
Aspects of Engineering Education: A Comparison between Bangladesh and Australia

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Abstract

Skilled engineering graduates are needed for the sustainable development of a country. Bangladesh is the eighth populous country in the world, with only 3 engineers per thousand as compared to 25 engineers per thousand in Australia. This paper compares engineering studies at Western Sydney University (WSU) and Bangladesh University of Engineering and Technology (BUET). It also compares Civil Engineering courses at WSU, BUET, Indian Institute of Technology, Kharagpur (IITK) and Massachusetts Institute of Technology (MIT), USA. Engineering education in WSU and BUET has few similarities, but there are several differences in terms of curriculum, accreditation, assessment, and career prospects. It has been found that BUET, IITK and MIT have few social sciences courses in their undergraduate engineering courses as opposed to WSU. Also, WSU Civil Engineering course does not have any chemistry subject in contrary to BUET, IITK and MIT. BUET course has a strong theoretical basis, which can be strengthened by adding more topics on soft skills such as scholarly writing and industry placements. Both the WSU and BUET should include subjects on emerging fields such as climate science, artificial intelligence (AI) and sustainability. In terms of 2025 global ranking, WSU is placed at 384 (QS ranking), 301-350 (Times Higher Education) and 1 (Impact ranking). BUET has a ranking of 761-770 (QS ranking) and 1001-1200 (Times Higher Education). These rankings reflect the overall quality of WSU and BUET. WSU and BUET has an active memorandum of understanding (MOU), which should be made more effective by building new collaborations in teaching, learning and research in the areas of common interests.

Keywords: Engineering education, Bangladesh, Australia, BUET, WSU, Washington Accord.

1. INTRODUCTION

Throughout the ages, engineers have been playing significant role in the development of human society especially in the field of infrastructure, technology, healthcare and environmental sustainability. Engineering education and skilled engineers contribute significantly to the economic growth and development of a country (CEBR, 2016). As compared to general undergraduate education like an arts degree, engineering education needs specialised attention to produce skilled graduates who can lead infrastructural developments of a country. In line with the technological development of the world, engineering curriculum, research and lab facility, educators/teachers and assessment process should be updated with time to cope with the current trends. Innovative and timely strategies should be taken by the engineering institutions and regulatory authorities for engineering students to keep pace with the continuous change of technology and engineering practices (Taraban, 2017; Burley et al., 2016; Hynes et al., 2019).

Engineering education in Bangladesh started its journey in 1876 from the establishment of Dhaka Survey School. In 1948, this school was upgraded to Ahsanullah Engineering College. Later in 1962, it was upgraded to East Pakistan University of Engineering and Technology and in 1971, this was renamed as the Bangladesh University of Engineering and Technology (BUET). In addition, four engineering colleges were established. These four engineering colleges were upgraded to Bangladesh Institute of Technology (BIT), in 2003 these were upgraded to engineering universities (Chowdhury et al., 2008). Now, there are many engineering schools in Bangladesh (both government and private). The Institution of Engineers, Bangladesh (IEB) is responsible for accreditation of engineering degrees in Bangladesh. IEB has more than 60,000 members (IEB, 2024).

In this study different area of study and practice are selected to compare engineering and educational standards between Bangladesh and Australia. Also, a comparison of civil engineering courses is made among BUET, Western Sydney University (WSU), Indian Institute of Technology Kharagpur (IITK) and Massachusetts Institute of Technology (MIT).

2. CURRICULUM

Curriculum is an important aspect in engineering education systems as it helps to prepare fresh graduates for immediate employment (Chowdhury et al, 2013). To compare difference in engineering curriculum, two institutes i.e., BUET from Bangladesh and Western Sydney University (WSU) from Australia are selected in this study.

BUET's engineering programs generally focus heavily on technical depth within specific disciplines. For example, Civil Engineering curriculum includes in-depth courses on structural analysis, geotechnical engineering, and materials science. There is strong emphasis on fundamental mathematics and science courses, including advanced calculus, differential equations, and physics. In contrary, WSU emphasises preparing students for industry by integrating more industry-relevant skills and contemporary practices into the curriculum apart from the courses in mathematics and physics. This might include more focus on emerging technologies and project management. Hence, WSU curriculum focuses mainly on industry-relevant skills. In WSU, a balance is maintained between technical courses and broader education, which includes communication skills and teamwork.

