering students articulate their learning better when allowed to describe where they struggled, what clicked, and which tools transformed their understanding. Questions like "*What activity most improved your understanding*?" and "*What part of the course should be redesigned*?" generate actionable feedback. When I teach a course for the second or third time, I show students what changed based on previous evaluations—updated simulations, redesigned lab sheets, clearer conceptual scaffolding. This transparency builds trust and engagement, reinforcing PEO2: Competent Graduates by modeling continuous improvement.

External evaluators add an industry-aligned perspective, supporting PO (k): Project Management and Finance and PO (f): The Engineer and Society. In courses with practical labs or communication-system projects, I regularly discuss student performance with external examiners. Their comments on design justifications, coding quality, and modeling assumptions often confirm the growth I observe. These conversations help benchmark my students against professional expectations, ensuring they are prepared for industrial roles (PEO2).

Perhaps the strongest evidence emerges after graduation. Former students often return to share how the MATLAB workflows in DSP, debugging culture in microcontroller labs, or real-world routing challenges in networking gave them an edge during internships or early employment. This retrospective feedback confirms that learning outcomes extend beyond the classroom and that graduates are engaging in lifelong learning (PEO3) while demonstrating innovation and competence (PEO2).

Finally, the classroom environment itself reflects learning. In early weeks, students hesitate when faced with open-ended engineering problems. By the end, they approach complexity with structure: formulating hypotheses, breaking down signal chains, interpreting anomalies, and testing alternatives. This behavioral shift is not accidental—it results from a pedagogical system built around hands-on work, digital experimentation, collaborative problem-solving, and iterative feedback. Their confidence, technical precision, and improved engineering judgment are the clearest evidence that learning has occurred and that the teaching strategies are functioning as intended—fully aligned with the graduate profile envisioned by the program.

Supervision

I have explored and applied several approaches to become an effective supervisor for bachelor and master projects and theses (Lee, 2012; McCarthy, 2015; Pearson & Brew, 2002). Supervision, in my view, is not just about guiding students to complete a document; it is about mentoring, building confidence, and helping them develop as independent thinkers. Over the years, I have learned that successful supervision requires clarity, flexibility, and a genuine commitment to the student's growth. For me, it is a collaborative process where both the student and I learn from each other.

During my academic career, I supervised more than 100 bachelor students and around 20 master's theses at UITS between 2009 and 2022. A complete list is given in Appendix C. In many cases, I have collaborated with colleagues on supervision, and I often encourage teamwork among students. Several of my bachelor and master students have worked with me on research projects, collecting data that later contributed to published articles. These collaborations have been rewarding because they turn supervision into a shared learning experience for both the student and me.

My approach to supervision is structured yet flexible. I start by setting clear expectations, both theirs and mine, about meeting frequency, feedback timelines, and milestones. For master's students, I typically schedule more frequent meetings at the beginning of the semester to refine the topic, research questions, and methodology. Since most of the theses I supervise involve qualitative methods, I make sure to have dedicated sessions after data collection to help students interpret and make sense of their findings. Later in the process, I encourage students to share drafts for feedback, which can happen in physical meetings or virtually. I maintain an open-door policy, but I am transparent about my availability and always set up meetings when needed. This clarity builds trust and keeps the process smooth. Because I follow an outcome-based curriculum, my supervision practices are designed to help students achieve the intended learning outcomes. When students begin their projects, I focus on developing their ability to review research literature effectively. I guide them through structured literature review sessions and teach database search strategies, often using IEEE Xplore or Scopus. I remember one bachelor student who struggled to narrow down a topic until we worked together on annotated bibliographies and discussed key papers; this process helped the student gain confidence and clarity. As projects progress, I emphasize problem-solving and research design. For example, in a master's thesis on renewable energy systems, I encouraged the students to analyze real-world case studies before finalizing the methodology, which strengthened their analytical skills and aligned with the outcome of investigating complex problems using research-based knowledge.

Applying modern tools is another critical outcome, and I integrate this into supervision through hands-on sessions or simulation software. In one project on power electronics, students learned to model circuits using simulation tools before implementing them in the laboratory, which gave them practical experience and confidence. Communication skills are equally important, so I conduct academic writing workshops and peer-review sessions. I recall organizing a mock presentation for a group of bachelor students where peers provided feedback on clarity and technical depth; this exercise improved their confidence and presentation skills significantly. Finally, I encourage continuous learning by asking students to maintain reflective journals and participate in seminars. One master's student attended an international webinar on smart grids and later integrated those insights into their thesis, demonstrating the value of lifelong learning.

Throughout the process, assessment is continuous and aligned with OBE principles. I monitor teamwork, communication skills, and progress through observation records and feedback sessions. These assessments are not mere formalities; they help students understand that professional growth is as important as completing the thesis. My supervision style blends structure with flexibility and combines functional approaches with enculturation by introducing students to research communities. I involve them in seminars, research groups, and co-authorship opportunities, reinforcing their sense of belonging in the academic and engineering community.

Overall, I see supervision as a partnership. It is about guiding students to produce quality work while helping them develop confidence, professional skills, and a mindset for continuous learning. Every supervision experience is unique, and I adapt my approach to the individual needs of the student, ensuring flexibility without losing structure.

Continuous Improvement Through Students' Feedback

Student feedback is the cornerstone of my reflective teaching practice within the Outcome-Based Education framework. It transforms abstract alignment—mapping COs to POs and PEOs—into actionable strategies that improve classroom experience and learning outcomes. The comments from students across multiple courses provided clear signals for refinement in content delivery, resource design, and assessment practices.

One recurring theme was the need for more real-life examples and practical exercises to complement theoretical rigor. While students appreciated the structured weekly outlines and balanced theory-practice approach, they noted that some chapters felt rushed and certain sections overloaded. In response, I re-sequenced syllabi to distribute workload evenly and embedded industry-driven case studies into lectures. For example, in Digital Signal Processing, I replaced generic examples with applications such as audio noise cancellation and biomedical signal analysis, making abstract concepts like Fourier transforms tangible and relevant. To further support active engagement, I introduced short design challenges during class and optional formative quizzes, allowing students to test their understanding without the pressure of high-stakes grading.

Feedback on CO achievement highlighted that while OBE principles were clear, students wanted stronger visibility of CO links in assessments and more frequent progress updates. To address this, I implemented a "*CO of the Week*" spotlight at the start of each module, explicitly connecting topics—such as Z-transform applications—to their corresponding COs and POs. Assignment and test cover sheets were redesigned to show which COs were assessed in each question and how marks were allocated. This transparency demystified the assessment process and helped students focus their efforts strategically. Mid-semester CO progress reports provided individualized feedback, reinforcing accountability and motivation.

Comments on learning resources prompted modernization of materials and improved accessibility. Outdated content was replaced with current research, and I developed interactive MATLAB and Python tutorials to strengthen conceptual understanding. Broken links were fixed, and a curated library of short video demonstrations was introduced for complex topics, enabling students to review at their own pace. Visual aids and annotated solutions were added to practice problems, closing the gap between theory and application.
Teaching method feedback emphasized pacing and interactivity. Students requested more group work and comprehension checks, which led to adopting flipped classroom models and structured peer-learning activities. In Communication Theory, for instance, students collaborated on link-budget design tasks, fostering teamwork and deeper conceptual engagement. I also began ending each class with concise summaries and quick diagnostic questions to reinforce learning and adapt pacing to student comprehension.

Assessment practices were generally praised for fairness but needed clearer rubrics and more practice opportunities. I responded by publishing detailed rubrics before major assignments, outlining performance criteria for each CO and illustrating proficiency levels. Revision sessions before exams shifted focus from rote review to problem-solving strategies, reducing anxiety and improving confidence. Additionally, I created a bank of self-paced exercises with annotated solutions, enabling students to receive immediate feedback and strengthen mastery.

These refinements, directly informed by student voice, exemplify my commitment to a responsive, evidence-based approach. By treating feedback as essential data rather than criticism, I have cultivated a learning environment that is transparent, engaging, and aligned with the high standards of OBE. The result is not only improved student satisfaction but demonstrable attainment of course and program outcomes, ensuring graduates are equipped for industry and lifelong learning.

Dissemination

My commitment to educational excellence extends beyond my own classroom, driving me to actively share, collaborate, and elevate teaching practices within my department, institution, and the broader engineering education community. I view dissemination not as a separate activity, but as a natural extension of my reflective practice—a way to test, refine, and scale effective teaching innovations.