In terms of course structure, BUET curriculum typically includes a broad range of core engineering subjects early on, with specialised electives introduced in later years. There is project work in the course and students are usually required to complete field based or laboratory-based project work or a thesis in their final year, which involves real-world problems. The course at WSU has more flexibility with elective choices, allowing students to tailor their education to their interests or career goals. WSU engineering course integrates work-integrated learning, blended learning, and work experience, which presents a good networking opportunities with engineering industry by the students. In BUET practical training is given mostly through laboratories and workshops. Training through fieldwork is limited for BUET students. In WSU, there is a strong emphasis on industry partnerships and real-world experience. Many students work on projects sponsored by industries and/or work part-time in industries during their studentship.

A curriculum comparison in undergraduate engineering courses among WSU, IITK, BUET and MIT shows many similarities among these institutes, however, there are notable differences in terms of curriculum, industry engagement, global reputation, and research opportunities. MIT offers world-class education with an emphasis on research, innovation, and global impact. MIT is renowned for its rigorous and research-intensive curriculum. Engineering programs at MIT have a strong theoretical basis that focus on cutting-edge research and technological innovation. MIT programs encourage interdisciplinary study and often allow students to work on frontier technologies. WSU focuses on practical aspects and regional connections. IITs are globally recognised for their rigorous and research-heavy programs. The curriculum focuses on both theoretical knowledge and practical

application, though with a stronger emphasis on mathematical and scientific foundations. BUET is known for providing a strong foundational engineering education with a balance of theoretical and practical components and with emphasis on core engineering subjects and technical competence. The BUET program is oriented toward producing skilled engineers who can contribute to national and international industries. BUET provides more emphasis on research, particularly in infrastructure and applied sciences, though it lacks the global research footprint of IITs or MIT.

The civil engineering curriculum of MIT has three tracks from first year i.e., structural design track, atmosphere and climate track and transportation track. The curriculum for other three institutes does not have any track from first year. BUET curriculum includes choice of specialisation in structural engineering, environmental engineering, transportation engineering and geotechnical engineering in the final year of the study. Humanities and social science subjects are missing in WSU curriculum. At MIT, more emphasis is given to Humanities, Arts, and Social Sciences (HASS) courses compared to the three other institutes. There are eight subjects for HASS requirement for the MIT course through out four years of study. MIT courses are mainly categorised as General Institute Requirements (GIRs) and General Department Requirements (GDRs) subjects. Other three institutes do not categorise their course like MIT. One important observation is that WSU Civil Engineering course does not have any Chemistry subject whereas the three other institutes have chemistry subject. Lack of chemistry knowledge could rise difficulties for civil engineering students in learning wastewater treatment, environmental processes, drinking water treatment and materials related subjects. Also, there is no HASS subject in WSU civil engineering course in contrary to the three other institutes.

3. ACCREDITATION

Engineering accreditation is very important as it ensures that an engineering program meets established standards of quality and prepares graduates to meet industry and professional expectations. The accreditation processes and bodies can vary significantly between Bangladesh and Australia. The engineering programs of BUET are accredited by the Board of Accreditation for Engineering and Technical Education (BAETE), which is part of the Institution of Engineers (IEB), Bangladesh. The accreditation standards set by BAETE/IEB are primarily customised to the specific educational and professional needs within Bangladesh. These standards focus on ensuring that engineering education meets national industry requirements and professional expectations. The IEB's accreditation is recognised within Bangladesh and in some in South Asian countries. In the past, BUET's programs did not have international accreditation from global bodies like the Accreditation Board for Engineering and Technology (ABET), though they were highly respected locally. The BAETE/IEB has now become a full signatory of the Washington Accord since 12 June 2024, retroactively effective from June 2023 (IEB, 2024). This has given IEB's accreditation a global recognition.

In case of WSU, program accreditation is done by the Institution of Engineers, Australia (IEAust). The IEAust is a signatory to the Washington Accord, which means its accreditation is recognised globally. The IEAust follows the standards set by the Washington Accord, which ensures that accredited programs meet international standards for engineering education. This includes a focus on a broad range of competencies, including technical skills, management skills, and professional practice. Global recognition of accreditation facilitates easier international mobility for engineering graduates and this particularly advantageous for graduates seeking employment or further education abroad.

4. GRADUATE SKILLS

The engineering graduate skills from BUET and WSU can vary due to differences in curriculum focus, course structure, industry integration, and educational approaches, etc.

BUET graduates generally have strong technical knowledge and a deep understanding of core engineering principles. The curriculum is rigorous and emphasises fundamental theories and advanced

technical skills. Students at BUET develop strong analytical and problem-solving skills through challenging coursework and complex project work. This often includes strong theoretical and mathematical expression of engineering problems, mathematical modelling, simulation, and advanced problem-solving techniques. The practical skills are mainly honed through extensive laboratory work and workshops. Students gain hands-on experience with engineering tools and technologies relevant to their field. The research skill for BUET student is covered during final-year projects involving research, field and laboratory work which allow students to develop skills in data collection, analysis, and presentation. There is limited emphasis on technical report writing and presentation for students to effectively communicate complex technical information. BUET's programs are tailored to meet the specific needs of the Bangladeshi and South Asian engineering contexts, with a focus on local industry practices and standards.

At WSU, industry-relevant skills are achieved through work-integrated learning. WSU places a strong emphasis on industry-relevant skills through internships, industry projects, and work placements. Graduates are well-prepared for real-world engineering challenges and workplace environments. WSU curriculum includes a focus on developing soft skills such as teamwork, communication, and leadership. These are crucial for working effectively in diverse and collaborative environments. WSU graduates are exposed to the latest engineering technologies and practices, including those emerging in their field. The focus is on equipping students with current and future industry skills. WSU focuses on applied problem-solving capabilities for student. Therefore, emphasis is placed on innovative problem-solving approaches and the application of engineering principles to practical and often complex real-world problems. WSU's graduates are trained to meet international standards and are prepared for global engineering challenges. WSU incorporates project management principles into its engineering programs, providing students with skills in planning, executing, and managing engineering projects. WSU students get access to many industry software which may not be accessible to BUET students due to funding problem.

5. WORK EXPERIENCE

Engineering work experience can significantly impact the readiness of graduates for the professional world. The work experience opportunities and focus at BUET and at WSU reflect their different approaches to education and industry integration.

In BUET, internships and industrial training are not structured properly as compared to that of WSU. BUET offers internships and industrial training programs, but these may not be as integrated or systematic as those in some western countries. Internships are often optional and may depend on students' initiative and connections. The duration and scope of internships can vary, and students may need to arrange these placements independently, often relying on personal or professional networks. Practical experience for BUET student is mainly limited to laboratories and workshops. BUET emphasises practical experience through extensive use of laboratories and workshops, where students gain hands-on skills with engineering tools and technologies. Final-year project work is a requirement for BUET student. Students undertake significant final-year projects that often involve real-world problems or research. These projects can offer valuable experience but are typically academic in nature rather than industrial. Industry training and experience for student are very limited. Students may gain work experience through collaborations with Bangladeshi companies or research institutes. BUET's career services is limited compared to many western countries.

Many engineering programs at WSU include work-integrated learning components such as internships, industry placements, or project-based work as part of the curriculum. These are often mandatory and integrated into the program. WSU has established partnerships with various industries, and the university often facilitates placements through formal agreements, making it easier for students to secure relevant work experience. WSU incorporates industry-sponsored projects and case studies into the curriculum. Students work on real-world problems provided by the industry partners, gaining practical experience and exposure to current industry practices. WSU has strong industry

connections both locally and internationally. These connections provide students with a range of opportunities for internships, placements, and industry collaboration. WSU also offers comprehensive career services, including job placement assistance, career counselling, and networking events with industry professionals. Due to WSU's global focus and international standards, students may have opportunities for work experience that aligns with global engineering practices, enhancing their readiness for international careers. It should be noted that WSU was ranked Number 1 university globally as per Times Higher Education impact ranking in 2023, 2024 and 2025. This is a recognition of WSU's sustainability related research initiatives where both academic staff and students take active part.