A primary channel for this has been institutional leadership and faculty development. As an appointed member of the Self-Assessment Committee of IQAC, UITS's OBE framework, and the author of the university's OBE Handbook, I have directly trained hundreds of faculty members across multiple engineering departments. These workshops—such as "Designing Authentic Assessments in Engineering" and "Mapping Course Outcomes to Global Competencies"—translate the principles I practice daily into actionable strategies for my colleagues, fostering a culture of continuous pedagogical improvement.

Furthermore, I routinely integrate my teaching methods into academic and professional development seminars. For instance, I have conducted sessions on "Active Learning in the Engineering Lab," where I demonstrate how I transformed my Microprocessor course labs into problem-based sprints, sharing the specific project briefs and assessment rubrics that have led to such marked improvements in student design thinking. This practice of sharing concrete, proven materials ensures that the dissemination has immediate, practical impact.

My dissemination efforts also bridge directly into my research and industry engagement. The success of collaborative projects in my classes, such as the IoT-based energy monitoring system developed by mixed teams of young graduates and senior engineers, provided a rich case study. I presented this model at a national conference on engineering education, highlighting how a carefully structured learning environment can simultaneously build technical skills, foster intergenerational mentorship, and create direct pathways to internships and employment. This work exemplifies my core belief: that effective teaching directly addresses real-world engineering and workforce needs.

Looking ahead, my goal is to broaden this impact. I am currently developing a digital repository of my most effective pedagogical materials—including my interactive MATLAB Live Scripts and simulation-based challenges—to share as open educational resources. I am also planning to collaborate with international partners from my time at NTNU and VUT to author a paper on a comparative study of implementing active learning in diverse cultural contexts, from Bangladesh to Norway. Through these ongoing efforts, I strive to contribute to the global scholarship of teaching and learning, ensuring that the insights gained from my classrooms can inspire and inform engineering educators worldwide.

Reflections on Own Educational Development

My journey into academia began not with a lesson plan, but with a shared struggle. In 2009, as a graduate teaching assistant at KIIT University in India, I stood beside my peers, guiding them through projects, research tasks, and thesis work, untangling the complexities of engineering problems together. In those moments of collective problem-solving, when a furrowed brow softened into a nod of understanding, I discovered something far more compelling than any scientific result: the profound impact of guiding another person to their own insight. That unmistakable moment of clarity made it evident that my place was in the classroom. Guest lectures that same year, paired with strong student evaluations, confirmed that I could not simply teach engineering — I could help others learn it. That early spark of shared discovery ignited a passion that has shaped every step of my academic career.

As I progressed, I realized that clarity of explanation and technical mastery could take students only so far. I could derive equations flawlessly and decode circuit diagrams with ease, yet many students struggled to translate those ideas into functioning prototypes or analytical reasoning. That disconnect was my first major lesson: knowledge alone does not guarantee competence. Students learn when they build, test, revise, and experience the consequences of their design decisions. This realization marked my transition from a traditional lecturer to a designer of learning experiences, and it continues to anchor my practice today.

A defining moment in my development came from watching how students interacted with signal-processing tasks. They could manipulate equations mechanically but could not interpret the spectral behaviors they plotted. This gap forced me to rethink the entire learning process. By integrating MATLAB notebooks, SDR data, microcontroller routines, and network simulators, I made invisible phenomena visible. Students approached aliasing, noise behavior, filter characteristics, and routing logic with curiosity rather than memorization. This confirmed a principle that now guides my teaching: engineering understanding emerges only when students control the tools and confront the system-level outcomes of their choices.

Embedding diagnostic thinking into my teaching was another turning point. Instead of assuming comprehension, I began structuring classes around conceptual checkpoints that reveal misunderstandings early. This pushed me to refine how I sequence material, how I present abstractions, and how I design scaffolding that aligns with actual student cognition. My teaching became more adaptive and more tightly coupled to learning outcomes because I could see, in real time, where conceptual cracks were forming.

Cultivating a strong feedback culture has also shaped my development. Mid-semester evaluations, open-ended questionnaires, and discussions with external examiners expose patterns that I treat as engineering input. Students routinely pointed out where pacing was effective, where a lab needed clearer structure, or where a concept required deeper contextualization. Instead of treating evaluations as a verdict, I began treating them as a dataset — something to analyze, interpret, and act upon. This mentality turned course refinement into an iterative design loop, improving my communication, materials, and overall course architecture year after year.

The integration of modern digital ecosystems further accelerated my growth. Designing simulation-centered environments where MATLAB, Python, Packet Tracer, GNS3, and microcontroller platforms work as a unified learning system transformed how I think about teaching. I shifted from delivering content to engineering full learning infrastructures —

environments where theoretical knowledge, simulation tools, and hardware practice reinforce one another. This systemic approach now defines my pedagogical identity.

Collaborative learning has deepened my understanding of how students develop engineering judgement. Watching teams debate filter structures, troubleshooting issues, or analyzing communication-link impairments revealed how much learning emerges through structured interaction. This insight led me to build clearer peer-review protocols, team-based analytical tasks, and reflective assignments that push students to justify their reasoning rather than merely state an answer.

Yet the most meaningful feedback often arrives years later. Former students have returned with reflections on how the hands-on, tool-driven, diagnostic-oriented approach shaped their ability to navigate uncertainty in professional environments. Their observations confirmed that digital competence, iterative design habits, and engineering reasoning — all core components of my courses — translate directly into workplace readiness. These reflections remain some of the strongest motivators in my development.

My evolution as an educator is ongoing, but it now follows a clear trajectory: deeper alignment with learning outcomes, richer digital learning environments, more authentic engineering tasks, and a continuously refined feedback loop. With every iteration, I move closer to the educator I aim to be — someone who builds environments where students learn to think, design, test, and reason like engineers long before they formally bear the title.

As my teaching philosophy matured, I began to see academia not just as a profession but as a way of life. The classroom, the laboratories, and the research desk became interconnected spaces where curiosity drives progress. Yet behind every successful course or published paper lies an ecosystem of effort that few outside academia truly understands. This realization prompted me to reflect on the broader demands and rewards of this path—what it takes to sustain excellence and why, despite its challenges, so many of us choose to stay.

Growing up surrounded by professors, I witnessed firsthand how busy their lives can be. I realized most students never truly realize just how incredibly busy professors are. The time you see them in class is probably less than ten percent of their actual workload. At research universities, teaching a class is only the beginning. They prepare lectures, design assignments and exams, grade countless papers (a task that is far more time-consuming than most imagine), hold office hours, and, of course, show up to teach. Beyond that, they write grant proposals, review other people's work, publish their own research, supervise graduate students, and serve on evaluation committees, which often means reading hundreds of pages of dissertations for master's and PhD defenses. They must constantly generate new research ideas, attend conferences, and somehow still try to have a life and a family!

Knowing all this, I often wondered *why anyone would choose to enter and stay in academia.* Well, after fifteen years in this world, I look at myself and realize what made me stay is something deeper – the joy of discovery, the thrill of asking questions no one has answered before, and the privilege of finding solutions that can change lives. I stay for the moment a student's eyes light up in office hours – not because they got the right answer, but because they finally understand *why* it is the right answer. It is the quiet satisfaction of mentoring students and watching them grow into independent thinkers. It is the sense of contributing to knowledge that will outlast us. For me, that makes every challenge worthwhile.

* * *

Appendix A

Program Educational Objectives (PEO)

Program Educational Objectives (PEOs) are broad, forward-looking statements that define the professional achievements and career growth expected of graduates within a few years of completing the program.

PEO1: Problem Solving
Ability to inspect complex engineering problems and propose effective solutions by using various analysis, synthesis and development tools of engineering.

PEO2: Competent Graduates
Graduates will be innovative, competent and productive in addressing the industrial needs in the country and abroad.

PEO3: Continuous Development
Graduates will engage in a lifelong pursuit of learning with proficient knowledge for engineering industries and societal responsibilities with high moral and ethical values.

Program Outcome (PO)

Program Outcomes (POs) define the knowledge, skills, and professional behaviors students should demonstrate upon completing the program. These broad competencies—such as problem-solving, teamwork, and lifelong learning—are achieved through specific Course Outcomes (COs) that guide individual courses.

PO (a): Engineering Knowledge
An ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialization to the solution of complex engineering problems.

PO (b): Problem Analysis
An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO (c): Design/Development of solutions
An ability to design solutions for complex engineering problems and design systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PO (d): Investigation
An ability to identify, analyze, and solve a problem by defining the engineering requirements of the problem through effectively gathering information.

PO (e): Modern Tool Usage
An ability to apply mathematical foundations, simulation, algorithmic principles, and engineering knowledge in the modeling and design of engineering systems by using various analysis, synthesis and development tools of engineering in a way that demonstrates comprehension of the tradeoffs involved in design choices.

PO (f): The Engineer and Society
Ability to understand human behavior, culture, and society through humanities and social science studies, and to recognize the local and global impacts of engineering solutions.

PO (g): Environment and Sustainability
Students will be able to understand the impact of professional engineering solutions on ecosystems for sustainable development in society.

PO (h): Ethics
Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO (i): Individual Work and Teamwork
An ability to work effectively, as an individual or in a team, in multifaceted and/or multidisciplinary settings.

PO (j): Communication
An ability to communicate complex engineering ideas clearly in speech and writing, including preparing effective reports and design documents, delivering strong presentations, and giving or receiving clear instructions.

PO (k): Project Management and Finance
An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team to manage projects in a multidisciplinary environment.

PO (l): Lifelong Learning
Ability to think critically and independently, use informed judgement to create innovative engineering solutions, and recognize the need for ongoing, self-directed professional development.

PO No.	Program Outcomes (PO)	PEO1	PEO2	PEO3
a.	Engineering Knowledge	yes	yes	
b.	Problem Analysis	yes	yes	
c.	Design/development of Solutions	yes	yes	
d.	Investigation	yes	yes	
e.	Modern Tool Usage	yes	yes	
f.	The Engineer and Society	yes		yes
g.	Environment and Sustainability	yes	yes	yes
h.	Ethics		yes	yes
i.	Individual Work and Teamwork		yes	yes
j.	Communication		yes	yes
k.	Project Management and Finance	yes		yes
l.	Lifelong Learning		yes	yes

Table A1: Mapping of Program Outcomes to Program Educational Objectives

Appendix B

Course Outcomes (CO)

Course Outcomes (COs) define what students should know, be able to do, and demonstrate by the end of a course. These outcomes are specific, measurable, and guide both teaching and assessment. For engineering students, COs typically combine technical skills, problem-solving abilities, and professional competencies—such as applying scientific and mathematical principles to solve complex problems, designing solutions, and conducting investigations using modern tools. They also include essential professional skills like effective communication, teamwork, ethical responsibility, and a commitment to lifelong learning. For example, following shows

Course Title	Digital Signal Processing
Course No	EEE 315

Course Outcome (CO)	CO Statement
CO1	**Apply** the principles of discrete-time signal analysis to perform various signal operations
CO2	**Apply** the principles of Fourier transform analysis to describe the frequency characteristics of discrete-time signals and systems.
CO3	**Use** computer programming tools (usually MATLAB or C/C++) to process and visualize signals

Program Outcome (PO)	PO Title	Corresponding CO's				
PO (a)	Engineering Knowledge	CO1	CO3			
PO (b)	Problem Analysis	CO2				
PO (c)	Design/Development of solutions					
PO (d)	Investigation					
PO (e)	Modern Tool Usage	CO2	CO3			
PO (f)	The Engineer and Society					
PO (g)	Environment and Sustainability					
PO (h)	Ethics					
PO (i)	Individual Work and Teamwork					
PO (j)	Communication					
PO (k)	Project Management and Finance					
PO (l)	Lifelong Learning					

Figure B1: Course Outcomes for EEE 315 and Their Alignment with Program Outcomes.

Class Test-1						
Question No.			Q1	Q2	Q3	
Select CO from Drop-down list -->			CO1	CO2	N/A	Total
Full Marks			15	10		25
Serial	Student ID	Name	Obtained Marks			
1	[redacted]	[redacted]	9	8		17
2	[redacted]	[redacted]	12	7		19
3	[redacted]	[redacted]	11	6		17
4	[redacted]	[redacted]	10	9		19
5	[redacted]	[redacted]	6	10		16
6	[redacted]	[redacted]	5	10		15
7	[redacted]	[redacted]	7	14		21
8	[redacted]	[redacted]	10	6		16
9	[redacted]	[redacted]	10	14		24
10	[redacted]	[redacted]	10	8		18
11	[redacted]	[redacted]	6	14		20
12	[redacted]	[redacted]	6	12		18
13	[redacted]	[redacted]	13	13		26
14	[redacted]	[redacted]	11	10		21
15	[redacted]	[redacted]	12	12		24
16	[redacted]	[redacted]	12	14		26
17	[redacted]	[redacted]	6	6		12
18	[redacted]	[redacted]	8	7		15
19	[redacted]	[redacted]	7	14		21
20	[redacted]	[redacted]	14	5		19
21	[redacted]	[redacted]	11	5		16
22	[redacted]	[redacted]	15	6		21
23	[redacted]	[redacted]	12	7		19
24	[redacted]	[redacted]	11	5		16
25	[redacted]	[redacted]	15	8		23
26	[redacted]	[redacted]	6	14		20
27	[redacted]	[redacted]	11	7		18
28	[redacted]	[redacted]	12	8		20
29	[redacted]	[redacted]	8	14		22
30	[redacted]	[redacted]	8	10		18
31	[redacted]	[redacted]	13	8		21
32	[redacted]	[redacted]	7	7		14
33	[redacted]	[redacted]	10	14		24
34	[redacted]	[redacted]	9	5		14
35	[redacted]	[redacted]	13	13		26
36	[redacted]	[redacted]	9	6		15
37	[redacted]	[redacted]	11	12		23
38	[redacted]	[redacted]	9	9		18
39	[redacted]	[redacted]	12	9		21
40	[redacted]	[redacted]	10	6		16
41	[redacted]	[redacted]	14	13		27
42	[redacted]	[redacted]	6	9		15
43	[redacted]	[redacted]	5	7		12
44	[redacted]	[redacted]	8	14		22
45	[redacted]	[redacted]	6	10		16

Figure B2: Evidence of Course Outcome Attainment in EEE 315 Based on Class Test Results

Assignment						
Select CO from Drop-down list -->			CO1	CO2	CO3	Total
Full Marks			5	5	5	15
Serial	Student ID	Name	Obtained Marks			
1	[redacted]	[redacted]	2	5	3	10
2	[redacted]	[redacted]	3	4	2	9
3	[redacted]	[redacted]	2	2	5	9
4	[redacted]	[redacted]	4	4	5	13
5	[redacted]	[redacted]	5	3	2	10
6	[redacted]	[redacted]	5	2	2	9
7	[redacted]	[redacted]	3	5	5	13
8	[redacted]	[redacted]	4	5	2	11
9	[redacted]	[redacted]	3	5	4	12
10	[redacted]	[redacted]	4	2	4	10
11	[redacted]	[redacted]	4	2	2	8
12	[redacted]	[redacted]	2	3	2	7
13	[redacted]	[redacted]	4	3	4	11
14	[redacted]	[redacted]	4	4	3	11
15	[redacted]	[redacted]	3	2	3	8
16	[redacted]	[redacted]	5	2	3	10
17	[redacted]	[redacted]	5	4	2	11
18	[redacted]	[redacted]	5	3	2	10
19	[redacted]	[redacted]	3	3	4	10
20	[redacted]	[redacted]	5	3	2	10
21	[redacted]	[redacted]	5	2	4	11
22	[redacted]	[redacted]	5	3	2	10
23	[redacted]	[redacted]	2	4	4	10
24	[redacted]	[redacted]	2	3	5	10
25	[redacted]	[redacted]	5	5	2	12
26	[redacted]	[redacted]	2	5	5	12
27	[redacted]	[redacted]	3	4	2	9
28	[redacted]	[redacted]	4	5	2	11
29	[redacted]	[redacted]	3	2	4	9
30	[redacted]	[redacted]	3	2	4	9
31	[redacted]	[redacted]	5	5	3	13
32	[redacted]	[redacted]	4	3	2	9
33	[redacted]	[redacted]	2	2	4	8
34	[redacted]	[redacted]	3	4	3	10
35	[redacted]	[redacted]	3	3	4	10
36	[redacted]	[redacted]	2	5	4	11
37	[redacted]	[redacted]	2	5	3	10
38	[redacted]	[redacted]	3	2	4	9
39	[redacted]	[redacted]	2	2	3	7
40	[redacted]	[redacted]	4	5	3	12
41	[redacted]	[redacted]	5	4	2	11
42	[redacted]	[redacted]	4	4	3	11
43	[redacted]	[redacted]	3	3	4	10
44	[redacted]	[redacted]	3	4	4	11
45	[redacted]	[redacted]	5	3	5	13

Figure B3: Attainment of Course Outcomes in EEE 315 Through Assignment Performance