6. RESEARCH

The engineering research in an institute depends on institutional priorities, research facilities, and academic focus. Research at BUET often addresses local and regional engineering problems pertinent to Bangladesh and South Asia. This might include infrastructure development, urban planning, environmental engineering, and issues specific to the region's needs. BUET also addresses some global issues like climate change. BUET has research programs mainly in traditional engineering fields such as civil, mechanical, electrical, and computer engineering, often with a focus on practical applications relevant to local industries. BUET has well-established laboratories and research facilities, though they might be more focused on traditional engineering disciplines and may not always have the latest international research equipment and technologies. Research funding may primarily come from national sources, including government grants and local industry partnerships, which can limit the scope of research projects compared to institutions with broader international funding. Research collaborations are limited, often local, involving Bangladeshi universities, government agencies, and industries. International collaborations are less frequent but are increasing. Students, particularly at the graduate level, are encouraged to engage in research projects, often culminating in theses or dissertations that contribute to local knowledge and solutions.

Australia provides a research-based learning approach wherein all the concepts and ideas are gathered and implemented in the classroom (Atkinson, 2016). WSU engineering education is research focused. WSU's research often addresses global challenges and incorporates multidisciplinary approaches. This can include advanced topics in emerging technologies, sustainability, and innovative engineering solutions with international relevance. There is a strong focus on applied research with direct industry applications, including collaboration with industry partners and solving current technological problems. WSU invests in modern research facilities and cutting-edge technologies, providing students and researchers access to advanced tools and equipment. Research at WSU often benefits from diverse funding sources, including international grants, industry partnerships, and collaborative research projects with global institutions.

WSU has extensive international research collaborations, including partnerships with universities, research institutions, and industries around the world. This global network enhances the scope and impact of research. Strong connections with industry and participation in international research consortia help ensure that research is relevant and impactful on a global scale. WSU provides numerous research opportunities for both undergraduate and graduate students, including internships, research assistant positions, and involvement in large-scale research projects. Students often work on projects with industry partners or as part of international research teams. A good number of students in WSU publishes conference and journal articles from their final year projects.

7. COMMUNICATION SKILL

Engineering communication skills are crucial for success in both academia and industry. They encompass the ability to effectively convey complex technical information, collaborate with team

members, and engage with various stakeholders. There are noticeable communication skill differences between students at BUET and WSU.

At BUET, more emphasis is placed on technical writing and presenting technical content, such as research reports and project documentation, rather than on broader communication skills. Students mainly develop presentation skills through project work and theses, but these opportunities might be more focused on technical content and less on public speaking or general communication techniques. Collaboration and teamwork skills are usually developed through work on the team projects. However, the team projects are focused more on technical aspects and less on formal team dynamics and communication strategies. Although, the courses are typically conducted in Bengali or English, communication skills training might be less emphasised in the local language compared to international standards. There is limited exposure to global communication practices, which can impact the development of skills required for international contexts. Feedback on communication skills might be less structured or formalised compared to institutions with a strong focus on communication. There are few BUET graduates with high communication skills, which are mainly dependant on individual initiative.

WSU's engineering programs typically include a strong emphasis on developing communication skills as part of the curriculum. This includes technical writing, oral presentations, and professional communication. Communication skills are integrated into various aspects of the program, including coursework, group projects, and industry placements. Students often receive training in effective communication techniques as part of their education. WSU emphasises team-based learning and collaborative projects, which include structured activities to enhance teamwork, negotiation, and communication skills. Group assignments often involve diverse team dynamics and formal communication processes. Courses are conducted in English, and students receive training that aligns with international standards. This helps in developing communication skills that are effective in global contexts. Students are exposed to international communication practices through diverse coursework and interactions with global industry partners. WSU provides structured feedback on communication skills through presentations, written reports, and professional interactions. This feedback is designed to help students continuously improve their communication abilities. The university often offers additional resources such as workshops, seminars, and career services that focus on enhancing professional communication skills.

8. CONCLUSION

This paper compares BUET and WSU engineering courses. It has been found that BUET emphasises more on mathematical and theoretical aspects with very good laboratory-based learning. WSU focuses more on applied side with a higher industry focused learning. Now both BUET and WSU are full signatories of Washington Accords which may facilitate joint degree offering and student staff exchange. Since BUET and WSU has active MOU, they should take up more collaborative teaching and research projects. It is recommended that WSU engineering course include few social science courses like MIT and a chemistry subject for Civil, Environmental and Sustainability engineering courses. It is also recommended that BUET emphasises on work-integrated learning, soft skills such as oral presentation and scholarly writing at their engineering courses. Both BUET and WSU should emphasise on climate science, sustainability, and artificial intelligence to meet the future industry demand and challenges.

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