Grade											
Serial	Student ID	Name	Attendance 10%	Class Test-1 5%	Class Test-2 5%	Class Test-3 5%	Assignment 5%	Final Exam 70%	Total Marks 100%	Grade Point	Grade
1	[redacted]	[redacted]	9	3	3	2	3	48	68	3.25	B+
2	[redacted]	[redacted]	9	4	3	3	3	54	76	3.75	A
3	[redacted]	[redacted]	10	3	4	5	3	46	71	3.5	A-
4	[redacted]	[redacted]	9	4	3	2	4	54	76	3.75	A
5	[redacted]	[redacted]	9	3	4	2	3	63	84	4	A+
6	[redacted]	[redacted]	8	3	3	3	3	48	68	3.25	B+
7	[redacted]	[redacted]	8	4	4	2	4	57	79	3.75	A
8	[redacted]	[redacted]	9	3	4	5	4	49	74	3.5	A-
9	[redacted]	[redacted]	10	5	4	4	4	57	84	4	A+
10	[redacted]	[redacted]	8	4	4	4	3	49	72	3.5	A-
11	[redacted]	[redacted]	8	4	4	2	3	54	75	3.75	A
12	[redacted]	[redacted]	9	4	4	4	2	55	78	3.75	A
13	[redacted]	[redacted]	9	5	4	4	4	50	76	3.75	A
14	[redacted]	[redacted]	10	4	5	2	4	50	75	3.75	A
15	[redacted]	[redacted]	10	5	3	2	3	50	73	3.5	A-
16	[redacted]	[redacted]	9	5	3	4	3	47	71	3.5	A-
17	[redacted]	[redacted]	8	2	3	3	4	54	74	3.5	A-
18	[redacted]	[redacted]	10	3	4	3	3	61	84	4	A+
19	[redacted]	[redacted]	10	4	5	3	3	51	76	3.75	A
20	[redacted]	[redacted]	9	4	3	2	3	58	79	3.75	A
21	[redacted]	[redacted]	10	3	4	2	4	58	81	4	A+
22	[redacted]	[redacted]	9	4	4	4	3	52	76	3.75	A
23	[redacted]	[redacted]	10	4	5	3	3	53	78	3.75	A
24	[redacted]	[redacted]	10	3	3	2	3	49	70	3.5	A-
25	[redacted]	[redacted]	10	5	4	3	4	55	81	4	A+
26	[redacted]	[redacted]	10	4	5	2	4	53	78	3.75	A
27	[redacted]	[redacted]	9	4	4	4	3	56	80	4	A+
28	[redacted]	[redacted]	9	4	3	4	4	50	74	3.5	A-
29	[redacted]	[redacted]	8	4	4	4	3	56	79	3.75	A
30	[redacted]	[redacted]	9	4	5	3	3	50	74	3.5	A-
31	[redacted]	[redacted]	10	4	3	4	4	62	87	4	A+
32	[redacted]	[redacted]	10	3	4	2	3	52	74	3.5	A-
33	[redacted]	[redacted]	9	5	3	3	3	52	75	3.75	A
34	[redacted]	[redacted]	10	3	5	5	3	48	74	3.5	A-
35	[redacted]	[redacted]	10	5	5	5	3	52	80	4	A+
36	[redacted]	[redacted]	8	3	3	4	4	50	72	3.5	A-
37	[redacted]	[redacted]	8	5	4	3	3	55	78	3.75	A
38	[redacted]	[redacted]	9	4	5	4	3	56	81	4	A+
39	[redacted]	[redacted]	8	4	3	5	2	44	66	3.25	B+
40	[redacted]	[redacted]	9	3	5	3	4	57	81	4	A+
41	[redacted]	[redacted]	9	5	5	3	4	49	75	3.75	A
42	[redacted]	[redacted]	9	3	3	4	4	61	84	4	A+
43	[redacted]	[redacted]	10	2	3	4	3	58	80	4	A+
44	[redacted]	[redacted]	10	4	5	3	4	41	67	3.25	B+
45	[redacted]	[redacted]	9	3	4	4	4	58	82	4	A+

Grade Summary										
Grade	A+	A	A-	B+	B	B-	C+	C	D	F
Counts	13	16	12	4	0	0	0	0	0	0
%	29%	36%	27%	9%	0%	0%	0%	0%	0%	0%

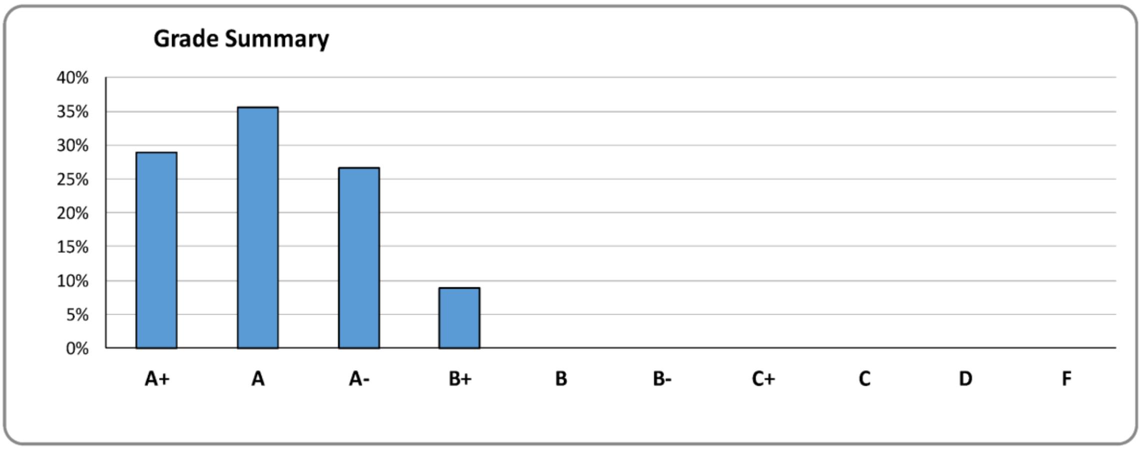


Figure B4: Evidence of CO Achievement for EEE 315 Based on Assignment Results

Individual CO Achivement

Serial	Student ID	Name	CO1		CO2		CO3	
			Marks	Achievement	Marks	Achievement	Marks	Achievement
1	[redacted]	[redacted]	53%	0	75%	1	58%	0
2	[redacted]	[redacted]	78%	1	72%	1	65%	1
3	[redacted]	[redacted]	58%	0	62%	1	95%	1
4	[redacted]	[redacted]	68%	1	72%	1	68%	1
5	[redacted]	[redacted]	70%	1	86%	1	65%	1
6	[redacted]	[redacted]	65%	1	60%	1	65%	1
7	[redacted]	[redacted]	75%	1	91%	1	58%	0
8	[redacted]	[redacted]	65%	1	77%	1	75%	1
9	[redacted]	[redacted]	73%	1	92%	1	80%	1
10	[redacted]	[redacted]	68%	1	75%	1	73%	1
11	[redacted]	[redacted]	68%	1	85%	1	53%	0
12	[redacted]	[redacted]	60%	1	91%	1	63%	1
13	[redacted]	[redacted]	83%	1	80%	1	70%	1
14	[redacted]	[redacted]	68%	1	86%	1	60%	1
15	[redacted]	[redacted]	70%	1	74%	1	63%	1
16	[redacted]	[redacted]	70%	1	77%	1	78%	1
17	[redacted]	[redacted]	68%	1	72%	1	60%	1
18	[redacted]	[redacted]	73%	1	78%	1	73%	1
19	[redacted]	[redacted]	60%	1	89%	1	75%	1
20	[redacted]	[redacted]	95%	1	72%	1	50%	0
21	[redacted]	[redacted]	80%	1	74%	1	70%	1
22	[redacted]	[redacted]	85%	1	75%	1	73%	1
23	[redacted]						75%	1
24	[redacted]						65%	1
25	[redacted]						75%	1
26	[redacted]						58%	0
27	[redacted]						78%	1
28	[redacted]						73%	1
29	[redacted]						80%	1
30	[redacted]						78%	1
31	[redacted]						85%	1
32	[redacted]						60%	1
33	[redacted]						78%	1
34	[redacted]						73%	1
35	[redacted]						78%	1
36	[redacted]						75%	1
37	[redacted]						75%	1
38	[redacted]						78%	1
39	[redacted]						78%	1
40	[redacted]						70%	1
41	[redacted]						73%	1
42	[redacted]						88%	1
43	[redacted]						83%	1
44	[redacted]						58%	0
45	[redacted]						75%	1

CO Achievement Summary

CO	CO Achievement	CO Achievement
CO1	91%	Y
CO2	100%	Y
CO3	87%	Y

PO Achievement Summary

PO	PO Achievement	PO Achievement
PO (a)	93%	Y
PO (b)	100%	Y
PO (c)		
PO (d)		
PO (e)	87%	Y
PO (f)		
PO (g)		
PO (h)		
PO (i)		
PO (j)		
PO (k)		
PO (l)		

Figure B5: Overall PO Attainment for EEE 315 Based on CO Performance Metrics.

Appendix C

Student Supervision

During my tenure at UITS, I actively supervised both undergraduate and postgraduate students in their research, project work, and industrial internships. These projects span advanced topics in wireless communication, antenna design, signal processing, and emerging technologies such as 5G and IoT. My role involved guiding students through problem formulation, design, simulation, and implementation, while fostering critical thinking and professional competencies. The following list represents the students I mentored, and the research projects completed under my supervision.

Postgraduate Students:

1. Md. Sohanur Rahman Adnan, Ishak Md. Tanjinul Haque, "*Reduction of Peak to Average Power Ratio in 5G Communication*", (2021)
2. Md Golam Kibria, Md. Sabbir Hossain, Md. Kaisar Ahmad, "*Design & Implementation of Microstrip Patch Antenna for 5G Communication",* (2021)
3. Abdulkadir Mohamed Mohamoud, Hassan Ahmed Mohamed, "Design an H-shape microstrip patch antenna at dual band mm-wave for 5G communication", (2021)
4. Abdikani Mohamud Samatar Hussein, Abdinajib Jama Said, "Interference Mitigation in Multiuser Multiple-Input-Multiple-Output Term-Evolution Advanced Systems", (2021)
5. Fath Ahmed Mohammed Ali, "Design and Analysis of a Highly Sensitive Hollow Core Photonic Crystal Fiber for Chemical Sensing", (2021)
6. Abdulkadir Mumin Harare, Khadar Awil Abdi, "Phased Array Antenna Design for 5G Network", (2021)
7. Mubarak Ali Hayd, "*Performance Analysis of Micro-strip Patch Antenna on Human Body at ISM(2.45GHz) Band*", (2020)
8. Abdiaziz Mohamed, "*Performance Simulation and performance analysis of high-speed fiber optic communication system with OFDM/WDM*", (2020)
9. Shankar Kumar Barman, "*Impact of Regulatory Aspects on 5G Mobile Communication Systems*", (2020)
10. Sharmaarke Mohamed Ali, "*Performance Evaluation of LTE Physical Layer Using SC-FDMA & OFDMA*", (2020)
11. Karar Jahidul Islam Anik, Riazul Ahsan Rabbi, "Design and Implementation of Polyphase Filtering for 5G Communication using FPGA", (2020)
12. Farzana Hoque Sonia, Md. Matiwr Rahman, Md. Mydul Islam, "*Multiband Microstrip Antena Design for Wireless Energy Harvesting",* (2019)
13. Sadia Shubash Mim, Mohammad Nurul Ambia, Baby Akhter, "*Distributed Energy Efficient Clustering (DEEC) for Wireless sensor networks*", (2019)
14. Khadija Akther Sonya, Nadim Mohammad, "*How 5G technologies empower the health based on Internet of things*", (2019)
15. Deen Mohammad, Md. Shamsul Arafin Shakil, "*Radar System in Vessel Traffic Management Information System*", (2019)
16. Syeda Umme Honey, Md. Enamul Hasan, Sadman Islam, "*Design and Analysis of Massive MIMO for 5G Communication*", (2019)
17. Md. Amanul Haque Aman, Md. Ahmadul Haque, "*Design and Implementation of a Secure Campus Network by using Different Security Mechanism and Routing Protocols*", (2019)

18. Tipu Sultan, Ishak Md. Tanjinul Haque, Md. Sohanur Rahman Adnan, "*Reduction of Peak-to-Average Power Ratio (PAPR) in 5G Communication System*", (2019)
19. Babangida Ibrahim, Md. Ekhterul Islam, Md. Selim Ahmed, "*Impact of 5G Technology on Business*", (2017)
20. Md. Rasel Biswas, "*Microstrip Patch Antenna for 5G*", (2017)
21. Md. Sohel Rana, Samina Yesmin, "*Image Watermarking using Discrete Wavelet Transform with Identification Noise*", (2017)
22. A.K.M. Zilhazur Rahman, Shamsunnahar Kadir, S. M. Zahidul Islam, Md. Zahidur Rahman, *The study of Network Virtualization & its Performance Analysis in Open-Stack Cloud Computing*, (2017)
23. Md. Azmal Huda, Mahmud Sayed, Md. Abu Taher, *PAPR Reduction in OFDM Systems using Modified Gamma Correction Companding*, (2017)
24. Mahfuz Alam, "*Performance improvement in OFDM system by different PAPR reduction methods (PTS and SLM)*", (2015)

Undergraduate Students:

1. Md. Ripon Mia, Ahsan Jamil, Md. Sohel Ahmed, Md. Selim Reza, SK. Mushfiqul Islam, "*Campus surveillance by Drone technology*", (2022)
2. Alok Sarker, Iftekharul Islam, Md. Emam Hossain, Mehedi Hasan, "*IOT Cloud Based Traffic Monitoring & Controlling System in Bangladesh*", (2022)
3. Sharmeen Akter Imama, "*Implementation & analysis of 5G*", (2021)
4. Md. Sudha Amin Badhan, "*Simulation of Digital Notice Board*", (2021)
5. Emade Uddin Pantho, Taozia Mostafie, Tamim Islam Momin, Pronay Chandra Das, "*Study on Substation Distribution, Operation & Maintenance system of DESCO*", (2021)
6. Md. Nazmul Kabir, Md. Ataur Rahman, Md. Asraful Islam, Amina Haque Pushpo, Arif Hossain, "*HVDC over HVAC Power Transmission System Fault Current analysis using VSC*", (2021)
7. Md. Mirja Monir, Md. Shah Farhad, Md. Ujjal Hassan, Md. Golam Rabbani, Monira Begum, "*Installation, Testing & Commissioning of 33/11 kV & Electrical substation Equipment*", (2021)
8. Shankar Kumar Barman, "*Impact of Regulatory Aspects on 5G Mobile Communication Systems",* (2021)
9. Yasir Taher, "Journey of 5G from 4G Network", (2018)
10. Abdullah Al-Bayezid, "Design of a Microstrip Patch Antenna for 2.4GHz WLAN Applications", (2021)
11. Md. Taseen Mallick, Md. Zahid Hasan, "Performance Analysis of Beyond 5G Compatible Downlink IBFD MIMO Wireless Communication System", (2020)
12. Md. Monir Hossain, "*Centralized Mobile Detector in Exam Hall",* (2019)
13. Rokonuzzaman, "*Network Operation Center at Banglalion Communication Ltd.*", (2019)
14. Md. Ajijul Hakim, Md. Nazrul Islam, "*Digital Notice Board with Finger Scanner",* (2019)
15. Mst. Lubna Jahan, "*OOB Reduction in 5G Transmission",* (2019)
16. Rokibul Islam, Iqbal Hossain, Mohammad Ariful Haque, Md. Emran Hossain Khan, Md. Din Islam, Md. Shahidul Islam, "*Digital Notice Board with Finger Scanner",* (2019)
17. Mydul Islam, "*Industrial Automation of PLC Based Conveyor Belt Control System",* (2019)
18. Md. Mahbubul Haque, Nadia Akter, "*Generator Alternator and Auto Transfer Switch ATS",* (2019)
19. Md. Nazmul Kabir, Md. Ataur Rahman, Md. Asraful Islam, Amina Haque Pushpo, "*HVDC over HVAC Power Transmission System Faulty Current Analysis using VSC",* (2019)

20. Md. Nasir Uddin, A.S.M Mayeedul Kabir, Md. Shakhawat Hossain Chowdhury, "*Network Operation Center: Monitoring of IPS Network*", (2019)
21. Usaimung Murma, "*Internship on Installation, Testing & Commissioning of 33/11KV and 11/4.415KV Electrical Substation Equipment",* (2019)
22. Md. Faruque Hossain, Md. Aslam Hossain, Md. Shamim Hossain, Md. Ashraf Siddique, "*Internship on switchgear and protective relays*", (2019)
23. Md. Abdullah Miah, Istake Ahmed, "*Internship on GSM 325 Volvo Generator & Electrical System",* (2019)
24. Irin Sultana Bristi, "*Internship at a Center Instructure and Development",* (2019)
25. Shovon Roy, Md. Al Mamun Kabir, Md. Mahadi Hasan, Md. Jannatul Islam, "Design and Implementation of a *Multipurpose Robovac with Cleaning-kit*", (2017)
26. Md. Abdullah Al Mamun, Azizul Hakim, "*Distribution & Power Transformer and Power Factor Plant*", (2017)
27. Kazi Rezaul Hasan, Md. Ovi, Hasibul Anwar Bappy, S.M. Naimur Rahman, "*Library Book Management with RFID*", (2017)
28. Shamar Debnath, Tareq Mahmud, Nowshin Naowar Nikita, Sayeda Rakib Hasan, "*Automatic Star Delta Starter using relays and adjustable electronic timer for Induction Motor*", (2017)
29. Md. Rihad Hossain Hemel, Md. Murad Hosan, Chandan Datta, "*Performance of Carrier Frequency offset in OFDM system and Estimation using MATLAB*", (2017)
30. Kazi Saiful Islam, "*Elevator Installation & Commissioning*", (2017)
31. Taukir Ahmed, Md. Rifat Hossain, Mohammad Nurunnaee Sajib, "*Linearization Error analysis among several precoding methods in OFDM*", (2017)
32. Md. Ziaur Rahman, Md. Mahmudul Hasan Mondal, Yusuf Md. Aminul Momenin, Md. Rezaul Karim, "*OPAMP Application Trainer Kit*", (2017)
33. Md Abdul Kader, Abdus Salam, "*Design and Simulation of L-Slit Rectangular Microstrip Patch antenna for GSM, WLAN & WiMAX Application*", (2016)
34. Md. Al Amin Hossain, Niaz Mohammad Hasan, Masum Billah, "*GSM Radio Network Planning & Optimization*", (2016)
35. Ridwanul Alam, Riyad Hasan, "*Energy consumption in wireless sensor network*", (2016)
36. M A K Wahid Mahumder, "*Secure Network Implementation with Cisco Solution*", (2016)
37. Md. Shihabul Islam, Mst. Maliha Islam, Touhida Zaman, "*VHDL Implementation of Convolutional Encoders*", (2016)
38. Mohammad Mahadi Hasan Foad, Fahin Raian Dip, Krishna Murari Das, "*Fast and Efficient wavelet transform for OFDM*", (2016)
39. Md. Kamal Uddin, Safayat Ullah Zibon, Asibur Rahman, "*Operation and maintenance of GSM System*", (2015)
40. Jilan Hossen Sohel, "RE Engineering", (2015)
41. Md. Jewel Rana, "RF optimization", (2015)
42. Sibbir Bin Siddique, Bidhan Sarkar, Tareq Mohammad Faruqi, "*Performance analysis & Comparison of carbon Nanotube Graphene nanoribbon & silicon nanowire Transistor*", (2015)
43. Shakti Kumar Shaha, "*DTMF Based Home Automation System*", (2015)
44. Md. Shohidul Islam, Md. Shafiul Bashar, Md. Minaur Rahman, Sayeduzzaman, "*Wireless rush driving detection & controlled with automatic speed breaker",* (2015)
45. Tasnimun Tabassum, Most. Shabnaz Akter Sony, Mafiha Rahman, Mahmudul Hasan, "*Automatic Railway Gate Control*", (2015)
46. Md. Zulfiker Ali, Shaikh Masud Alam, Md. Imroz Alam, Mohammad Syful Islam, "*Design and Simulation of a U-Shape micro strip TCH antenna of RF*", (2015)
47. Subrata Das, Mohammad Mahfuzul Hasan Chowdhury, "*Peak to Average Power Ratios Reduction using Sinusoidal Decomposition*", (2015)

48. Rahat Ahmed, Miti Saha, "*A New Blind Channel Estimation Technique",* (2015)
49. Nuzahat Nurey, Sharmin Akter, Anika Tasnim, Sarmin Jahan, "*Performance analysis of FFT & wavelet based OFDM*", (2015)
50. Avishek Batman, Tariqul Islam Pavel, Fahmida Akter, Shamsunnahar Sumi, "*EEG Signal Acquisition & Analysis*", (2015)
51. Shuvo Saha, Md. Amadul Haque, Md. Anisur Rahman Munshi, "*Radio Frequency Optimization*", (2015)
52. S. M. Samim Reza, Md. Masud Rana, Noor Alam, Abu Khalid, "*Wireless mobile phone charger*", (2015)
53. Md. Mahdi Hasan Faisal, "*PAR Reduction in OFDM systems using Companding*", (2015)

Appendix D

Pedagogical Training and Workshops

I strengthened my teaching practice and contributed to institutional quality assurance by actively participating in and conducting pedagogical workshops during my tenure at UITS. These sessions addressed curriculum design, teaching methodologies, assessment strategies, and outcome-based education, which refined my instructional approach and supported knowledge sharing among colleagues. I also served as a member of the Self-Assessment Committee within the IQAC Cell at UITS. The list below highlights the key workshops and training activities that shaped my academic development and leadership in faculty training.

Training Attended:

1. "*Inception Workshop on establishment of IQAC at UITS*" –Dr. Sanjoy Adhikar, Professor & Head, Quality Assurance Unit, HEQEP, UGC. Date: 31.05.2017
2. "*Workshop on Team Building*", Dr. Mohammed Solaiman, Professor & Vice-Chancellor, UITS. Date: 13.06.2017
3. "*Workshop on Self-Assessment Activity*", Dr. Mohammed Solaiman, Professor & Vice-Chancellor, UITS. Date: 24.07.2017
4. "*Workshop on Self-Assessment Survey Questionnaire*" –Dr. Shanti Narayan Ghose, Professor, Department of Business and Director, IQAC, BUBT. Date: 16.10.2017
5. "*Workshop on Curriculum Concept Model-01*", Dr. Mohammed Solaiman, Professor & Vice-Chancellor, UITS; Muhammad J. Munir, Additional Director, IQAC, UIU; Mohammad Tohidul Islam Miya; Core Resource Person, Quality Assurance Unit, HEQEP, UGC. Date: 09.11.2017
6. "*Workshop on Curriculum Concept Model-02*", Dr. Mohammed Solaiman, Professor & Vice-Chancellor, UITS; Dr. Khawza Iftekhar Uddin Ahmed, Professor, EEE & Director, IQAC, UIU; Dr. Md. Serajul Islam Prodhan, Associate Professor, EETE & Director, IQAC, DhIU, Date: 16.11.2017
7. "*Workshop on Curriculum Concept Model-03*", Dr. Mohammed Solaiman, Professor & Vice-Chancellor, UITS; Dr. Nazmun Nahar, Associate Professor and Director, IQAC, NSU, Dr. Md. Mostafizer Rahman, Professor & Director, IQAC, Gono Bishwabidyalay, Savar, Dhaka. Date: 23.11.2017
8. "*Workshop on Teaching Methodology-1*", Dr. Mohammed Solaiman, Professor & Vice-Chancellor, UITS; Dr. Muhammad Mahboob Ali, Professor, School of Economics, University of Dhaka. Date: 20.01.2018
9. "*Workshop on Teaching Methodology-2*", Dr. Mohammed Solaiman, Professor & Vice-Chancellor, UITS; Professor Dr. M. Kaykobad, Professor, CSE, BUET. Date: 27.01.2018
10. "*Workshop on Teaching Methodology-3*", Dr. Mohammed Solaiman, Professor & Vice-Chancellor, UITS; Dr. M.R. Kabir, Professor & Pro-Vice Chancellor, University of Asia Pacific; Dr. M. Kaykobad, Professor, CSE, BUET. Date: 03.02.2018
11. "*Workshop on Post Self-Assessment Improvement Plan* (PSAIP)", Dr. Mahbub Ahsan Khan, Quality Assurance Specialist, QAU, HEQEP, UGC and Professor of IER at DU. Date: 30.07.2018
12. "*Team Building Workshop*", Dr. Khawza Iftekhar Uddin Ahmed, Professor, EEE & Director, IQAC, UIU. Date: 30.10.2017

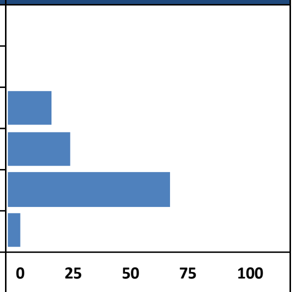
Training Conducted:

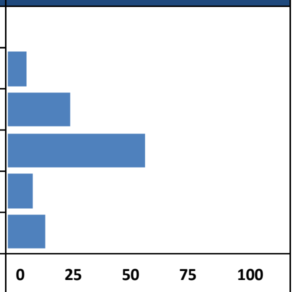
13. "*SA Activity Workshop-2 (Survey Data Sharing)*", Dr. Mohammad Mahmudul Hasan, Associate Professor, Department of EEE/ECE & SAC Member, IQAC, UITS. Date: 27.02.2018
14. "*Survey for Academic & Non-Academic Stuff, Students*", Dr. Mohammad Mahmudul Hasan, Associate Professor, Department of EEE/ECE & SAC Member, IQAC, UITS. Date: 4.11.17, 13.11.17
15. "*Survey Questionnaire for Alumni*", Dr. Mohammad Mahmudul Hasan, Associate Professor, Department of EEE/ECE & SAC Member, IQAC, UITS. Date: 08.12.2017

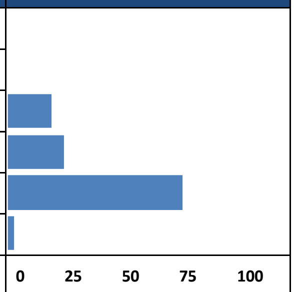
Appendix E

Students' Feedback

Course Content and Organization

Statement: The course objectives were clear.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	7	15.6%	
Agree	(4)	10	22.2%	
Strongly Agree	(5)	26	57.8%	
No Answer	(0)	2	4.4%	
Response Rate		**Mean**	**STD**	**Median**
43/45 (95.56%)		4.44	0.76	5.0

Statement: The course objectives were clear.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	3	6.7%	
Neutral	(3)	10	22.2%	
Agree	(4)	22	48.9%	
Strongly Agree	(5)	4	8.9%	
No Answer	(0)	6	13.3%	
Response Rate		**Mean**	**STD**	**Median**
39/45 (86.67%)		3.69	0.76	4.0

Statement: The course was well organized.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	7	15.6%	
Agree	(4)	9	20.0%	
Strongly Agree	(5)	28	62.2%	
No Answer	(0)	1	2.2%	
Response Rate		**Mean**	**STD**	**Median**
44/45 (97.78%)		4.48	0.75	5.0

Course Outcome (CO) Achievement

Statement: Teacher discussed OBE and COs at the beginning of the semester.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	8	17.8%	
Agree	(4)	12	26.7%	
Strongly Agree	(5)	22	48.9%	
No Answer	(0)	3	6.7%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
42/45 (93.33%)		4.33	0.78	5.0

Statement: Teacher explained the assessment criteria in the class.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	8	17.8%	
Agree	(4)	12	26.7%	
Strongly Agree	(5)	22	48.9%	
No Answer	(0)	3	6.7%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
42/45 (93.33%)		4.33	0.78	5.0

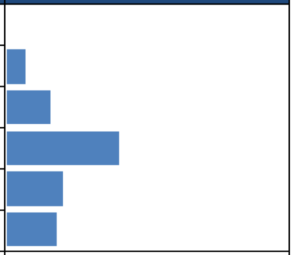
Statement: Teacher explained how assessments align with COs.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	7	15.6%	
Agree	(4)	15	33.3%	
Strongly Agree	(5)	18	40.0%	
No Answer	(0)	5	11.1%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
40/45 (88.89%)		4.28	0.74	4.0

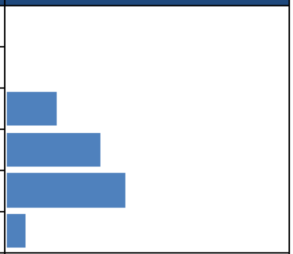
Statement: Teacher ensured that all students achieve the COs of corresponding course.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	5	11.1%	
Agree	(4)	18	40.0%	
Strongly Agree	(5)	17	37.8%	
No Answer	(0)	5	11.1%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
40/45 (88.89%)		4.30	0.68	4.0

Learning Resources and Learning Environment

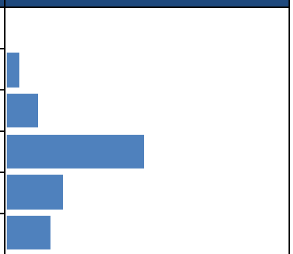
Statement: Learning materials were relevant and useful.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	2	4.4%	
Agree	(4)	18	40.0%	
Strongly Agree	(5)	23	51.1%	
No Answer	(0)	2	4.4%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
43/45 (95.56%)		4.49	0.59	5.0

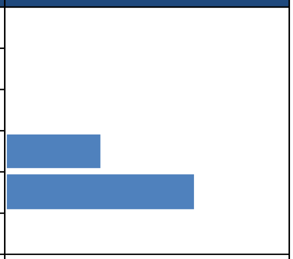
Statement: Recommended readings, books etc. were relevant and appropriate.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	5	11.1%	
Agree	(4)	12	26.7%	
Strongly Agree	(5)	26	57.8%	
No Answer	(0)	2	4.4%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
43/45 (95.56%)		4.49	0.69	5.0

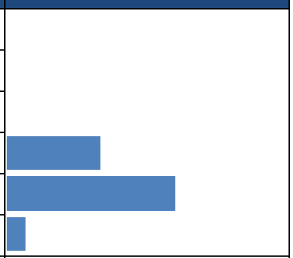
Statement: Facilities of the classroom were adequate.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	3	6.7%	
Neutral	(3)	7	15.6%	
Agree	(4)	18	40.0%	
Strongly Agree	(5)	9	20.0%	
No Answer	(0)	8	17.8%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
37/45 (82.22%)		3.89	0.86	4.0

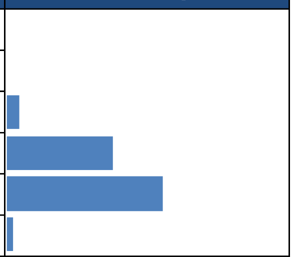
Statement: The overall environment in the classroom was conducive to learning.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	8	17.8%	
Agree	(4)	15	33.3%	
Strongly Agree	(5)	19	42.2%	
No Answer	(0)	3	6.7%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
42/45 (93.33%)		4.26	0.76	4.0

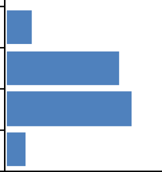
Teaching Method and Teaching Quality

Statement: Course was well structured to achieve learning outcomes.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	2	4.4%	
Neutral	(3)	5	11.1%	
Agree	(4)	22	48.9%	
Strongly Agree	(5)	9	20.0%	
No Answer	(0)	7	15.6%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
38/45 (84.44%)		4.00	0.76	4.0

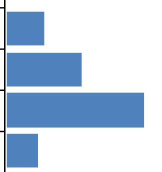
Statement: Teacher has adequate knowledge on the course.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	0	0.0%	
Agree	(4)	15	33.3%	
Strongly Agree	(5)	30	66.7%	
No Answer	(0)	0	0.0%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
45/45 (100.00%)		4.67	0.47	5.0

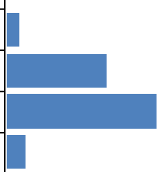
Statement: Teacher was regular in class.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	0	0.0%	
Agree	(4)	15	33.3%	
Strongly Agree	(5)	27	60.0%	
No Answer	(0)	3	6.7%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
42/45 (93.33%)		4.64	0.48	5.0

Statement: Ideas and concepts were presented clearly.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	2	4.4%	
Agree	(4)	17	37.8%	
Strongly Agree	(5)	25	55.6%	
No Answer	(0)	1	2.2%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
44/45 (97.78%)		4.52	0.58	5.0

Statement: Teacher was dedicated to improving teaching method.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	4	8.9%	
Agree	(4)	18	40.0%	
Strongly Agree	(5)	20	44.4%	
No Answer	(0)	3	6.7%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
42/45 (93.33%)		4.38	0.65	4.0

Assessment

Statement: The method of assessment was effective.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	6	13.3%	
Agree	(4)	12	26.7%	
Strongly Agree	(5)	22	48.9%	
No Answer	(0)	5	11.1%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
40/45 (88.89%)		4.40	0.73	5.0

Statement: Difficulty of exam questions was manageable.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	2	4.4%	
Agree	(4)	16	35.6%	
Strongly Agree	(5)	24	53.3%	
No Answer	(0)	3	6.7%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
42/45 (93.33%)		4.52	0.59	5.0

Statement: Feedback on assessment was timely and helpful.				
Response Option	**Weight**	**Frequency**	**Percent**	**Percent Responses**
Strongly Disagree	(1)	0	0.0%	
Disagree	(2)	0	0.0%	
Neutral	(3)	1	2.2%	
Agree	(4)	17	37.8%	
Strongly Agree	(5)	22	48.9%	
No Answer	(0)	5	11.1%	
				0 25 50 75 100
Response Rate		**Mean**	**STD**	**Median**
40/45 (88.89%)		4.53	0.55	5.0

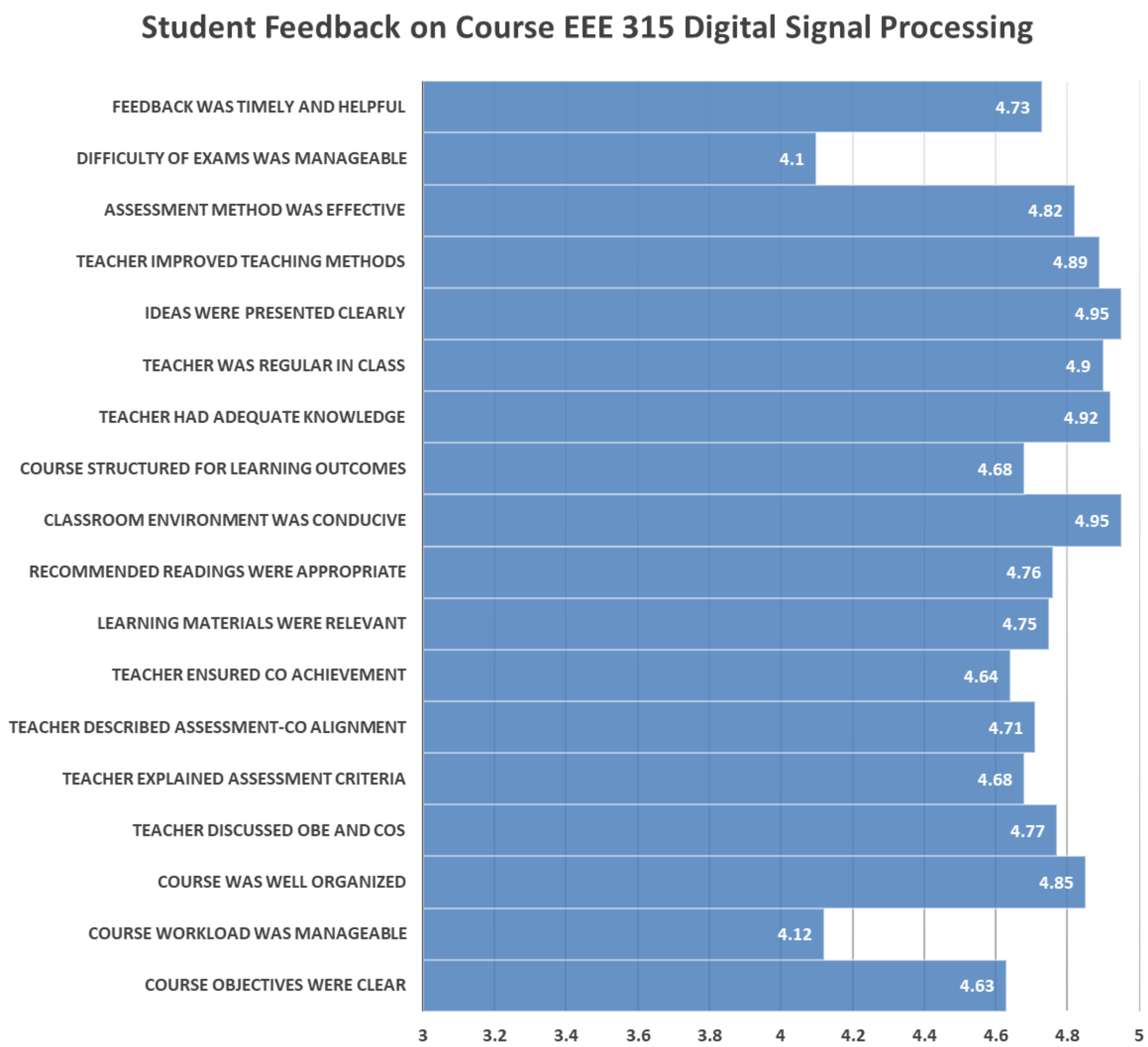


Figure E1. Students' feedback collected on UCAM at the end of the course.

Additional Comments

Course Content and Organization:
Topics were clear and well-paced, flow was easy to follow, weekly outlines helped, slides were concise, balanced theory and practice, smooth progression overall, but some chapters felt rushed, a few sections overloaded, some content outdated, could use more real-life examples and case studies, mid-course workload high in parts, more practical exercises would help, clearer links between topics needed, some repetition could be reduced, objectives for each week could be highlighted.

Course Outcome (CO) Achievement:
COs were explained clearly, teacher gave good overview of OBE, assessment links were helpful, teacher pushed us to achieve COs, clear start-of-semester briefing, regular reinforcement was nice, mapping examples were useful, transparent criteria, overall CO direction clear, but sometimes CO links were hard to see, a few COs seemed overlapping, marks-to-CO mapping unclear, some CO targets felt high, more feedback on individual CO progress needed, reminders of COs during semester would help, better check-ins to track CO achievement suggested.

Learning Resources and Learning Environment
Learning materials were useful and relevant, reading list solid, classroom comfortable, multimedia used well, handouts helpful, resources well organized, conducive environment, adequate facilities, clean classroom, reference materials helpful, slides mostly clear, but some materials outdated, more practice problems wanted, readings sometimes too advanced, a few broken links, more visual aids would help, Wi-Fi and access to resources could be improved, lighting and air quality sometimes poor, solutions to exercises needed.

Teaching Method and Teaching Quality
Teacher was knowledgeable and dedicated, explanations mostly clear, concepts broken down well, class structured to achieve learning outcomes, engaging style, regular in class, encouraged participation, improved teaching over semester, committed, good pacing overall, but sometimes lectures too fast, needed more interactive sessions and group work, more examples and case studies would help, check understanding regularly, reduce repetition, clarify assignment instructions, provide summaries at end of class, more visuals and demos suggested, adapt pace to student comprehension.

Assessment
Assessment methods mostly fair, feedback helpful and timely, exam difficulty manageable, good variety of questions, clear marking criteria, aligned with learning outcomes, some tricky questions, partial credit could help, more formative assessments for practice, better alignment with taught content, revision sessions before exams would help, marking rubrics sometimes unclear, instructions for tasks could be clearer, some exams felt heavy, preparation tips appreciated, overall feedback quality strong.

University of Information Technology & Sciences (UITS)

Department of Electrical and Electronic Engineering

Course Title: Digital Signal Processing

Course Code: EEE 315, Credit: 3.00

Faculty Name: Mohammad Mahmudul Hasan

STUDENT FEEDBACK FORM

(to be filled up by each student at the time of course completion)

Evaluate the following aspects of the course by marking " ✓" in box of corresponding column according to the scale given:

5- Strongly agree, 4- Agree, 3- Neutral, 2- Disagree, 1- Strongly disagree

A. Course Content and Organization	5	4	3	2	1
1. The course objectives were clear.	✓				
2. The course workload was manageable.		✓			
3. The course was well organized.	✓				
4. Additional Comments: Explanations clear, examples useful, pace sometimes fast					

B. Course Outcome (CO) Achievement	5	4	3	2	1
1. Teacher discussed OBE and COs at the beginning of the semester.	✓				
2. Teacher explained the assessment criteria in the class.	✓				
3. Teacher described the relationship between assessments and COs to achieve the course outcomes.	✓				
4. Teacher worked hard to ensure that all students achieve the COs of corresponding course.	✓				
5. Additional Comments: CO recap during assessments would help clarity					

C. Learning Resources and Learning Environment	5	4	3	2	1
1. Learning materials were relevant and useful.	✓				
2. Recommended readings, books etc. were relevant and appropriate.	✓				
3. The overall environment in the classroom was conducive to learning.	✓				
4. Facilities of the classroom were adequate.			✓		
5. Additional Comments: Facilities were adequate, projector could be sharper					

D. Teaching Method and Teaching Quality	5	4	3	2	1
1. Course was well structured to achieve learning outcomes.	✓				
2. Teacher has adequate knowledge on the course.	✓				
3. Teacher was regular in class.	✓				
4. Ideas and concepts were presented clearly.	✓				
5. Teacher was dedicated to improving teaching method.	✓				
6. Additional Comments: He's always on time, pays attention to us, inspires us					

E. Assessment	5	4	3	2	1
1. The method of assessment was effective.	✓				
2. Difficulty of exam questions was manageable.		✓			
3. Feedback on assessment was timely and helpful.	✓				
4. Additional Comments: Consistent, transparent, helped identify weak spots					

F. Overall Evaluation

1. The best features of the course were:

clear explanations, structured lectures, good hands-on, real-world examples, supportive guidance, well paced content, organized assessments. Engineering is fun finally ...

2. The course could have been improved by:

A few more practice sets, occasional recap sessions

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